APPENDIX A

AIRPORT CONSTRUCTION PROJECT CHECKLIST

MARTIN STATE AIRPORT

BWI BALTIMORE/WASHINGTON INTERNATIONAL Thurgood Marshall AIRPORT

MARYLAND DEPARTMENT OF TRANSPORTATION
MARYLAND AVIATION ADMINISTRATION
OFFICE OF ENGINEERING AND CONSTRUCTION MANAGEMENT

AIRPORT CONSTRUCTION PROJECT CHECKLIST
DIVISION OF FACILITIES DESIGN

MAA Project No.: _____

Project Title: _____

FAA Funding? ____ Yes ____ No **FAA Project No**.: _____

Instructions: All projects designed for the Maryland Aviation Administration, Office of Engineering and Construction Management will be performed in accordance with this checklist. The checklist should be completed as design progresses, and must be included with each submission of design documents. In general, any item on the following checklist which is checked "N/A" (not available or not applicable) should include a short explanation of action taken

Items on the checklist are to be completed by the Engineer, except as noted otherwise. Where checklist items call for approval, coordination, or notification of other agencies, including those outside of MAA, documentation shall be made by the Engineer in writing. If information is not transmitted in a timely manner, the Engineer should send a follow-up request. If no response is received, the Engineer should document such non-response and notify the MAA project manager.

Any changes in project scope, design and/or construction costs, or schedule resulting from design reviews or other causes must be approved by the Manager, Design Services in writing before design work may proceed. There will be no exceptions.

For Federally-funded projects, the FAA Project Checklist (see Schedule B) must also be completed.

Yes	No	N/A	
___	___	___	1. Has the Planning Division Checklist been received? Have all items noted in this checklist been addressed and coordinated with the Office of Planning & Environmental Services, and will they have any impact on design? Can design proceed?
___	___	___	2. Have airport property plats and descriptions been reviewed? If the proposed project is not on MAA property, has the project been coordinated with the MAA Division of Real Estate?

Yes	No	N/A	
___	___	___	3. Have past engineer's reports involving the project area and/or scope been reviewed? List reports reviewed. _____ _____
___	___	___	4. Have record plans from the project area been reviewed? List project plans reviewed: _____ _____
___	___	___	5. Does the project area include wetlands or other environmentally sensitive areas that need to be addressed? Have environmental issues been properly coordinated with the Office of Planning and Environmental Services?
___	___	___	6. Has any required environmental documentation been coordinated with and approved by the Office of Planning & Environmental Services? Have necessary approvals been received? Can project proceed if approvals are not received?
___	___	___	7. If required, have appropriate mitigation measures been included in the design?
___	___	___	8. If required, has an FAR Part 77 obstruction survey been conducted? Have possible impacts on the project schedule been evaluated?
___	___	___	9. Does the design call for obstructions to be removed or lighted? Have removal and/or lighting decisions been coordinated with the Office of Planning & Environmental Services and Office of Design and Construction?
___	___	___	10. If required, has an FAA Form 7460-1, "Notice of Proposed Construction or Alteration," been completed, submitted, and approved? Has a companion permit application for MAA Board of Airport Zoning Appeals (BAZA) been completed, submitted, and approved?
___	___	___	11. Have FAR Part 77 and Part 139 obstructions been identified? Have the disposition of all obstructions been coordinated and resolved with MAA Office of Engineering and Construction Management and FAA-WADO?
___	___	___	12. Has an erosion and sediment control and storm water management permit been received from MDE? Application date: _____
___	___	___	13. Has a U.S. Army Corps of Engineers water quality permit been received?

Yes	No	N/A	
___	___	___	14. Have NPDES permit requirements and conditions been coordinated with OPE Environmental Services? Has an NPDES permit been applied for and received? Application date: _____
___	___	___	15. Have other required permits been received? List permits and application dates: _____ _____
___	___	___	16. Has BG&E work been coordinated and finalized? BG&E representative: _____
___	___	___	17. Has Bell Atlantic work been coordinated and finalized? Bell Atlantic representative: _____
___	___	___	18. Has an application for frequency approval been submitted to FCC? Application date: _____
___	___	___	19. Have Anne Arundel County Department of Public Works approvals and permits been received for water and/or sewer hook-ups?
			20. Has work been coordinated with the following agencies?
___	___	___	a. State Highway Administration?
___	___	___	b. Mass Transit Administration?
___	___	___	c. Amtrak and Maryland State Railroad Administration?
___	___	___	d. FAA – Air Traffic Control and Facilities?
___	___	___	e. FAA – Washington Airports District Office?
___	___	___	f. FAA – Eastern Region?
___	___	___	g. Federal Inspection Services (FIS) Agencies?
___	___	___	21. Have surveying and mapping been completed?
___	___	___	22. Has the Pre-Design Meeting been held (at 30%) Design)? In certain cases a Pre-Pre-Design meeting will be required. OPE will provide direction.
___	___	___	23. Have the 30% Design plans, specifications, and construction cost estimate been received, distributed, and reviewed? The 30% submission was distributed to: _____

Yes	No	N/A	
			_____
___	___	___	24. Has the Preliminary Engineer's Report including been completed, distributed, and reviewed (at the 30% Design stage)? Does the report include supporting calculations? The report was distributed to: _____ _____
___	___	___	25. Have the 30% Design review comments been addressed and resolved?
___	___	___	26. Have the 60% Design plans, specifications, and construction cost estimate been received, distributed, and reviewed? The 60% submission was distributed to: _____ _____
___	___	___	27. Have the 60% Design review comments been addressed and resolved?
___	___	___	28. Have the 100% Design plans, specifications, Engineers Report, and construction cost estimate been submitted for review and approval? Does the report include supporting calculations? The 100% submission was distributed to: _____ _____
___	___	___	29. Has the project been approved by the State Fire Marshal?
___	___	___	30. Have the final plans, specifications, and construction cost estimate been submitted? Submission date: _____
___	___	___	31. Have state wage rates been requested and received from the State of MD Dept. of Labor Licensing & Regulation?
___	___	___	32. Have Federal wage rates been requested and received from the Office of Procurement?
___	___	___	33. Has the construction phasing been coordinated with Airport Operations, FAA ATCT, FAA Facilities, Air Transport Association, and other airport tenants and/or users?
___	___	___	34. Have the proper MBE/DBE requirements and goals for the project been included?
___	___	___	35. Do the contract documents include the Technical Provisions (General Information, Technical Specifications, Wage Rates, Standard Provisions Forms, and Interim Standard Provisions), and Bid Forms (Agreement, Performance Bond, Payment Bond, Affidavits, and Proposal)?

Yes	No	N/A	
___	___	___	36. Have the requirements of the Airport Operations Checklist been incorporated into the contract documents? Has the checklist been completed and attached?
___	___	___	37. Have the requirements of the Fire Rescue Services Checklist been incorporated into the contract documents? Has this checklist been completed and attached?
___	___	___	38. Have the requirement of the Maintenance Division Checklist been incorporated into the contract documents? Has this checklist been completed and attached?
___	___	___	39. Have the requirements of the Finance Division Checklist been incorporated into the contract documents?
___	___	___	40. Has schedule A been completed and attached?
___	___	___	41. Have MAA design standards been reviewed and incorporated into the design?

I certify that the referenced project has been completed in accordance with this checklist.

_____

Engineer's Signature Date

MARYLAND DEPARTMENT OF TRANSPORTATION
MARYLAND AVIATION ADMINISTRATION
FACILITIES DEVELOPMENT AND ENGINEERING

AIRPORT CONSTRUCTION PROJECT CHECKLIST
OFFICE OF DESIGN
SCHEDULE A

MAA Project No.: _____

Project Title: _____

Yes	No	N/A	
___	___	___	1. Has the project been coordinated through the Office of Airport Operations with affected tenants?
___	___	___	2. Has the project been coordinated with the Office of Commercial Management where leases and tenant agreements are affected?
			Traffic Control Plan
___	___	___	1. Has the traffic control plan been coordinated with Airport Operations, State Highway Administration, and county government (i.e., detours, temporary pavement marking, lighting, signage, directional arrow board, etc.)?
___	___	___	2. Have temporary markings on airfield pavements been specified to be painted? (The use of temporary tape markings must be approved by Airport Operations.)
___	___	___	3. Is adequate temporary lighting specified?
___	___	___	4. Are adequate customer/pedestrian protection, temporary signs, dust control measures, etc. specified?
			Civil and Landscaping
___	___	___	1. Have adequate storm water management, erosion and sediment control measures during construction been specified?
___	___	___	2. If needed, have special treatments for establishing ground cover (minimum requirement: topsoil, seed, and mulch) been specified?
___	___	___	3. Have landscaping plans been approved by the MAA Maintenance Division?
			Electrical
___	___	___	1. Have Mode II runway and taxiway signs been specified?
___	___	___	2. Have “switch hitter” runway centerline lights been specified?

Yes	No	N/A	
___	___	___	3. Have runway condition sensors been included if specified by MAA?
___	___	___	4. Have any required control tower facsimile panel modifications been included?
			Buildings
___	___	___	1. On major structures, has the Governor's Commission approved the architectural concept?
___	___	___	2. Have the roof specifications been approved by the Department of General Services? Has modified bitumen roof been specified?
___	___	___	3. Have temporary heat and air conditioning been provided?
___	___	___	4. Have temporary water and sanitary sewer service been provided?
___	___	___	5. Is temporary power provided?
___	___	___	6. Have handicapped facilities been provided in accordance with ADA? Have these facilities been reviewed by the MAA Office of Transportation and Terminal Services?
___	___	___	7. If required, have additional FIDS been provided?
___	___	___	8. Have 6" diameter minimum bollards been specified?
___	___	___	9. If required, has a reflectivity study been conducted and approved?
			Safety
___	___	___	1. Has FAA Advisory Circular 150/5300-9 been incorporated?
___	___	___	2. Has FAA Advisory Circular 150/5370-2 been incorporated?
			Aesthetics
___	___	___	1. Is there any need or justification for special treatments for aesthetic reasons?
___	___	___	2. Is there any need for artist's renderings and/or a special aesthetics review?
			Sensitive Security Information
___	___	___	Does the project involve the modification or addition to any of the following four security systems: CASS, CCTV, Flex Response or CAD? If "Yes," then the project probably contains SSI and the scope must be reviewed with the MAA Director of Airport Security and Sole Source System Contractors.

___	___	___	Has the project been reviewed with the MAA Office of Airport Security and Sole Source System Contractors for Sensitive Security Information?

I certify that the referenced project has been completed in accordance with this checklist.

_____

Engineer's Signature Date

FEDERAL AVIATION ADMINISTRATION
PLANS AND SPECIFICATIONS REVIEW CHECKLIST

SCHEDULE B

Airport: _____ **AIP No**.: _____

Yes	**No**	Item
___	___	1. Do the plans and specifications cover all the work included in the tentative allocation? If not, please explain. _____ _____
___	___	2. Do the plans and specifications include any non-eligible development?
___	___	3. Have all coordination (sponsor, users, FAA, etc.) comments been satisfied? If not, please explain. _____ _____
___	___	4. Has an Engineer's Report been submitted to FAA?
___	___	5. For projects containing airport paving, has the FAA Pavement Design Form (FAA Form 5100.1) been submitted to the FAA?
___	___	6. Was a pre-design conference held?
___	___	7. Are there any waivers to FAA standards included in Engineering Report? Have waivers been: Requested: Yes_____ No _____ Approved: Yes_____ No _____
___	___	8. Does the development included in the plans and specifications conform with the approved Airport Layout Plan? If not, please explain. (Note: This can be controlled by including a general layout sheet in the plan set with all grant work items listed in the legend and shown at the location on the airport where it will be constructed. The location and size shown should agree with the approved ALP). _____ _____
___	___	9. Are there any special environmental conditions or requirements that need to be incorporated in the plans and specifications? If yes, please explain. _____ _____

Yes	No	Item
___	___	10. If over $100,000 estimated cost, does specifications include 100% payment, and 100% performance bonds?
___	___	11. Are the current EEO, Davis Bacon Act and DBE provisions in the plans and specifications? (Reference current boilerplate)
___	___	12. Is the current minimum Wage Rate Schedule (U.S. Department of Labor) included verbatim or referenced in specifications?
___	___	13. Does the Wage Rate Schedule include all the worker classifications required?
___	___	14. Are the EEO (minority/women) goals shown in the specifications in accordance with the Department of Labor requirements shown in the Federal Register dated Friday, October 3, 1980, page 65976?
___	___	15. Are the DBE goals shown in the specifications in conformance with sponsor's approved DBE plan?
___	___	16. Has a copy of the invitation for bids been sent to the Minority Business Resource Center for DBE coordination?
___	___	17. Do Plans and Specifications include safety requirements of Advisory Circular 150/5370-2, "Operational Safety on Airports During Construction"?

_____
Signature

_____ _____
Title Date

APPENDIX B

STANDARD FORMS

MARTIN STATE AIRPORT

BWI BALTIMORE/WASHINGTON INTERNATIONAL Thurgood Marshall AIRPORT

STANDARD FORMS

- MEETING MINUTES FORM
- ENGINEER'S REPORT GENERAL SUMMARY
- STANDARD COST ESTIMATE
- KNOX BOX ORDER FORMS
- REQUEST FOR VARIANCE – INTERFACE OF FIRE ALARM, LIFE SAFETY AND SECURITY SYSTEMS
- PRE-OCCUPANCY FIRE INSPECTION
- REQUEST FOR VARIANCE – OT STANDARDS AND SPECIFICATIONS
- CHANGE REQUEST – OT STANDARDS AND SPECIFICATIONS
- RESOURCE ALLOCATION PERMIT – OT STANDARDS AND SPECIFICATIONS
- CONFIDENTIALITY AND NON-DISCLOSURE AGREEMENT (FOR CONSTRUCTION CONTRACT BIDDERS) – SSI
- CONFIDENTIALITY AND NON-DISCLOSURE AGREEMENT (FOR A/E, CMI, TENANT AND SOLE SOURCE PROVIDER) – SSI
- CONTRACTOR REPRESENTATIVE INFORMATION – SSI

Baker

ENGINEERING & ENERGY

MEETING MINUTES

MEETING DATE		
MEETING LOCATION		
MEETING SUBJECT		
TASK NUMBER & TITLE		
MAA TASK MANAGER		EMAIL:
CONSULTANT TASK MANAGER		EMAIL:
MINUTES PREPARED BY		EMAIL:

INVITED PARTICIPANTS	ATTENDEES	REPRESENTING	EMAIL ADDRESS	PHONE NUMBER

INTRODUCTION AND PURPOSE OF THE MEETING
1.

A	***NEW*** **ACTION/DISCUSSION ITEMS**	**ACTION REQUIRED BY**	**DATE REQUESTED**
B	**OUTSTANDING ITEMS REQUIRING ACTION/DISCUSSION FROM *PREVIOUS* MEETING(S)**	**ACTION REQUIRED BY**	**DATE REQUESTED**
	Action:		

Distribution:
cc:

ENGINEER'S REPORT GENERAL SUMMARY

Date	
Report Phase	☐ Preliminary ☐ Draft ☐ Final
Airport	☐ BWI ☐ Martin
A/E Contract Number	
Task Number	
Task Title	
Construction Contract Number	
Construction Contract Title	
CONSULTANT'S CONTACT INFORMATION	
Prime Consultant	
Consultant's Task Manager	
Task Manager's Phone Number	
Task Manager's Email Address	

Contract Number
Task Number and Title

Date

ESTIMATING LEVEL: ☐ **Budget** ☐ **Concept** ☐ **30%** ☐ **60%** ☐ **100%** ☐ **Bid**

ITEM	DESCRIPTION		UNIT	UNIT COST	QUANTITY	TOTAL	COMMENT
	CONSTRUCTION COST ESTIMATE						
1						$0	
2						$0	
3						$0	
4						$0	
5						$0	
6						$0	
7						$0	
	Special Systems	☐ BAS (Metasys)					
		☐ FAS (Honeywell)					
		☐ CASS					
		☐ CCTV					
		☐ BGE					
		☐ Verizon					
		☐ BHS (Bagage Handling Systems)					
		☐ Other Systems (Specify)					
	SUBTOTAL A					**$0**	
	Design Contingency (15% to 25% of A)				25%	$0	
	SUBTOTAL B					**$0**	
	General Conditions X% of B (If not included in Unit Costs)				10%	$0	
	Contractor O&P X% of B (if not included in Unit Costs)				15%	$0	
	Construction Security Plan (X% of B)				5%	$0	
	SUBTOTAL C					**$0**	
	Construction Quality Control Plan (3% of C)				3%	$0	
	SUBTOTAL D					**$0**	
	Miscellaneous Construction Allowance (5% to 10% of C)				10%	$0	
	Construction Quality Control Plan (3% of Misc. Construction Allow.)				3%	$0	
	TOTAL CONSTRUCTION COST ESTIMATE					$0	
	ADDITIONAL PROGRAM COSTS						
	Estimated Design Fee (8% to 12% of Construction Cost)				12%	$0	
	Estimated CMI Fee (8% to 12% of Construction Cost)				12%	$0	
	TOTAL CAPITAL PROGRAM COST ESTIMATE					$0	
	Escalation Factor (if applicable)				0%	$0	
	GRAND TOTAL					$0	

Level of Accuracy	☐ Quantity Take-Off	☐ General Square Foot	☐ Comparison with other installations/facilities
List of Sole Source Items	1	3	5
Included in this Contract	2	4	6
List of Assumptions			

KNOX

2006 Fire/Law Enforcement Rapid Entry System AUTHORIZATION ORDER FORM

800-552-5669 • 623-687-2300 • Fax: 623-687-2290 • WWW.KNOXBOX.COM

Effective January 1, 2006

Section 1 BILLING INFORMATION - MUST MATCH CREDIT CARD INFORMATION IF USED.

COMPANY / NAME

DATE ORDERED

STREET (NO P.O. BOXES)

SUITE / BUILDING

CITY

STATE

ZIP CODE

CONTACT NAME

PHONE NUMBER

P.O. NUMBER (GOV. AGENCIES ONLY)

Send this form with payment to:
KNOX COMPANY
1601 W. Deer Valley Road,
Phoenix, AZ 85027

ORDER WILL NOT BE PROCESSED
Without Authorized Signature

Section 2

Baltimore - Wash Intl Airport F/Res
State Aviation BWI Fire/Res
PO Box 8766
Baltimore, MD 21240

Authorized Fire Agency Signature and Date

Print Name Clearly

PS-39-026-02-89
System Code

IMPORTANT NOTE - Knox™ Master Keys are provided to authorized fire departments or other registered entities on an as-needed basis solely for use with the Knox Rapid Entry System. No other use of the keys or their associated codes is authorized. Key codes associated with the Knox Master Keys and Keyways remain the property of the Knox Company and are maintained by the Knox Company in Phoenix, Arizona. For questions regarding this policy, contact Knox at 800-552-5669.

Section 3 ORDER PRODUCT HERE

Quantity	Part Number	Amount
		Total $
		Total $
		Total $

Shipping & Handling

1 lb. to 7 lbs.	$7.00
8 lbs. to 25 lbs.	$17.00
26 lbs. to 50 lbs.	$30.00
51 lbs. to 75 lbs.	$40.00

75 lbs.+ call Knox for quote. Alaska, Hawaii, Canada or Priority Shipping, please call for rates.

If required, add $7.00 per submastered item $

Shipping and Handling $

Subtotal $

No St Tax
Sales Tax $

Regd
Pre-payment
Total $

PRE-PAYMENT INFORMATION REQUIRED

USE PRICE LIST ON LAST PAGE

☐ Check or Money Order made payable to: **KNOX COMPANY** **Federal I.D. #95-3617858**

☐ VISA ☐ AMEX ☐ MC ☐ DISC

CARD NUMBER

EXP. DATE (MM / YYYY)

Cardholder Signature

Section 4 INSTALLATION ADDRESS - REQUIRED BY FIRE DEPARTMENT

BUILDING NAME (WHERE ITEM WILL BE INSTALLED) - PLEASE TYPE ADDITIONAL INSTALLATION ADDRESSES ON A SEPARATE SHEET (REQUIRED BY FIRE DEPT.)

ADDRESS

CITY

STATE

ZIP CODE

Fire Department Approval Signature Required to Submaster Items

☐ Check here to Submaster

Authorized Fire Agency Signature
Submaster fee $7.00 per keyed item.

Section 5 SHIP TO ADDRESS IS REQUIRED

O/N

REC'D

SHIP TO CONTACT NAME

COMPANY NAME

STREET ADDRESS (NO P.O. BOXES)

CITY

STATE

ZIP CODE

E-MAIL ADDRESS

CT-KBAUTH-0059-A

Continued Page 1

Section 6 **DUAL LOCK OPTION - For Permitted Dual Lock Products ONLY**

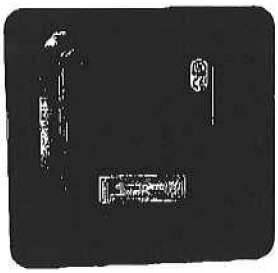
Knox Master Keys are provided to authorized fire departments or other registered entities on an as-needed basis solely for the use with Knox Rapid Entry System. No other use of the keys or their associated codes is authorized. Key codes associated with the Knox Master Keys and Keyways remain the property of the Knox Company. If any replacement keys are needed, the transaction will be handled through the local fire department. Knox Company will send the replacement key to the Knox coordinator at the appropriate Fire Department and the Fire Department representative will give the key to the appropriate property owner representative.

Authorized Dual Lock User Signature

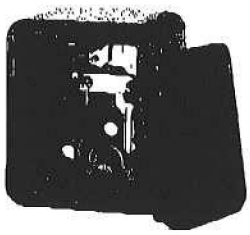
Date

Knox Rapid Entry System Product Catalog

KNOX-BOX® 3200 Series w/ Lift-Off Door - Heavy Duty



#3227 Recessed



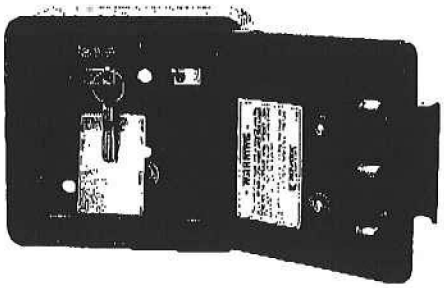
#3208 Surface

- Heavy-duty, high security construction
- Capacity for up to 10 keys and access cards
- 1/2" solid steel door
- Dimensions: Surface 5" H x 4" W x 3-1/4" D
  Recessed 7" H x 7" W Flange
- **Ship Weight: 10 lbs.**
- Colors: Black, Bronze, Aluminum
- Finish: Knox-Coat® Weather resistant proprietary coating system

- Options:
  - Alarm tamper switches
  - Aluminization (additional rust and corrosion protection)
  - Recessed Mounting Kit available for new masonry construction

KNOX-VAULT™ 4400 Series - Heavy Duty

#4444 Recessed



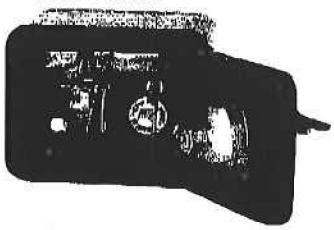
#4414 Surface

- Heavy-duty, high security construction
- 50 key capacity storage, for access cards, floor plan
- 5/8" solid steel door, re-locking mechanism with drill resistant hard-plate lock protector
- Dimensions: Surface 7" H x 7" W x 5" D
  Recessed 9-1/2" H x 9-1/2" W Flange
- **Ship weight: 29 lbs**
- Colors: Black, Bronze, Aluminum
- Finish: Knox-Coat® Weather resistant proprietary coating system

- Options:
  - Alarm tamper switches
  - Single, dual or combination locks
  - Aluminization (additional rust and corrosion protection)
  - Recessed Mounting Kit available for new masonry construction

KNOX-BOX® 3200 Series w/ Hinged Door

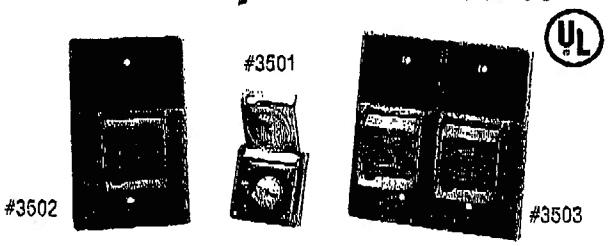
#3275 Recessed



#3266 Surface

- Allows single-handed operation
- Stores both keys and access cards
- Ensures efficient emergency response
- Door attached with hinge, it's all one unit
- Dimensions: Surface 4" H x 5" W x 3-1/4" D
  Recessed 7" H x 7" W Flange
- **Ship Weight: 10 lbs.**
- Colors: Black, Bronze, Aluminum
- Options: Same as 3200 Lift-Off door model above

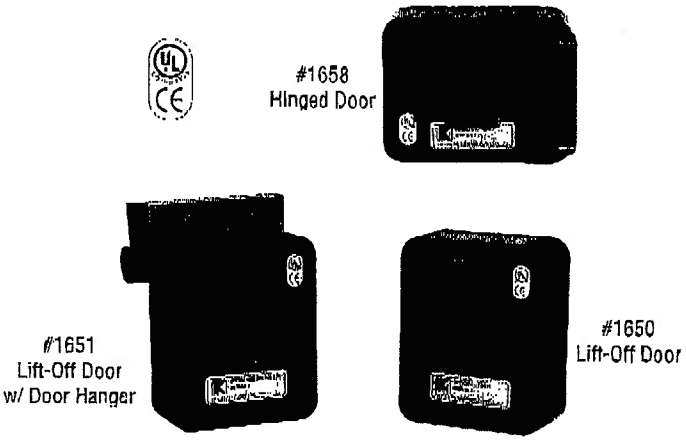
Knox® Key Switch 3500 Series



- Electric override for perimeter gates, parking garages, gated communities, HVAC controls and industrial equipment lockout
- For fire, EMS & law enforcement
- Single or dual-key options
- All stainless steel dust cover
- **Ship Weight: 1 lb.**

Knox® Residential 1650 Series

- For temporary or permanent residential key storage
- 1 to 2 key capacity only
- Surface or door mount
- Dimensions: Lift-Off Door 5" H x 4" W x 2" D
  Hinged Door 4" H x 5" W x 2" D
- **Ship Weight: 7 lbs.**
- Color: Black
- Finish: - Knox-Coat® Weather resistant proprietary coating system
- Option: - Over-the-Door Hanger

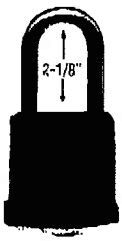


Knox® Padlock

Agency I.D. Label Included

(Lock Core)

Exterior - All Weather Conditions

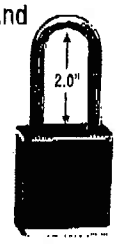


#3753

- Secures perimeter and fire access gates, and other fire department equipment
- Heavy duty brass body, stainless steel 3/8" diameter shackle
- Protective EPDM boot with shackle seal
- Metal keyhole cover

Interior - Light Duty

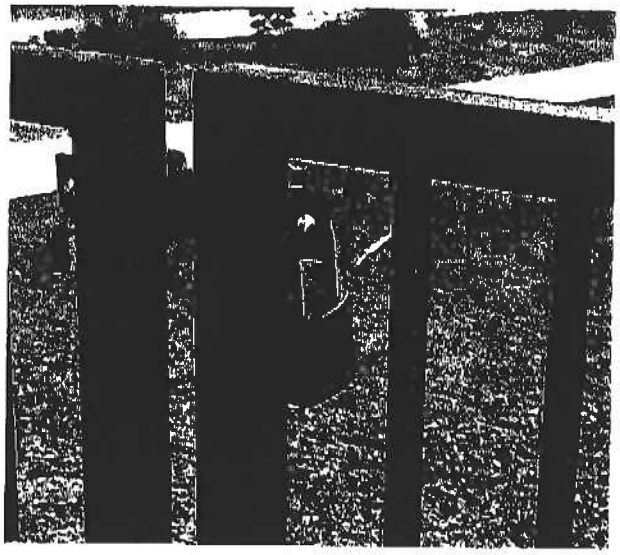
- Steel body and hardened steel 5/16" diameter shackle



#3754

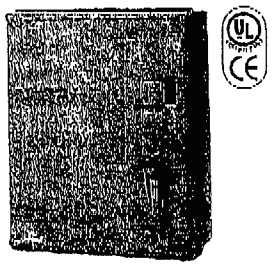
Ship Weight: 1.5 lbs

WARNING: Before ordering, measure hasp fittings to ensure proper shackle size.

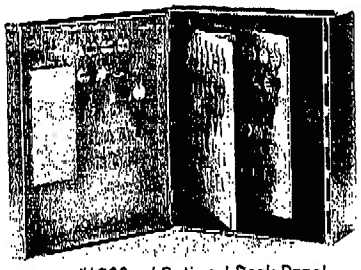


.nox® Master Keys are provided to authorized fire departments or other registered entities on an as-needed basis solely for use ith the Knox Rapid Entry System. No other use of the keys or their associated codes is authorized. Key codes associated with the .nox Master Keys and Keyways remain the property of the Knox Company and are maintained by the Knox Company in Phoenix, Z. For questions regarding this policy, contact Knox at 800-552-5669 or knoxbox.com.

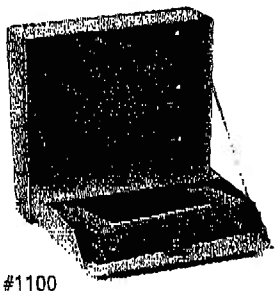
Knox Rapid Entry System Product Catalog



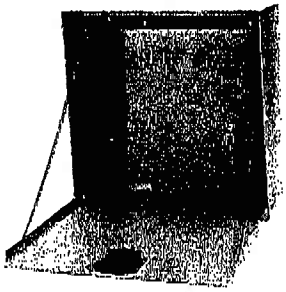
#1307 Dual Lock



#1308 w/ Optional Back Panel and Swing Panels.



#1100
Not suitable for key storage.



#1201 Weather Housing/Rain Shield with #1301 Cabinet Inside. Has latch without lock.

Knox® Cabinet

- **1300 Series** – UL listed high security cabinet
- Stores keys, blueprints, floor plans, MSDS, Haz-Mat information and other entry items
- Available in 5" or 7" depths
- Dimensions: 18" H x 14-1/2"W x 5" or 7"D
- **Ship Weight: 65 lbs**
- Color: Light grey
  Finish: Knox-Coat® Weather resistant proprietary coating system

- **1100 Series** - Document storage cabinet
- Stores blueprints, floor plans, MSDS, Haz-Mat information and other items (Not suitable for key storage)
- Dimensions: 14"H x 14"W x 4-1/4"D
- **Ship Weight: 26 lbs**
- Color: Light grey
  Finish: Knox-Coat® Weather resistant proprietary coating system

- **1201** Weather housing/Rain shield
- Protect Knox cabinet from weather
- Weather housing has latch without lock
- Dimensions: 21" H x 20"W x 13-5/8"D
- **Ship Weight: 75 lbs**
- Color: Light grey
  Finish: Knox-Coat® Weather resistant proprietary coating system

Knox® FDC Plug

- Solid Stainless Steel Construction
- Protect sprinkler system against vandalism
- Prevent frequent cap replacement
- Finish: - All stainless steel with polished, chrome-like stainless face
  - All stainless steel with bright stainless face
- **Ship Weight: 3 lbs**

#3011

#3010

FDC Plugs listed are 2-1/2" male plugs with National Standard Threads. Other sizes and threads available. Call for details.

Knox® FDC Storz Cap

- Secure large diameter connections
- Prevent unauthorized access
- Available in 4", 5" or 6" sizes
- Finish: Dark, hard anodized aluminum
- **Ship Weight: 5 lbs**

#3080

#3090

Knox® Master Keys are provided to authorized fire departments or other registered entities on an as-needed basis solely for use with the Knox Rapid Entry System. No other use of the keys or their associated codes is authorized. Key codes associated with the Knox Master Keys and Keyways remain the property of the Knox Company and are maintained by the Knox Company in Phoenix, AZ. For questions regarding this policy, contact Knox at 800-552-5669 or knoxbox.com.

2006 Price List - Order Online at www.knoxbox.com

Prices and availability subject to change.

● Included
– Not Included

KNOX-BOX®

3200 Series w/ Lift-Off Door Surface Mounted

Part #	Color	Tamper Switch	Aluminization*	Price
3201	Black	–	–	$189.00
3202	Black	●	–	$229.00
3203	Black	–	●	$229.00
3204	Black	●	●	$269.00
3205	Aluminum	–	–	$199.00
3206	Aluminum	●	–	$239.00
3207	Dark Bronze	–	–	$199.00
3208	Dark Bronze	●	–	$239.00

Ship Wt: 10 lbs.

3200 Series w/ Lift-Off Door Recess Mounted

Part #	Color	Tamper Switch	Aluminization*	Price
3220	Black	–	–	$229.00
3221	Black	●	–	$269.00
3222	Black	–	●	$269.00
3223	Black	●	●	$309.00
3224	Aluminum	–	–	$239.00
3225	Aluminum	●	–	$279.00
3226	Dark Bronze	–	–	$239.00
3227	Dark Bronze	●	–	$279.00
3240	3200 Lift-Off Door Recessed Mounting Kit			$69.00

Ship Wt: 10 lbs.

3200 Series w/ Hinged Door Surface Mounted

Part #	Color	Tamper Switch	Aluminization*	Price
3261	Black	–	–	$229.00
3262	Black	●	–	$269.00
3267	Black	–	●	$269.00
3268	Black	●	●	$309.00
3263	Aluminum	–	–	$239.00
3264	Aluminum	●	–	$279.00
3265	Dark Bronze	–	–	$239.00
3266	Dark Bronze	●	–	$279.00

Ship Wt: 10 lbs.

3200 Series w/ Hinged Door Recess Mounted

Part #	Color	Tamper Switch	Aluminization*	Price
3270	Black	–	–	$269.00
3271	Black	●	–	$309.00
3276	Black	–	●	$309.00
3277	Black	●	●	$349.00
3272	Aluminum	–	–	$279.00
3273	Aluminum	●	–	$319.00
3274	Dark Bronze	–	–	$279.00
3275	Dark Bronze	●	–	$319.00
3290	3200 Hinged Recessed Mounting Kit			$69.00

Ship Wt: 10 lbs.

KNOX-VAULT™

4400 Series Surface Mounted

Part #	Color	Lock	Tamper Switch	Aluminization*	Price
4401	Black	Single	–	–	$325.00
4402	Black	Single	●	–	$365.00
4403	Black	Dual	–	–	$385.00
4404	Black	Dual	●	–	$425.00
4405	Black	Single	–	●	$375.00
4406	Black	Single	●	●	$415.00
4407	Black	Dual	–	●	$435.00
4408	Black	Dual	●	●	$475.00
4409	Aluminum	Single	–	–	$335.00
4410	Aluminum	Single	●	–	$375.00
4411	Aluminum	Dual	–	–	$395.00
4412	Aluminum	Dual	●	–	$435.00
4413	Dark Bronze	Single	–	–	$335.00
4414	Dark Bronze	Single	●	–	$375.00
4415	Dark Bronze	Dual	–	–	$395.00
4416	Dark Bronze	Dual	●	–	$435.00

Ship Wt: 29 lbs.

4400 Series Recess Mounted

Part #	Color	Lock	Tamper Switch	Aluminization*	Price
4430	Black	Single	–	–	$375.00
4431	Black	Single	●	–	$415.00
4432	Black	Dual	–	–	$435.00
4433	Black	Dual	●	–	$475.00
4434	Black	Single	–	●	$425.00
4435	Black	Single	●	●	$465.00
4436	Black	Dual	–	●	$485.00
4437	Black	Dual	●	●	$525.00
4439	Aluminum	Single	–	–	$385.00
4440	Aluminum	Single	●	–	$425.00
4441	Aluminum	Dual	–	–	$445.00
4442	Aluminum	Dual	●	–	$485.00
4443	Dark Bronze	Single	–	–	$385.00
4444	Dark Bronze	Single	●	–	$425.00
4445	Dark Bronze	Dual	–	–	$445.00
4446	Dark Bronze	Dual	●	–	$485.00
4470	4400 Recessed Mounting Kit				$85.00

Ship Wt: 29 lbs.

KNOX® KEY SWITCH

Part #	Part (includes all stainless steel dust cover)	Price
3501	Key Switch	$62.00
3502	Key Switch on Mounting Plate	$79.00
3503	Double Key Switch on Mounting Plate	$129.00

Continued on back page

006 Price List - Order Online at www.knoxbox.com

Prices and availability subject to change.

● Included
– Not Included

(NOX® PADLOCK

Part #	Part	Price
	Exterior - All Weather Conditions	
3753	2-1/8"H stainless shackle clearance, 3/8" diameter	$79.00
	Interior - Light Duty	
3754	2"H hardened steel shackle clearance, 5/16" diameter	$58.00

(NOX® RESIDENTIAL (Holds two keys maximum)

Part #	Color	Part	Price
1650	Black	Surface Mount, Lift-Off Door	$139.00
1651	Black	Surface Mount, Lift-Off Door, with Door Hanger Bracket	$150.00
1658	Black	Surface Mount, Hinged Door	$165.00
1659	Black	Surface Mount, Hinged Door, with Door Hanger Bracket	$176.00

KNOX® CABINET

1300 Series - UL Listed

Part #	Color	Lock	Tamper Switch		Depth	Price
1301	Lt. Grey	Single	–	Ship Wt: 65 lbs.	5"	$545.00
1302	Lt. Grey	Single	–		7"	$585.00
1303	Lt. Grey	Single	●		5"	$585.00
1304	Lt. Grey	Single	●		7"	$625.00
1305	Lt. Grey	Dual	–		5"	$605.00
1306	Lt. Grey	Dual	–		7"	$645.00
1307	Lt. Grey	Dual	●		5"	$645.00
1308	Lt. Grey	Dual	●		7"	$685.00

1300 Cabinet Options

Part #	Part	Price
1351	Back Key Hook Panel - 48 Keys	$50.00
1352	Swing Key Hook Panel & Mounting Assembly - 78 Keys	$140.00
1353	2nd Swing Key Hook Panel for 7" Deep Model Only (must already have mounting assembly)	$110.00
1201	Non Locking Weather Housing/Rain Shield (for exterior cabinet protection)	$350.00

1100 Series

Part #	Color	Part	Price
1100	Lt. Grey	Data Storage Cabinet (Not for key storage)	$274.00

ACCESSORIES

Part #	Part	Price
1001	Fire Dept. Reflective Alert Decal	$1.50
1002	Fire Dept. Reflective Single Key Switch Decal (Red)	$3.00
1003	Sheriff Dept. Reflective Single Key Switch Decal (Gold)	$3.00
1004	Police Dept. Reflective Single Key Switch Decal (Blue)	$3.00
1005	Pre-Fire Plan Reflective Decal (8" x 8")	$12.00
1006	Key Tags (Package of 10)	$3.00
1007	One Inch Key Rings (Package of 10)	$3.50
1008	Tamper Seals (Package of 50)	$10.00
1009	Tamper Evident Bags (Package of 10)	$3.00

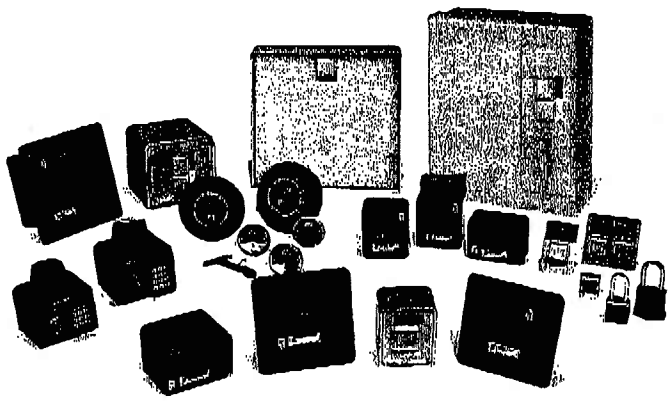
KNOX® LOCKING FDC PLUGS

Part #	Part	Price
3011	All stainless Steel with Bright Stainless Face	$115.00
3010	All stainless Steel with Polished, Chrome-like Stainless Face	$125.00

FDC Plugs listed are 2-1/2" male plugs with National Standard Threads. Other sizes and threads available. Call for details.

KNOX® LOCKING FDC STORZ CAPS

Part #	Part	Price
3080	4" Storz Cap - Dark, Hard Anodized Aluminum	$225.00
3090	5" Storz Cap - Dark, Hard Anodized Aluminum	$245.00
3099	6" Storz Cap - Dark, Hard Anodized Aluminum	$295.00



KNOX®
Serving Fire Departments Since 1975

623-687-2300 • 800-552-5669
Fax 623-687-2299
E-mail: info@knoxbox.com • Web: www.knoxbox.com
1601 W. Deer Valley Road, Phoenix, Arizona 85027

AIRPORT WIDE STANDARD FOR INTERFACE OF FIRE ALARM, LIFE SAFETY AND SECURITY SYSTEMS

REQUEST FOR VARIANCE

Name: _____ Date: _____

Company: _____ Tel. No: _____

Project Name: _____ MAA Contract No: _____

MAA Building Permit No. _____

1. Purpose of Variance Request.

2. Related Code References:

3. Justification for Variance (include discussion of design impact; code interpretation: budget increase/decrease; and other relevant facts). (Attach additional sheets as needed).

4. Design and Construction Cost impact if approved: $ _____ (Design), $ _____ (Construction)

5. Approval/Disapproval of this request is required by: _____ Days (Allow minimum 2 weeks.) .

BELOW THIS LINE IF FOR INTERNAL USE ONLY

A. OFM Comments.

B. Director of Engineering Comments.

C. ☐ Variance approved as submitted.
☐ Variance approved with comments incorporated.
☐ Variance denied.

_____ _____ ____Yes ___
No
OFM Date

_____ _____ ____Yes ___
No
Operations Manager Date

_____ _____ ____Yes ___
No
MAA Director of Design Date

NOTE: This Request for Variance is applicable to this specific project only.

Maryland Aviation Administration

BWI AIRPORT FIRE & RESCUE DEPARTMENT

Fire and Rescue Department
Office of the Fire Marshal
Fire Prevention and Inspection Division
1334-G, Ashton Road, Hanover MD 21076
410-859-7511

PRE-OCCUPANCY FIRE INSPECTION

[ ] Initial Pre-Occupancy Fire Inspection
[ ] Re-Inspection
[ ] Other _____

[ ] New Construction
[ ] Addition
[ ] Interior Alteration or Renovation

MAA / Facility Name _____

Building #, Address _____

City _____, MD ZIP _____

Inspection conducted by A-FM_____ 410-859-7511/ _____

Date and Time of Inspection _____/_____/_____ _____ [ ] AM [ ] PM

Property Use and Occupancy Classification:
[ ]-[ ], _____ Use Group (Example: S-1, Storage)

Area of facility _____ (Square Feet)

Means of Egress (Note: All code references refer to NFPA 101, 2006 unless otherwise noted.)	**Yes**	**No**	**Reference**
Paths of egress and exits are readily visible and identifiable			7.2.1.1.2, 7.5.2, 7.7.3, 7.10.1.2, 4.5.3.3
Exits and means of egress are clear and unobstructed (e.g. – no			7.5.1.1,

carts)			7.5.2, 4.5.3.2, 7.1.10.1
Means of Egress (Note: All code references refer to NFPA 101, 2006 unless otherwise noted.)	**Yes**	**No**	**Reference**
Adequate numbers of exits are provided			13.1.7, 13.2
Remote Exit is available, if required			7.5.1.3.1, 4.5.3.1
Travel distances are within required limits			7.6
Dead-ends are within required limits			7.5.1.5
Doors swing in direction of egress travel, if required			7.2.1.4.2
ADA compliant lever hardware, panic hardware, are provided, where required			7.2.1.7
Doors open and close easily and latches operate properly			7.2.1.4.5, 7.2.1.8
Security gates meet separation requirements			7.2.1.4.1.4
Emergency evacuation plan is posted on site			4.8.1(2)
Other-			
Other-			

Corridors and Concourse	**Yes**	**No**	**Reference**
Adequate minimum width for use and capacity requirements			7.3.1.1, 7.3.4.1
Integrity of separation barriers and partitions CH 7			IBC Ch. 7
Arrangement and width of egress paths (Note: The concourse width is not permitted to be less than 12 or 14 feet during normal flight operating hours.)			DST

Exit Illumination and Signage	**Yes**	**No**	**Reference**
Adequate Emergency White Lighting Levels			7.9
Exit signs [RED on WHITE] visible and illuminated			7.10
Emergency lighting systems pre-tested ___/___/___			7.9.3

Stairways	**Yes**	**No**	**Reference**
Aggregate width (50/50) adequate			7.7.2, 7.7.4
Integrity of walls and doors			7.2.2.5.1
Guardrails / Handrails properly installed – No obstructions			7.2.4.4, 7.2.4.5
Security equipment appropriately placed			7.2.2.5.3.1
Discharge arrangement adequate and clear			7.2.2.1.1
Stairs are: Ventilated [ ], Pressurized [ ], Conditioned [ ]	N/A	N/A	N/A
Other-			

Fire Doors, Fire Walls, Fire and Smoke Separation Walls	Yes	No	Reference
Rating is appropriate for location(s)			IBC Ch.7
Materials properly installed			IBC Ch.7
Other-			
Other-			

HVAC Systems and Controls	Yes	No	Reference
Building zone ceiling has: Ducted Returns [ ], Plenum Returns [ ]	N/A	N/A	N/A
Pre-Testing Balancing Report was provided ____/____/____			N/A
Dampers and Detectors in ducts properly placed			NFPA 90A
A schedule is provided (if more than two systems)			DST
Fire damper types: Wall [ ], Floor [ ], Ceiling [ ]	N/A	N/A	N/A
Kitchen hood systems: UL 300 compliant [ ], Duct wrapped [ ], FA supervised, Cleanout access signage placed [ ]			Various
Other-			

Electrical System	Yes	No	Reference
Panel board clear of storage			9.1.2
Panel board properly labeled			9.1.2
GFCI circuits installed in correct areas and operating properly			9.1.2
Emergency power available: UPS [ ], Generator [ ]			9.1.2
MAA certified electrical inspections completed			DST
Other-			
Other-			

Housekeeping	Yes	No	Reference
Storage properly arranged (18" below AS, with proper signage)			Various
Rubbish and building materials removed			7.1 10.1
Flammable and combustible liquids properly stored			8.7.3
Other-			

Fire Alarm	Yes	No	Reference
Type of system (specify)			N/A
Monitored by _____ Phone #_____ Pin#_____			9.7.2.1
Initiating devices: PS [ ], HD [ ], SD [ ], Water flow[ ], Valve Tamper[ ], Special Systems/MM [ ], Building Notification [ ] Audio/Visual [ ], Other _____[ ]			9.7.2.1
System tested and operational			9.8
Other-			

Fire Extinguishers			
Adequate number [ ], and distribution			9.7.4.1
			NFPA 10
Properly mounted and located			NFPA 10
Other-			

Sprinkler System	Yes	No	Reference
Type of system _____ Number of Zones _____			N/A
Appropriate type for hazards (Kitchens=Class K, 10lb / 4A60BC in FEC, typical)			9.6.7.3
System tested and emergency operational on _____/_____/_____			9.8
Alarm initiation type: Flow Switch [ ], Water motor gong [ ]			N/A
Valve supervision by: Fire alarm [ ], Flow switch [ ], MAA-Old FRD [ ], Padlock/Chain [ ]			9.7.2.1
Other-			

Fire Hydrants	Yes	No	Reference
Are in compliance with NFPA 24			N/A
Threads are compatible with DST requirements			DST
Are operational and maintained in good condition			NFPA 24

Special Fire Protection Systems The Building manager has been advised of testing, maintenance, and document submission requirements for the following special fire protection systems	Yes	No	Reference
[ ] NFPA 72, Fire Alarm Systems			N/A
[ ] NFPA 25, Water Based Fire Protection Systems			N/A
[ ] NFPA 10, Portable Fire Extinguishers			N/A
[ ] NFPA 13, Fire Sprinkler Systems			N/A
[ ] Building Manager advised that all special fire protection system re-submittals, field revisions, conformed graphic plans, and CD copies must be provided to the OFM.			N/A
Other-			

MARYLAND AVIATION ADMINISTRATION
BWI MARSHALL FIRE AND RESCUE DEPARTMENT
FIRE PREVENTION AND INSPECTION DIVISION

PRE-OCCUPANCY FIRE INSPECTION RESULTS

As a result of this inspection, the subject facility, known as

_____

is hereby:

[ ] **APPROVED FOR OCCUPANCY** (See Note 1).

[ ] **APPROVED FOR TEMPORARY OCCUPANCY**, subject to correction of items noted (See conditions of temporary or phased occupancy approval listed below).

[ ] **APPROVED FOR PHASED TEMPORARY** stocking and occupancy only (See Note 2).

[ ] **DENIED** occupancy approval due to the fire code deficiencies noted. The Tenant/Contractor is directed to correct the items noted prior to requesting re-inspection.

Note 1: "Approved for occupancy" indicates a finding that all fire safety criteria set forth at the time and date of the attached inspection has been met in accordance with the applicable adopted codes and standards of the State of Maryland and the Maryland Aviation Administration (MAA) Fire Prevention and Inspection Division at the BWI – Thurgood Marshall Airport. This certificate will only be issued if the building or structure is deemed safe for occupancy. All life safety and fire detection and suppression systems must be in full working operation, including alarm supervision, and alarm transmission requirements.

Note 2: A "phased temporary" approval is hereby granted to STOCK and OCCUPY a substantially completed, permitted portion. This temporary approval will expire within 30 days after completion of work unless a final certificate of occupancy is issued by the MAA-OFM, and the Owner (MAA-Engineer). The portion approved is:

_____

(List Portion(s) approved for Phased Temporary occupancy)

Owner's Representative
MAA Engineer Signature: _____ Date: _____

Inspector's Signature: _____ [FM-__] Date: _____

Tenant's Signature: _____ Date: _____

Sub-Tenant's Signature: _____ Date: _____

Contractor's Signature: _____ Date: _____

The above signatures attest that the parties listed are aware of deficiencies noted (if any), and any listed conditions of approval (if applicable), and agree to diligently correct any deficiencies noted. Failure to abide by a lawful order of the Fire Marshal is a violation of the State Fire Prevention Code, and is punishable in accordance with the provisions therein.

Conditions of Temporary, or Phased, Occupancy Approval These items must be corrected within the time limits listed as a condition of a temporary, or phased, certificate of occupancy. Failure to complete these items within the prescribed time limits will void this temporary approval. The OFM must be notified upon correction of the items listed and a re-inspection must be scheduled.	**10 Days**	**30 Days**	**Other**

[End of Document – Form FM-07-01]

REQUEST FOR VARIANCE

NOTE: This Request for Variance is applicable to this specific project only.

Name:_____ Date: _____

Company: _____ Tel. No.: _____

Project Name: _____ MAA Contract No.:_____

1. Purpose of Variance Request.
2. Related Code References:
3. Justification for Variance (include discussion of design impact; code interpretation; budget increase/decrease; and other relevant facts). (Attach additional sheets as needed)
4. Design and Construction Cost impact if approved: $_____
5. Approval/Disapproval of this request is required by: _____
   (Allow minimum 3 weeks.)

BELOW THIS LINE IF FOR INTERNAL USE ONLY

A. Fire Marshall Comments.(if applicable)

B. □ Variance approved as submitted.
□ Variance approved with comments incorporated.
□ Variance denied.

_____ _____ _____ Yes _____No
Manager, IT Networking Date

_____ _____ _____ Yes _____No
Manager, Telecommunications Date

CHANGE REQUEST

Name:_____ Date: _____

Company: _____ Tel. No.: _____

Date/Revision No. of Standard: _____

1. Section/paragraph to be changed:

2. Justification for change (site technical and code issues):
   (Attach additional sheets as needed)

BELOW THIS LINE IF FOR INTERNAL USE ONLY

CHANGE APPROVAL

_____ _____ _____Yes _____No
Mr. Robert C. Polkiewicz
Manager, Network Engineering Date
Office of Technology

_____ _____ _____Yes _____No
Mr. Timothy A. Watson Date
Manager, Communications Engineering
Office of Technology

_____ _____ _____Yes _____No
Mr. William Lins Date
Director
Office of Technology

Resource Allocation Permit

This Permit is valid for 6 month from date of issue. At the end of the 6 months the resources will become available to others.

Use additional Pages if needed

Name: _____ Date: _____

Company: _____ Tel. No.: _____

E-mail: _____ Requested completion date: _____

Door Number: _____

Resource Requested: _____

Information Required

Indicate what resource you wish to reserve (i.e. fiber, floor space, wall space) . Also include all relevant information like power requirements, BTU out put of equipment, environmental parameter requirements. Scale plans of exactly where you wish to reserve must also be provided

The OT Engineer(s) will evaluate your request for availability of resources. We may ask for additional information if needed for evaluation of request.

Applicant shall review Section 17.2.7 "Services" prior to request and agrees to all stipulations of the permit process

BELOW THIS LINE IF FOR OT USE ONLY

_____ _____ _____Yes _____No
Mr. Dwayne Abrams Date
PDS Administrator

_____ _____ _____Yes _____No
Mr. Robert C. Polkiewicz Date
Manager, Network Engineering

_____ _____ _____Yes _____No
Mr. Timothy A. Watson Date
Manager, Telecommunications

Effective Approval Date: _____

Expiration Date: _____

MAA CONFIDENTIALITY AND NON-DISCLOSURE AGREEMENT
SENSITIVE SECURITY INFORMATION
(For Construction Contract Bidders)

Date _____

_____ _____
Contract or Building Permit Number Contract or Building Permit Name

1. I, _____, an employee of

_____ ("Contractor"), under contract (the "Contract") with Maryland Aviation Administration (referred to herein as "MAA"), is executing the acceptance of its responsibilities for Airport Security at Baltimore/Washington International Thurgood Marshall Airport (referred to herein as "BWI Marshall") and Martin State Airport.

2. Pursuant to the Contractor's work for MAA under the Contract, the Contractor has and will request that MAA provide it with various documents or other records collectively, "documents".

3. I understand the following with respect to any documents, or information therein, that are provided by MAA to me, or which come into my possession pursuant to the Contractor's work for MAA:

A. These documents may be considered Sensitive Security Information ("SSI") under applicable Federal and State regulations;

B. These documents may be protected from disclosure under the Maryland Public Information Act;

C. These documents may be protected from disclosure under the Federal Freedom of Information Act;

D. These documents are considered by MAA to contain information that is vital to the security and safe operation of BWI Marshall Airport and Martin State Airport, whether or not these documents are otherwise classified by any other entity or law as containing such information;

E. These documents are considered by MAA to possibly contain information that is a trade secret.

MAA CONFIDENTIALITY AND NON-DISCLOSURE AGREEMENT
SENSITIVE SECURITY INFORMATION
(For Construction Contract Bidders)

4. I agree to comply with the requirements of Management of Sensitive Security Information (SSI) for MAA Projects and Building Permits at Baltimore/Washington International Thurgood Marshall Airport and Martin State Airport with respect to any SSI documents, or information therein, that are provided by MAA to me, developed by me or which come into my possession pursuant to the Contractor's work for MAA. In addition;

A. I will safeguard these documents and the information therein, to prevent inadvertent disclosure of them by keeping the documents under the control of authorized persons, when in use, and store the documents in a secure container, such as a locked desk, file cabinet or locked room when not in use; and

B. I will not release these documents, or the information therein, to any party, company, person, organization or entity for any reason that does not expressly serve the Contractor's obligations to MAA under its contract with MAA, as determined by the Contractor's employee with appropriate supervisory and decision-making authority; and

C. I will not reproduce any project plans or specifications containing SSI without the authorization of the applicable MAA Project Phase Manager; and

D. Should it become necessary to transmit project plans and/or specifications containing SSI, I will ensure that documents are protected to prevent inadvertent visual disclosure.

E. I will not release these documents, or the information therein, pursuant to a request under the Maryland Public Information Act or the Federal Freedom of Information Act without affording MAA the opportunities under those laws to protect these documents from disclosure; and

F. I will notify MAA if a request is made for these documents, or the information therein; and

G. I shall return these documents following the completion of the agreed upon bid period; and

H. Specifically with regard to SSI, I shall comply, and I shall ensure compliance by any subcontractors and subconsultants assisting or working with me on the preparation of a bid for this project, with the broadest possible interpretation of the federal and local regulations in handling SSI (49 CFR 1520), as amended; and

5. I understand that Failure to return all Plan and Specification sets fully intact, unauthorized reproduction or failure to comply with the requirements of this 'MAA

MAA CONFIDENTIALITY AND NON-DISCLOSURE AGREEMENT
SENSITIVE SECURITY INFORMATION
(For Construction Contract Bidders)

Confidentiality and Non-Disclosure Agreement – Sensitive Security Information' shall result in the forfeiture of my $6,000 deposit and may lead to civil penalties.

My signature below, I hereby affirm and agree to the matters set forth above.

Contractor:	Witnessed:
_____	_____
Signature	Signature
_____	_____
Print Name	Print Name
_____	MAA Project Phase Representative
Title	Title
_____	Maryland Aviation Administration
Company	

MAA CONFIDENTIALITY AND NON-DISCLOSURE AGREEMENT
SENSITIVE SECURITY INFORMATION
(For A/E's, CMI, Tenants and Sole Source Providers)

Date _____

_____ _____
Contract or Building Permit Number Contract or Building Permit Name

_____ _____
Task Number Task Description / Title

1. I, _____, an employee of

_____ ("Contractor"), under contract (the "Contract") with Maryland Aviation Administration (referred to herein as "MAA"), is executing the acceptance of its responsibilities for Airport Security at Baltimore/Washington International Thurgood Marshall Airport (referred to herein as "BWI Marshall") and Martin State Airport.

2. Pursuant to the Contractor's work for MAA under the Contract, the Contractor has and will request that MAA provide it with various documents or other records collectively, "documents".

3. I understand the following with respect to any documents, or information therein, that are provided by MAA to me, or which come into my possession pursuant to the Contractor's work for MAA:

A. These documents may be considered Sensitive Security Information ("SSI") under applicable Federal and State regulations;

B. These documents may be protected from disclosure under the Maryland Public Information Act;

C. These documents may be protected from disclosure under the Federal Freedom of Information Act;

D. These documents are considered by MAA to contain information that is vital to the security and safe operation of BWI Marshall Airport and Martin State Airport, whether or not these documents are otherwise classified by any other entity or law as containing such information;

E. These documents are considered by MAA to possibly contain information that is a trade secret.

4. I agree to comply with the requirements of Management of Sensitive Security Information (SSI) for MAA Projects and Building Permits at Baltimore/Washington International Thurgood Marshall Airport and Martin State Airport, (Design Standard No. 2010-03) with respect to any SSI documents, or information therein, that are provided by MAA to me, developed by me or which come into my possession pursuant to the Contractor's work for MAA. In addition:

A. I will safeguard these documents and the information therein, to prevent inadvertent disclosure of them by keeping the documents under the control of authorized persons, when in use, and store the documents in a secure container, such as a locked desk, file cabinet or locked room when not in use; and

B. I will not release these documents, or the information therein, to any party, company, person, organization or entity for any reason that does not expressly serve my obligations under my contract with MAA; and

C. I will not reproduce any project plans or specifications containing SSI without the authorization of the applicable MAA Project Phase Manager and/or Building Permit Manager; and

D. Should it become necessary to transmit project plans and/or specifications containing SSI, I will ensure that documents are protected to prevent inadvertent visual disclosure.

E. I will not release these documents, or the information therein, pursuant to a request under the Maryland Public Information Act or the Federal Freedom of Information Act without affording MAA the opportunities under those laws to protect these documents from disclosure; and

F. I will notify MAA if a request is made for these documents, or the information therein; and

G. I shall return these documents and any reproductions following the completion of the project or contract; and

H. Specifically with regard to SSI, I shall comply, and I shall ensure compliance by those subcontractors and subconsultants in my employ, with the broadest

possible interpretation of the federal and local regulations in handling SSI (49 CFR 1520), as amended; and

I. If I am a consultant who employs subconsultants, I shall ensure compliance by those in my employ with training, badging and handling requirements associated with SSI and the requirements of the MAA Design Standard for the Management of SSI including completion of a MAA Confidentiality And Non-Disclosure Agreement for each team member; and

J. I shall limit reproduction of this material to subcontractors or subconsultants and shall ensure the destruction of all SSI in accordance with Design Standard No. 2010-03.

5. I further understand that failure to comply with the requirements of this 'MAA Confidentiality and Non-Disclosure Agreement – Sensitive Security Information' may lead to civil penalties.

My signature below, I hereby affirm and agree to the matters set forth above.

Contractor:	Witnessed:
_____	_____
Signature	Signature
_____	_____
Print Name	Print Name
_____	MAA Project Phase Representative
Title	Title
_____	Maryland Aviation Administration
Company	

CONTRACTOR REPRESENTATIVE INFORMATION FORM

Insert Contract Title

Insert Contract No.

Date: _____

Name: _____

Social Security Number: _____

Date of Birth: _____

Drivers License: State: _____

Drivers License No.: _____

Company Name: _____

Telephone No.: _____

Facsimile No.: _____

Email Address: _____

I understand that by signing this form, I grant my consent to allow the Maryland Aviation Administration to perform a Transportation Security Administration (TSA) "No Fly List" Security Verification of my background for the purpose of granting limited SSI privileges unto me. I further consent to comply with the requirements of 49 CFR 1520 and I understand and acknowledge that my failure to comply with the requirements of 49 CFR 1520 could result in civil penalties.

_____

Signature

_____

Print Name

APPENDIX C

MAA STANDARD CONTRACT DRAWINGS

MARTIN STATE AIRPORT

BWI BALTIMORE/WASHINGTON INTERNATIONAL Thurgood Marshall AIRPORT

MAA STANDARD CONTRACT DRAWINGS

- GENERAL CONSTRUCTION AND SAFETY NOTES I – SIDA (BWI MARSHALL)
- GENERAL CONSTRUCTION AND SAFETY NOTES II – SIDA (BWI MARSHALL)
- GENERAL CONSTRUCTION AND SAFETY NOTES – STERILE BUILDING AREA (BWI MARSHALL)
- GENERAL CONSTRUCTION AND SAFETY NOTES – NON SECURE AREAS (BWI MARSHALL)
- GENERAL CONSTRUCTION AND SAFETY NOTES I (MARTIN STATE)
- GENERAL CONSTRUCTION AND SAFETY NOTES II (MARTIN STATE)
- EROSION AND SEDIMENT CONTROL PLAN
- EROSION AND SEDIMENT CONTROL NOTES I
- EROSION AND SEDIMENT CONTROL NOTES II
- VEGETATIVE STABILIZATION NOTES
- EROSION AND SEDIMENT CONTROL DETAILS I
- EROSION AND SEDIMENT CONTROL DETAILS II
- EROSION AND SEDIMENT CONTROL DETAILS III
- EROSION AND SEDIMENT CONTROL DETAILS IV
- EROSION AND SEDIMENT CONTROL DETAILS V

MARTIN STATE AIRPORT

BWI BALTIMORE/WASHINGTON INTERNATIONAL Thurgood Marshall AIRPORT

GENERAL CONSTRUCTION NOTES

1. THIS PROJECT IS FOR WORK AT BALTIMORE/WASHINGTON INTERNATIONAL THURGOOD MARSHALL AIRPORT, HEREAFTER REFERRED TO AS 'THE AIRPORT' OR 'BWI'.

2. THIS PROJECT SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE CONTRACT PLANS AND SPECIFICATIONS AND ANY RULES, REGULATIONS, STANDARDS, OR SPECIFICATIONS REFERENCED THEREIN. THE PROJECT IS SUBJECT TO INSPECTION BY REPRESENTATIVES OF THE MARYLAND AVIATION ADMINISTRATION (MAA), THE FEDERAL AVIATION ADMINISTRATION (FAA), AND OTHER GOVERNING AGENCIES.

3. PROJECT PHASING – THE PROJECT IS TO BE COMPLETED IN CLOSE CONFORMANCE WITH THE PHASING PLANS, IF PROVIDED, AND NOTES AS CONTAINED IN THE CONTRACT DOCUMENTS. CHANGES TO THE PHASING PLANS SHALL BE COORDINATED WITH THE ENGINEER AND REVIEWED WITH THE DESIGNER PRIOR TO IMPLEMENTATION.

4. PROJECT COMPLETION TIMES – THE CONTRACTOR IS EXPECTED TO COMPLETE CRITICAL PORTIONS OF THE PROJECT WITHIN THE SPECIFIED TIMEFRAMES AND TO COMPLETE THE ENTIRE PROJECT ON TIME. LIQUIDATED DAMAGES, IF SPECIFIED, WILL BE ASSESSED SHOULD THE TIMEFRAME BE EXCEEDED.

5. CONSTRUCTION LIMITS – ALL CONTRACTOR VEHICLES SHALL REMAIN WITHIN THE DESIGNATED CONSTRUCTION LIMITS OR HAUL ROUTES (UNLESS OTHERWISE AUTHORIZED).

6. DIMENSIONS IDENTIFIED ON THE PLANS SHALL BE VERIFIED IN THE FIELD. IN GENERAL, SMALL–SCALE DRAWINGS WITH GREATER RESOLUTION (I.E. 1"=50') GOVERN OVER LARGER SCALE DRAWINGS OF LESS RESOLUTION (I.E. 1"=500'), WRITTEN NOTES GOVERN OVER GRAPHIC REPRESENTATION AND SPECIFICATIONS GOVERN OVER DRAWINGS. ANY DISCREPANCIES SHALL BE REPORTED TO THE ENGINEER FOR CLARIFICATION.

7. THE CONTRACTOR SHALL PROVIDE COLLAPSIBLE BARRICADES MARKED WITH DIAGONAL ALTERNATING ORANGE AND WHITE STRIPES, AND WITH FLASHING RED LIGHTS, AS SHOWN ON THE DRAWINGS TO DELINEATE THE WORK AREAS WHEN CLOSED TO AIRPORT TRAFFIC. ALL BARRICADES PLACED ADJACENT TO AN OPEN RUNWAY, TAXIWAY, OR TAXILANE MUST BE AS LOW AS POSSIBLE TO THE GROUND, OF LOW MASS, EASILY COLLAPSIBLE UPON IMPACT WITH AN AIRCRAFT, AND WEIGHTED OR STURDILY ATTACHED TO THE SURFACE TO PREVENT DISPLACEMENTS FROM PROP WASH, JET BLAST, WING VORTEX, OR OTHER SURFACE WIND CURRENTS. IF AFFIXED TO THE SURFACE, THE BARRICADES MUST BE FRANGIBLE AT GRADE LEVEL OR AS LOW AS .POSSIBLE, BUT NO GREATER THAN THREE INCHES ABOVE THE GROUND

8. OPEN TRENCHES, EXCAVATIONS, AND STOCKPILED MATERIAL LOCATED IN THE AIR OPERATIONS AREA (AOA) (I.E., THE SECURE PORTION OF THE AIRPORT) SHALL BE PROMINENTLY MARKED WITH ORANGE FLAGS AND LIGHTED BY APPROVED LIGHT UNITS DURING HOURS OF LIMITED VISIBILITY AND DARKNESS. THE CONTRACTOR SHALL CONTINUOUSLY MAINTAIN LIGHTS IN OPERATING CONDITION AND REPLACE BATTERIES, BULBS, ETC. AS NEEDED SO THAT THEY MAY ALWAYS BE LIGHTED IN HOURS OF DARKNESS.

9. EXISTING TOPOGRAPHIC FIELD SURVEYS WERE PROVIDED BY SURVEYORS NAME AND DATE. THE CONTROL ON THIS PROJECT IS TIED TO THE NAD 83/91 HORIZONTAL DATUM AND NAVD 88 VERTICAL DATUM. SURVEY UNITS SHALL BE IN U.S. SURVEY FOOT. PROJECT BENCHMARKS ARE SHOWN ON THE GENERAL PROJECT LAYOUT.

10. EXISTING AIRFIELD LIGHTING SYSTEMS – INTERRUPTION OF EXISTING AIRFIELD LIGHTING SYSTEMS NOT IDENTIFIED ON THE CONSTRUCTION DOCUMENTS SHALL NOT BE PERMITTED. ALL AIRFIELD LIGHTING CIRCUITS AFFECTED BY THIS PROJECT SHALL BE TEMPORARILY MAINTAINED BY THE CONTRACTOR DURING OPERATIONAL PERIODS.

11. THE CONTRACTOR SHALL PROVIDE AN ADEQUATE NUMBER OF WATER TRUCKS TO CONTROL DUST IN THE PROJECT WORK AREA, STAGING AREA, STORAGE AREAS, HAUL ROUTES AND THE WASTE SITE.

12. ALL THE PERMITS AND LICENSES REQUIRED FOR THE PROJECT WORK SHALL BE OBTAINED AT THE CONTRACTOR'S EXPENSE.

13. IN ACCORDANCE WITH THE SPECIFICATIONS, FEDERAL WAGE RATES SHALL BE POSTED OUTSIDE THE SITE FIELD OFFICE(S) IN A WEATHERPROOF ENCLOSURE. [FOR FEDERALLY FUNDED PROJECTS ONLY]

GENERAL AIRFIELD SAFETY DURING CONSTRUCTION

1. THE CONTRACTOR SHALL ACQUAINT SUPERVISORS AND EMPLOYEES WITH ACTIVITY AND OPERATIONS THAT ARE INHERENT TO THE AIRPORT AND SHALL CONDUCT CONSTRUCTION ACTIVITIES TO CONFORM TO ALL ROUTINE AND EMERGENCY AIR TRAFFIC REQUIREMENTS AND GUIDELINES FOR SAFETY SPECIFIED HEREIN.

2. THE CONTRACTOR AND HIS/HER SUBCONTRACTOR(S) SHALL PROTECT WORKERS, MAA AND AIRPORT TENANT EMPLOYEES, AND THE GENERAL PUBLIC. THE CONTRACTOR SHALL ALSO ENSURE THAT PROPERTY OR EQUIPMENT, UNRELATED TO WORK, WHICH BELONGS TO MAA OR AIRPORT TENANTS IS NOT DAMAGED DURING CONSTRUCTION.

3. THE CONTRACTOR SHALL NOT ALLOW EMPLOYEES, SUBCONTRACTORS, SUPPLIERS, OR ANY OTHER UNAUTHORIZED PERSON TO ENTER OR REMAIN IN ANY AIRPORT AREA WHICH WOULD BE HAZARDOUS TO PERSONS OR TO AIRCRAFT OPERATIONS.

4. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING ALL NECESSARY PROTECTIVE GEAR AND EQUIPMENT REQUIRED FOR THE PROTECTION OF THE CONTRACTOR'S PERSONNEL DURING CONSTRUCTION.

5. DURING PERFORMANCE OF THIS CONTRACT, THE AIRPORT RUNWAYS, TAXIWAYS, AND AIRCRAFT PARKING APRONS SHALL REMAIN IN USE BY AIRCRAFT TO THE MAXIMUM EXTENT POSSIBLE. ALL AIRCRAFT TRAFFIC ON THESE SURFACES SHALL HAVE PRIORITY OVER CONTRACTOR'S TRAFFIC. WHILE USE OF AREAS NEAR THE CONTRACTOR'S WORK MAY BE CONTROLLED TO MINIMIZE DISTURBANCE TO THE CONTRACTOR'S OPERATION, THE OWNER RESERVES THE RIGHT TO ORDER THE CONTRACTOR, AT ANY TIME, TO VACATE ANY AREA NECESSARY TO MAINTAIN SAFE AIRCRAFT OPERATIONS.

6. ALL WORK TO BE PERFORMED WITHIN CERTAIN LIMITS OF AN ACTIVE RUNWAY, TAXIWAY, OR APRON UNDER OPERATIONAL CONDITIONS SHALL BE PERFORMED WHEN THE RUNWAY, TAXIWAY OR APRON IS NOT IN USE. SUCH WORK SHALL ONLY BE ACCOMPLISHED WITH PRIOR PERMISSION FROM THE ENGINEER AND MAA OPERATIONS. REFER TO **PROJECT COORDINATION** FOR ADDITIONAL INFORMATION ON COORDINATING CLOSURES.

7. THE CONTRACTOR SHALL INSPECT ALL CONSTRUCTION AND STORAGE AREAS AS OFTEN AS NECESSARY AND PROMPTLY TAKE ALL STEPS NECESSARY TO PREVENT OR REMEDY ANY UNSAFE OR POTENTIALLY UNSAFE CONDITIONS OR ACTIVITIES DISCOVERED.

8. THE CONTRACTOR SHALL BE AWARE OF THE FOLLOWING TYPES OF SAFETY PROBLEMS AND/OR HAZARDS:

   a. TRENCHES, HOLES, OR EXCAVATION ON OR ADJACENT TO ANY OPEN RUNWAY OR IN SAFETY AREAS.

   b. PAVEMENT DROP–OFFS OR PAVEMENT TURF–LIPS GREATER THAN 1½ INCHES WHETHER PERMANENT OR TEMPORARY.

   c. UNMARKED/UNLIGHTED HOLES OR EXCAVATION IN ANY APRON, OPEN TAXIWAY, OPEN TAXILANE, OR RELATED SAFETY AREA.

   d. MOUNDS OR PILES OF EARTH, CONSTRUCTION MATERIALS, TEMPORARY STRUCTURES, OR OTHER OBJECTS IN THE VICINITY OF ANY OPEN RUNWAY, TAXIWAY, TAXILANE, OR IN A RELATED SAFETY AREA, APPROACH, OR DEPARTURE AREA.

   e. VEHICLES OR EQUIPMENT, WHETHER OPERATING OR IDLE, ON ANY OPEN RUNWAY, TAXIWAY, TAXILANE, OR IN ANY RELATED SAFETY AREA, APPROACH, OR DEPARTURE AREA.

   f. VEHICLES, EQUIPMENT, EXCAVATION, STOCKPILES, OR OTHER MATERIALS WHICH COULD DEGRADE OR OTHERWISE INTERFERE WITH ELECTRONIC SIGNALS FROM RADIOS OR ELECTRONIC NAVIGATIONAL AIDS (NAVAIDS).

   g. UNMARKED UTILITY, NAVAID, WEATHER SERVICE, RUNWAY LIGHTING, OR OTHER POWER OR SIGNAL CABLES THAT COULD BE DAMAGED DURING CONSTRUCTION.

   h. OBJECTS, WHETHER OR NOT MARKED OR FLAGGED, OR ACTIVITIES ANYWHERE ON OR IN THE VICINITY OF THE AIRPORT WHICH COULD BE DISTRACTING, CONFUSING, OR ALARMING TO PILOTS DURING AIRCRAFT OPERATIONS.

   i. UNFLAGGED/UNLIGHTED LOW VISIBILITY ITEMS SUCH AS TALL CRANES, DRILLS, ETC. ANYWHERE IN THE VICINITY OF ACTIVE RUNWAYS OR IN ANY APPROACH OR DEPARTURE AREA. SUCH EQUIPMENT SHALL BE PARKED IN THE CONTRACTOR'S STAGING AREA AND THE BOOM(S) LOWERED TO THE GROUND WHEN NOT IN USE.

   j. MISLEADING OR MALFUNCTIONING LIGHTS OR UNLIGHTED/UNMARKED OBSTRUCTIONS IN THE APPROACH TO ANY ACTIVE RUNWAY.

   k. INADEQUATE APPROACH OR DEPARTURE SURFACES (THESE SURFACES ARE NEEDED TO ASSURE ADEQUATE LANDING OR TAKEOFF CLEARANCE OVER OBSTRUCTIONS, INCLUDING THE CONTRACTOR'S WORK AND STORAGE AREAS).

   l. MARKING AND LIGHTING OF RUNWAYS, TAXIWAYS OR TAXILANES THAT COULD BE CONFUSING OR MISLEADING TO PILOTS, INCLUDING IMPROPERLY MARKED DISPLACED OR RELOCATED THRESHOLDS.

   m. INADEQUATE OR IMPROPER METHODS OF MARKING, BARRICADING, AND LIGHTING OF TEMPORARILY CLOSED PORTIONS OF THE AIRPORT AOA.

   n. WATER, SNOW, DIRT, DEBRIS, OR OTHER TRANSIENT ACCUMULATION WHICH TEMPORARILY OBSCURES PAVEMENT MARKINGS OR PAVEMENT EDGES, OR DIMINISHES THE VISIBILITY OF RUNWAY OR TAXIWAY LIGHTING.

   o. BIRD ATTRACTANTS SUCH AS EDIBLES (FOOD SCRAPS, ETC.), MISCELLANEOUS TRASH, OR PONDED WATER. FOOD SCRAPS AND MISCELLANEOUS TRASH SHALL BE SECURED BY THE CONTRACTOR AND DISPOSED OF USING PROPER SANITARY METHODS.

   p. FOREIGN OBJECTS DEBRIS:

      i. DEBRIS, WASTE, LOOSE MATERIAL (INCLUDING DUST AND DIRT), TRASH OR OTHER MATERIALS WHETHER ON RUNWAYS, TAXIWAYS, APRONS, OR IN RELATED SAFETY AREAS IS CONSIDERED FOREIGN OBJECT DEBRIS AND PRESENTS THE POTENTIAL FOR DAMAGE TO AIRCRAFT. SUCH MATERIAL SHALL NOT BE ALLOWED ON ANY AIRCRAFT MOVEMENT AREAS (REGARDLESS OF WHETHER THE AREA IS OPEN OR CLOSED) OR ADJACENT GRASSED AREAS. ANY DEBRIS (WHETHER CAUSED BY THE CONTRACTOR OR NOT) OBSERVED TO BE WITHIN THESE AREAS SHALL BE REMOVED IMMEDIATELY AND CONTINUOUSLY BY THE CONTRACTOR.

      ii. THE CONTRACTOR SHALL BE REQUIRED TO HAVE A VACUUM SWEEPER WITH PLASTIC BRUSHES (NOT STEEL) AND OPERATOR ON SITE AND READY AT ALL TIMES DURING CONSTRUCTION ACTIVITY.

      iii. WHERE TRAVEL ON OR ACROSS RUNWAYS, RAMP AREAS, TAXIWAYS, OR AIRCRAFT APRONS IS REQUIRED, THE CONTRACTOR SHALL PROVIDE ADEQUATE PERSONNEL AND EQUIPMENT TO KEEP SUCH SURFACES CLEAR OF DEBRIS.

      iv. ALL MATERIALS THAT COULD BLOW ACROSS ANY PAVEMENTS SHALL BE SECURED BY THE CONTRACTOR AND DISPOSED OF USING PROPER SANITARY METHODS.

   q. INADEQUATE BARRICADING OR OTHER MARKING WHICH IS PLACED TO SEPARATE CONSTRUCTION OR MAINTENANCE AREAS FROM OPEN AIRCRAFT OPERATING AREAS.

   r. FAILURE TO CONTROL UNAUTHORIZED VEHICLE AND HUMAN ACCESS THROUGH ACTIVE AIRCRAFT OPERATING AREAS. REFER TO **VEHICLE ACCESS, RADIO COMMUNICATIONS, AND SECURITY REQUIREMENTS** FOR MORE INFORMATION.

   s. FAILURE TO MAINTAIN RADIO COMMUNICATION BETWEEN CONSTRUCTION AND MAINTENANCE VEHICLES AND ATCT. REFER TO **VEHICLE ACCESS, RADIO COMMUNICATIONS, AND SECURITY REQUIREMENTS** FOR MORE INFORMATION.

   t. CONSTRUCTION AND MAINTENANCE ACTIVITIES OR MATERIALS WHICH COULD HAMPER THE RESPONSE OF AIRCRAFT RESCUE AND FIRE FIGHTING EQUIPMENT FROM REACHING AIRCRAFT, ALL OR ANY PART OF THE RUNWAY/TAXIWAY SYSTEM, RUNWAY APPROACH AND DEPARTURE AREAS, AND AIRCRAFT PARKING LOCATIONS.

SITE ACCESS, CONTRACTOR STAGING, HAUL ROUTES, AND MATERIAL STORAGE

1. ACCESS TO THE SITE – THE CONTRACTOR'S ACCESS POINTS TO THE SITE SHALL BE AS SHOWN ON THE PROJECT SECURITY PLAN. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL VEHICLES AND PERSONNEL WHO ENTER THE AIRPORT THROUGH THESE ACCESS POINTS. THE CONTRACTOR IS RESPONSIBLE FOR TRANSPORTING EMPLOYEES TO AND FROM THE JOB SITE. PERSONAL VEHICLES SHALL NOT BE PARKED ANYWHERE WITHIN THE AIRPORT OPERATIONS AREA. REFER TO **VEHICLE ACCESS, RADIO COMMUNICATIONS, AND SECURITY REQUIREMENTS** FOR ADDITIONAL INFORMATION.

2. ALL OFF–SITE HAUL ROUTES SHALL BE SELECTED TO MINIMIZE DISTURBANCE TO THE PUBLIC. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO COORDINATE OFF–SITE HAUL ROUTES (STATE HIGHWAYS, COUNTY ROADS, OR CITY STREETS) WITH THE APPROPRIATE OWNER WHO HAS JURISDICTION OVER THE AFFECTED ROUTE. THE CONTRACTOR'S ON–AIRPORT HAUL ROUTES ARE INDICATED ON THE PROJECT SECURITY PLAN. THESE SHALL BE EXISTING HAUL ROADS, WHERE AVAILABLE, OR ALONG TAXIWAY/TAXILANE PAVEMENTS UNLESS OTHERWISE INDICATED IN THE CONTRACT DRAWINGS.

3. ON–SITE ROADS AND OTHER AIRFIELD PAVEMENTS USED AS HAUL ROUTES SHALL BE MAINTAINED BY THE CONTRACTOR AND SHALL BE RESTORED AT THE CONTRACTOR'S EXPENSE TO THEIR ORIGINAL CONDITION UPON COMPLETION OF BEING USED AS A HAUL ROUTE, UNLESS OTHERWISE DIRECTED BY THE CONTRACT DOCUMENTS OR BY THE ENGINEER. THE BEFORE AND AFTER CONDITION OF ALL ON–SITE HAUL ROUTES (TEMPORARY OR PERMANENT) SHALL BE JOINTLY INSPECTED AND DETERMINED BY THE CONTRACTOR AND THE ENGINEER THROUGH THE USE OF DIGITAL PHOTOGRAPHY AND/OR VIDEO. THE CONTRACTOR MAY NEED TO COORDINATE HAUL ROUTE USAGE WITH OTHER CONTRACTORS WORKING ON THE AIRPORT.

4. FENCING, DRAINAGE, GRADING AND OTHER MISCELLANEOUS CONSTRUCTION REQUIRED TO CONSTRUCT OR RESTORE TEMPORARY OR PERMANENT HAUL ROUTES OR ACCESS POINTS ON THE AIRPORT WILL BE THE CONTRACTOR'S RESPONSIBILITY AND SHALL BE APPROVED BY THE ENGINEER PRIOR TO COMMENCING THE WORK.

5. ALL ON–SITE ACCESS ROADS TO AIRPORT FACILITIES SHALL REMAIN OPEN AND MAINTAINED AT ALL TIMES.

6. CONTRACTOR'S STAGING AREA – AN AREA WILL BE MADE AVAILABLE FOR CONTRACTOR'S MOBILIZATION AND STORAGE. THE CONTRACTOR'S STAGING AREA SHALL BE FREE OF DEBRIS. IF DIRECTED BY THE ENGINEER, THE CONTRACTOR WILL BE REQUIRED TO STAKE OUT AND FLAG THE STAGING AREA LIMITS. NO STAGING WILL BE ALLOWED WITHIN RUNWAY SAFETY AREAS. UPON COMPLETION OF THE PROJECT, THE STAGING AREA SHALL BE RESTORED TO ITS ORIGINAL CONDITION.

7. ALL MATERIALS AND EQUIPMENT (INCLUDING STOCKPILED MATERIAL) WHEN NOT IN USE SHALL BE PLACED IN APPROVED AREAS WHERE THEY WILL NOT CONSTITUTE A HAZARD TO AIRCRAFT OPERATIONS AND NOT PENETRATE CLEARANCE SURFACES SHOWN ON THE GENERAL CONSTRUCTION AND SAFETY NOTES II.

   - THE OBSTACLE FREE ZONE (OFZ) GOVERNS EQUIPMENT CLEARANCE DURING CONSTRUCTION ADJACENT TO AN ACTIVE RUNWAY. UNDER NO CIRCUMSTANCES SHALL ANY MEN OR EQUIPMENT PENETRATE THESE SURFACES UNLESS PRIOR ARRANGEMENTS HAVE BEEN MADE WITH AIRPORT OPERATIONS.
   - THE FAR PART 77 APPROACH, PRIMARY, AND TRANSITIONAL SURFACES GOVERN STOCKPILES AND PARKED EQUIPMENT. UNDER NO CIRCUMSTANCES SHALL STOCKPILES, PARKED EQUIPMENT, OR OTHER CONSTRUCTION ITEMS PENETRATE THESE SURFACES ADJACENT TO AN ACTIVE RUNWAY.
   - EQUIPMENT SHALL BE PARKED AT THE CONTRACTOR'S STAGING AREA WHEN NOT IN USE. TALL EQUIPMENT SUCH AS CRANES SHALL BE LOWERED TO THE GROUND WHEN NOT IN USE. STOCKPILED MATERIAL SHALL BE CONSTRAINED IN A MANNER TO PREVENT MOVEMENT RESULTING FROM AIRCRAFT JET BLAST OR WIND CONDITIONS IN EXCESS OF 10 KNOTS.

VEHICLE ACCESS, RADIO COMMUNICATIONS, AND SECURITY REQUIREMENTS

1. THE CONTRACT DOCUMENTS INCLUDE THE PROJECT SECURITY PLAN/S AND SPECIFICATIONS SECTION X–1, SECURITY REQUIREMENTS DURING CONSTRUCTION. THE CONTRACTOR SHALL REFER TO THESE FOR ADDITIONAL SECURITY REQUIREMENTS.

2. MOVEMENT AREA ACCESS REQUIREMENTS:

   a. DEFINITION – MOVEMENT AREA: THE MOVEMENT AREA DESIGNATION INCLUDES RUNWAYS, TAXIWAYS, AND OTHER AREAS OF AN AIRPORT WHICH ARE USED FOR TAXIING, HOVER–TAXIING, AIR–TAXIING, TAKEOFF, AND LANDING OF AIRCRAFT, EXCLUSIVE OF LOADING RAMPS AND AIRCRAFT PARKING AREAS.

   b. MOVEMENT AREA MARKINGS ARE DESIGNATED BY TWO PARALLEL LINES, ONE SOLID AND ONE DASHED, ON THE PAVEMENT.

   c. NOTE THAT AOA DRIVING PRIVILEGES ARE FOR NON MOVEMENT AREAS ONLY. ALL UNESCORTED ACCESS TO THE AIRFIELD MOVEMENT AREAS WILL REQUIRE CONTRACTOR PERSONNEL TO COMPLETE THE BWI AIRPORT MOVEMENT AREA TRAINING PROGRAM PROVIDED BY AIRPORT OPERATIONS. IF MOVEMENT AREA TRAINING IS REQUIRED TO ALLOW THE CONTRACTOR ACCESS TO THE AIRFIELD WITHOUT AN MAA OPERATIONS (OPS) ESCORT, A LETTER SHOULD BE SUBMITTED TO MAA'S DIRECTOR OF AIRPORT OPERATIONS IDENTIFYING: THE NAMES OF THE PERSONNEL TO BE TRAINED, THE REASON AIRFIELD ACCESS IS NEEDED, THE DURATION THAT ACCESS IS NEEDED, AND THE NUMBER OF TIMES ACCESS IS NEEDED DURING THAT DURATION. BASED ON THE INFORMATION IN THE LETTER, MAA OPS WILL EITHER OFFER A CLASS FOR TRAINING OF CONTRACTOR PERSONNEL OR HAVE AN OPS ESCORT AVAILABLE FOR AIRFIELD ACCESS. THE CONTRACTOR SHALL PROVIDE THE LETTER TO MAA'S DIRECTOR OF OPERATIONS THIRTY CALENDAR DAYS IN ADVANCE OF THE TRAINING. ONCE TRAINING IS SUCCESSFULLY COMPLETED, ONLY THOSE AUTHORIZED BY AIRPORT OPERATIONS WILL BE ALLOWED TO REQUEST COMMUNICATIONS CLEARANCE FROM THE ATCT TO ACCESS MOVEMENT AREAS, TAXIWAYS OR CLOSED RUNWAYS. PERSONNEL AND VEHICLES REQUIRING ACCESS TO CROSS OPEN OR ACTIVE RUNWAYS MUST BE ESCORTED BY AIRPORT OPERATIONS PERSONNEL, REGARDLESS OF TRAINING COMPLETED.

3. MOTORIZED VEHICLES WITHIN THE ACTIVE AIRCRAFT OPERATIONS AREA (AOA):

   a. ANY VEHICLE TO BE USED ON THE AIRPORT INCLUDING ALL CONTRACTOR EQUIPMENT AND MACHINERY CAPABLE OF BEING DRIVEN SHALL BE INSPECTED BY MAA OPERATIONS AND MUST DISPLAY A VALID AIRFIELD REGISTRATION DECAL. ALL OTHER (UNREGISTERED) VEHICLES MUST REMAIN UNDER CONTINUOUS ESCORT WHILE IN THE WORKSITE AND WHILE TRAVELING IN THE RESTRICTED AREAS OR TO AND FROM THE WORKSITE. IT IS THE CONTRACTOR'S RESPONSIBILITY TO ENSURE THAT VEHICLES ARE REGISTERED IN A TIMELY MANNER AS NOT TO DELAY THE PROJECT.

   b. ONLY VEHICLES REGISTERED BY THE MAA AND OPERATED BY APPROPRIATELY BADGED DRIVERS MAY PROCEED ON THE AIRFIELD WITHOUT AN ESCORT. UNREGISTERED VEHICLES MUST BE ESCORTED AT ALL TIMES BY A REGISTERED VEHICLE. APPROPRIATELY BADGED INDIVIDUALS OPERATING REGISTERED VEHICLES MAY ESCORT NO MORE THAN THREE VEHICLES AT ONE TIME. IF IT BECOMES NECESSARY TO ESCORT MORE THAN THREE VEHICLES, THE ESCORT SHOULD BE PERFORMED AS A MOTORCADE WITH ONE REGISTERED VEHICLE LEADING THE ESCORTED VEHICLES AND A SECOND REGISTERED VEHICLE COMPRISING THE REAR OF THE MOTORCADE.

   c. ALL PERMITTED VEHICLES SHALL BE MAINTAINED IN ACCORDANCE WITH ALL AIRPORT STANDARD OPERATING PROCEDURES.

   d. ALL PERMITTED VEHICLES SHALL BE CLEARLY MARKED WITH THE COMPANY NAME, LOGO, OR OTHER IDENTIFICATION ACCEPTABLE TO THE MAA. VEHICLE IDENTIFICATION SHALL BE IN ACCORDANCE WITH BWI TENANT DIRECTIVE 200.2, PARAGRAPH 3.2.B 'VEHICLE REGISTRATION PROGRAM', WHICH STATES THAT CHARACTERS ON THE SIDE ARE TO BE A MINIMUM OF 8 INCHES HIGH; CHARACTERS ON THE TOP (OR HOOD) ARE TO BE A MINIMUM OF 12 INCHES HIGH. TOP MARKINGS ARE TO BE ORIENTED LONGITUDINALLY. IN ADDITION, PERMITTED CONSTRUCTION VEHICLES SHALL, WHEN REQUESTED, DISPLAY IN FULL VIEW, ABOVE THE VEHICLE, A 3–FOOT X 3–FOOT, OR LARGER, ORANGE AND WHITE CHECKERBOARD PLASTIC FLAG. EACH CHECKERBOARD COLOR SHALL BE 1–FOOT SQUARE.

   e. EACH VEHICLE OPERATING ON A TAXIWAY OR RUNWAY DURING THE HOURS OF DARKNESS SHALL BE EQUIPPED WITH FLASHING OR NON–FLASHING IDENTIFICATION LIGHTS ON TOP OF THE VEHICLE AND OF SUCH INTENSITY TO CONFORM TO LOCAL CODES FOR MAINTENANCE VEHICLES. DARKNESS SHALL BE DEFINED AS ONE HOUR BEFORE OFFICIAL SUNSET UNTIL ONE HOUR AFTER SUNRISE.

   f. VEHICLES MAKING ONLY OCCASIONAL VISITS TO THE JOB SITE DO NOT NEED TO BE PERMITTED AND ARE EXEMPT FROM THE IDENTIFICATION REQUIREMENTS CONTAINED ABOVE, EXCEPT THAT THEY MUST ALSO BE LIGHTED WHEN ENTERING THE JOB SITE DURING THE HOURS OF DARKNESS.

   g. REFER TO SPECIFICATIONS ITEM X–1 FOR SECURITY ACCESS INFORMATION.

4. RADIO COMMUNICATIONS – FOR THOSE AUTHORIZED TO OPERATE OR WORK IN THE AIRFIELD MOVEMENT AREA, RADIO COMMUNICATION WITH THE FAA CONTROL TOWER IS REQUIRED AT ALL TIMES. ALL VEHICULAR MOVEMENTS IN THE MOVEMENT AREA ARE UNDER THE DIRECT CONTROL OF THE ATCT AND REQUESTS FOR MOVEMENT MUST BE APPROVED BY THE ATCT VIA RADIO COMMUNICATION PRIOR TO ENTERING OR MOVING WITHIN THE MOVEMENT AREA. RADIOS SHALL BE FURNISHED BY THE CONTRACTOR AND SHALL BE CAPABLE OF TRANSMITTING AND RECEIVING AT A GROUND FREQUENCY OF 121.9 MHZ. THIS FREQUENCY IS TO BE UTILIZED WHEN CROSSING ACTIVE FACILITIES. SUFFICIENT RADIOS SHALL BE ON SITE AND OPERATING AT ALL TIMES SO THAT INSTRUCTIONS OR COMMUNICATIONS MAY BE DISPATCHED TO ALL CREWS WITHIN AN ACTIVE AOA WITHIN ONE MINUTE AFTER RECEIPT OF DIRECTION FROM THE TOWER.

CLIENT LOGO HERE.

DESIGNED:	– – –
DRAWN:	– – –
CHECKED:	– – –
APPROVED:	– – –

REVISION NO.	REVISION DATE	DESCRIPTIONS

BALTIMORE/WASHINGTON INTERNATIONAL Thurgood Marshall AIRPORT

MARYLAND DEPARTMENT OF TRANSPORTATION
MARYLAND AVIATION ADMINISTRATION

OFFICE OF DESIGN AND CONSTRUCTION

PROJECT TITLE:	– –
SHEET TITLE:	GENERAL CONSTRUCTION AND SAFETY NOTES I – SIDA
SCALE:	AS SHOWN
DATE:	–
CONTRACT NO.:	
SHEET NO.:	

PROJECT COORDINATION

1. ALL COORDINATION BETWEEN THE CONTRACTOR AND MAA OFFICES SHALL BE DONE THROUGH THE ENGINEER EXCEPT AS NOTED UNDER EMERGENCY COORDINATION.

2. THE CONTRACTOR SHALL PROVIDE THE ENGINEER WITH A CURRENT LIST OF ALL EMPLOYEES WORKING ON THE AIRPORT INCLUDING SUBCONTRACTORS. THE LIST SHALL BE MAINTAINED CURRENT BY THE CONTRACTOR.

3. CONTRACTOR COORDINATION – CONSTRUCTION AND MAINTENANCE OPERATIONS BY OTHERS MAY OCCUR CONCURRENTLY AND IN THE VICINITY OF CONSTRUCTION ASSOCIATED WITH THIS PROJECT. THE CONTRACTOR SHALL COORDINATE OPERATIONS AND COOPERATE WITH MAINTENANCE CREWS AND OTHER CONTRACTORS WORKING ON THE AIRPORT.

4. COORDINATION WITH BWI AIRPORT FIRE RESCUE SERVICE (VIA THE ENGINEER):

   a. THE CONTRACTOR SHALL COMPLY WITH MARYLAND FIRE LAWS, NFPA 1 – UNIFORM FIRE CODE, ; CHAPTER 16, 'SAFETY DURING CONSTRUCTION AND DEMOLITION OPERATIONS' (CURRENT EDITIONS) AND CHAPTER 21, 'AIRPORTS'.

   b. OPEN FLAME, WELDING OR TORCH CUTTING OPERATIONS ARE PROHIBITED WITHOUT FIRST OBTAINING A BWI AIRPORT WELDING AND BURNING PERMIT. THE PERMIT IS AVAILABLE AT THE BWI FIRE MARSHAL'S OFFICE, 991 CORPORATE BLVD, LINTHICUM, MD 21090. THE PERMIT MAY BE REQUESTED FOR A PERIOD NOT TO EXCEED THIRTY DAYS. PRIOR TO COMMENCING WORK, ANY PERSON CONDUCTING OPEN FLAME/HOT WORK OPERATIONS SHALL BE FAMILIAR WITH THE LATEST EDITION OF NFPA 51B STANDARD FOR FIRE PREVENTION DURING WELDING, CUTTING, AND OTHER HOT WORK. ADEQUATE FIRE AND SAFETY PRECAUTIONS MUST BE TAKEN AND THE PROCEDURE APPROVED PRIOR TO COMMENCEMENT OF WORK. A FIRE WATCH IS REQUIRED.

   c. A HYDRANT USE PERMIT IS REQUIRED PRIOR TO CONNECTION TO ANY AIRPORT FIRE HYDRANT.

5. AIRPORT OPERATIONS COORDINATION (VIA THE ENGINEER):

   a. THE AIRPORT WILL BE IN OPERATION DURING THE CONSTRUCTION OF THIS PROJECT. THE CONTRACTOR SHALL BE REQUIRED TO COORDINATE ALL CONSTRUCTION ACTIVITIES WITH AIRPORT OPERATIONS AND COMPLY WITH ANY AND ALL RESTRICTIONS AND INSTRUCTIONS PROVIDED BY AIRPORT OPERATIONS.

   b. THE CONTRACTOR SHALL NOT BE ALLOWED TO IMPACT ANY NORMAL AIRPORT OPERATION WITHOUT PRIOR APPROVAL OF AIRPORT OPERATIONS.

   c. AT LEAST FOURTEEN CALENDAR DAYS BEFORE ACTUAL COMMENCEMENT OF CONSTRUCTION ACTIVITY, THE CONTRACTOR SHALL CONFIRM WITH THE ENGINEER, IN WRITING, THE PROPOSED TIME, DATE, AND AREA THAT CONSTRUCTION IS TO OCCUR.

   d. PORTABLE FLOODLIGHTING – USE OF PORTABLE FLOODLIGHTING SHALL BE COORDINATED WITH AIRPORT OPERATIONS AND THE ENGINEER TO ENSURE THAT THE LIGHTING DOES NOT COMPROMISE THE CONTROL TOWER'S VISIBILITY OR THAT IT IS NOT POSITIONED SUCH THAT IT FACES INTO ANY RUNWAY APPROACH WHERE IT MIGHT CAUSE CONFUSION TO PILOTS. THE CONTRACTOR SHALL PROVIDE PORTABLE FLOODLIGHTING AS REQUIRED FOR NIGHT CONSTRUCTION OPERATIONS.

   e. FLAGMEN AND VEHICLE ESCORTS –

   - THE CONTRACTOR SHALL FURNISH FLAGMEN AS NECESSARY TO CONTROL CONSTRUCTION TRAFFIC UNLESS OTHERWISE DIRECTED BY THE ENGINEER OR AIRPORT OPERATIONS.
   - ALL CONTRACTOR VEHICLES THAT ARE REQUIRED TO CROSS ACTIVE RUNWAYS AND RUNWAY SAFETY AREAS SHALL DO SO UNDER A DIRECT CONTROL ESCORT FROM AIRPORT OPERATIONS PERSONNEL.
   - CONTRACTOR VEHICLES THAT ARE REQUIRED TO CROSS ACTIVE TAXIWAYS MUST BE EITHER ESCORTED BY AIRPORT OPERATIONS OR HAVE COMPLETED THE BWI MOVEMENT AREA TRAINING PROGRAM AND BE AUTHORIZED TO OPERATE VEHICLES IN THE MOVEMENT AREA.
   - VEHICLES REQUIRED TO OPERATE ON TAXIWAYS OR CLOSED RUNWAYS SHALL DO SO UNDER THE DIRECT CONTROL OF A COMPETENT FLAGMAN WHO HAS COMPLETED MOVEMENT AREA TRAINING AND WHO IS IN DIRECT CONTACT WITH THE FAA AIR TRAFFIC CONTROL TOWER (ATCT) GROUND CONTROL.
   - VEHICLES REQUIRED TO OPERATE ON TAXILANES, APRONS, OR NON-MOVEMENT AREA HAUL ROUTES SHALL DO SO UNDER THE DIRECT CONTROL OF A COMPETENT FLAGMAN.

   f. FACILITY CLOSURES – REQUESTS FOR FACILITY CLOSURES SHALL BE MADE AT LEAST FOURTEEN CALENDAR DAYS IN ADVANCE OF THE PROPOSED CLOSING TO ALLOW AIRPORT OPERATIONS TIME TO ISSUE A TENANT INFORMATION ADVISORY. CLOSURES SHALL BE CONFIRMED FOUR WORKING DAYS PRIOR TO THE CLOSURE. THE CONTRACTOR MAY BE REQUIRED TO MEET WITH AIRPORT OPERATIONS AND THE FAA TO EVALUATE AND ESTABLISH ANY RUNWAY AND TAXIWAY CLOSURE TIMES AND DURATIONS. TO THE EXTENT POSSIBLE, THE CONTRACTOR SHALL COORDINATE CONSTRUCTION TO COINCIDE WITH RUNWAY AND TAXIWAY CLOSURES ALREADY SCHEDULED FOR CONSTRUCTION AND MAINTENANCE OPERATIONS BY OTHERS.

   g. UPON COMPLETION OF ANY STAGE OR PHASE OF WORK, THE ENGINEER WILL ARRANGE A PHYSICAL INSPECTION OF THE AREA WITH AIRPORT OPERATIONS PERSONNEL PRIOR TO THE OPENING OF ANY TAXIWAY, RUNWAY, RAMP AREA OR AIRPORT ROADWAY THAT HAS BEEN CLOSED FOR WORK OR USED FOR A CROSSING POINT OR HAUL ROUTE BY THE CONTRACTOR.

   h. UPON COMPLETION OF WORK AND RETURN OF ALL RELATED AREAS TO STANDARD CONDITIONS, THE CONTRACTOR SHALL NOTIFY MAA (IN WRITING) AND DESCRIBE THE AREA THAT IS COMPLETE AND AVAILABLE FOR NORMAL AIRPORT OPERATIONS.

6. UTILITIES:

   a. UNDERGROUND UTILITIES – LOCATIONS OF KNOWN UNDERGROUND UTILITIES SHOWN ON THE PLANS ARE APPROXIMATE. ALL UTILITY LOCATIONS SHALL BE FIELD VERIFIED BY THE CONTRACTOR PRIOR TO COMMENCING CONSTRUCTION. THE CONTRACTOR IS REQUIRED TO COMPLETE A DIGGING AUTHORIZATION FORM, AS SUPPLIED BY THE ENGINEER, PRIOR TO INITIATION OF EXCAVATION OPERATIONS.

   b. REPAIR OF UTILITIES DAMAGED DURING CONSTRUCTION MUST BE STARTED IMMEDIATELY AND CONTINUE UNTIL COMPLETED.

      i. ALL SUCH REPAIRS SHALL BE IN ACCORDANCE WITH THE CONTRACT SPECIFICATIONS OR AS DIRECTED BY THE ENGINEER AND SHALL BE AT THE CONTRACTOR'S EXPENSE.

      ii. IF FAA CABLES ARE DAMAGED, REPAIRS SHALL BE DONE IN ACCORDANCE WITH FAA REQUIREMENTS AND IN THE PRESENCE OF AN FAA REPRESENTATIVE. THE FAA MAY ELECT TO HAVE THE REPAIR PERFORMED BY OTHERS IN WHICH CASE THE CONTRACTOR SHALL BE RESPONSIBLE FOR PAYING THE INCURRED COSTS OF REPAIRS.

   c. UTILITIES NOTIFICATION – AT LEAST TWO WORKING DAYS PRIOR TO COMMENCING CONSTRUCTION OPERATIONS IN AN AREA WHICH MAY INVOLVE UNDERGROUND UTILITIES, THE CONTRACTOR SHALL NOTIFY THE ENGINEER AND THE OWNER OF EACH UNDERGROUND UTILITY AFFECTED.

   THE FOLLOWING LIST INCLUDES POSSIBLE UTILITIES WITHIN THE CONSTRUCTION LIMITS. ADDITIONAL UTILITIES NOT LISTED BELOW MAY ALSO BE ON-SITE.

   UTILITY OWNERSHIP:

MISS UTILITY CENTER	1-800-257-7777
BGE	(410) 685-0123
	(410) 234-5000
	1-800-685-0123
VERIZON REPAIR BURIED CABLE	(410) 954-2222
	1-800-275-2355
FAA AIRWAY FACILITIES SSC	(410) 859-7252
COMCAST	(410) 931-4600
	(410) 729-8000
MILLENIUM DIGITAL MEDIA	(410) 987-9300
ANNE ARUNDEL COUNTY UTILITY OPERATIONS BUREAU (WATER SUPPLY FROM AIRPORT PERIMETER TO METER)	
EMERGENCIES	(410) 222-8400
GENERAL INFORMATION	(410) 222-7520

EMERGENCY CONTACT INFORMATION

1. EXCEPT FOR EMERGENCIES, ALL CONTACT WITH AIRPORT PERSONNEL SHALL BE MADE THROUGH THE ENGINEER. FOR EMERGENCIES INVOLVING SAFETY (INJURIES, FIRES, SECURITY BREACHES, ETC.) THE CONTRACTOR SHALL MAKE DIRECT CONTACT WITH AIRPORT OPERATIONS FOLLOWED BY NOTIFICATION TO THE ENGINEER AS SOON AS POSSIBLE.

2. THE PROJECT SUPERVISORS SHALL HAVE THE FOLLOWING TELEPHONE NUMBERS WITH THEM AT ALL TIMES:

i.	MAA FIRE MARSHALL	(410) 859-7815/7511
ii.	BWI FIRE/RESCUE/MEDICAL EMERGENCY	(410) 859-7222
iii.	BWI POLICE EMERGENCY	(410) 859-7040
iv.	BWI DUTY AIRPORT OPERATIONS MGR	(410) 859-7018
v.	CONSOLIDATED DISPATCH CENTER	(410) 859-7117
vi.	BWI OFFICE OF AIRPORT SECURITY	(410) 859-7162
vii.	FAA ATCT	(410) 859-7636
viii.	FAA AIRWAY FACILITIES SSC	(410) 859-7252
ix.	MDE OIL CONTROL PROGRAM (COMPLIANCE AND REMEDIATION)	(410) 537-3442

3. THE CONTRACTOR SHALL PROVIDE THE PHONE NUMBERS OF THREE PERSONNEL, INCLUDING THE PROJECT SUPERINTENDENT, WHO MAY BE CONTACTED IN AN EMERGENCY. PERSONNEL SHALL BE ON CALL 24 HOURS PER DAY FOR MAINTAINING AIRPORT HAZARD LIGHTING AND BARRICADES.

4. THE CONTRACTOR SHALL PROVIDE THE NAME AND PHONE NUMBERS OF THE PROJECT SECURITY COORDINATOR AND THE DESIGNATED ALTERNATE WHO SHALL BE ON CALL 24 HOURS PER DAY FOR CONTACT REGARDING SECURITY ISSUES

RELATED DOCUMENTS

1. FAA ADVISORY CIRCULARS (AC's), ORDERS AND FEDERAL AVIATION REGULATIONS (FAR's) – THE FOLLOWING PUBLICATIONS CONTAIN DEFINITIONS OR DESCRIPTIONS OF CRITICAL AIRPORT OPERATING AREAS. COPIES OF THESE PUBLICATIONS ARE AVAILABLE THROUGH THE FAA AT WWW.FAA.GOV AND CAN BE REVIEWED AT THE OFFICES OF THE MAA.

   THE ITEMS OUTLINED BELOW PERTAIN TO AIRFIELD SAFETY REQUIREMENTS AND ARE REFERENCED THROUGHOUT THE CONTRACT DOCUMENTS.

   a. AC 150/5370-2, 'OPERATIONAL SAFETY ON AIRPORTS DURING CONSTRUCTION', CURRENT EDITION, SETS FORTH GUIDELINES TO ASSIST AIRPORT OPERATORS IN COMPLYING WITH FAR PART 139, "CERTIFICATION AND OPERATION: LAND AIRPORTS SERVING CERTAIN AIR CARRIERS" AND WITH THE REQUIREMENTS OF FEDERALLY FUNDED AIRPORT CONSTRUCTION PROJECTS.

   b. FAR PART 77 'OBJECTS AFFECTING NAVIGABLE AIRSPACE', CURRENT EDITION:

      i. ESTABLISHES STANDARDS FOR DETERMINING OBSTRUCTIONS TO NAVIGABLE AIRSPACE. IMAGINARY SURFACES ARE DEFINED IN THE PUBLICATION AND ARE SHOWN ON THIS SHEET.

      ii. ESTABLISHES REQUIREMENTS FOR FILING NOTICE TO THE FAA FOR CERTAIN PROPOSED CONSTRUCTION OR ALTERATION PROPOSALS. COMPLETION OF THE 'NOTICE OF PROPOSED CONSTRUCTION OR ALTERATION' FORM (FAA FORM 7460-1) IS DISCUSSED IN AC 70/7460-1 'OBSTRUCTION MARKING AND LIGHTING', CURRENT EDITION.

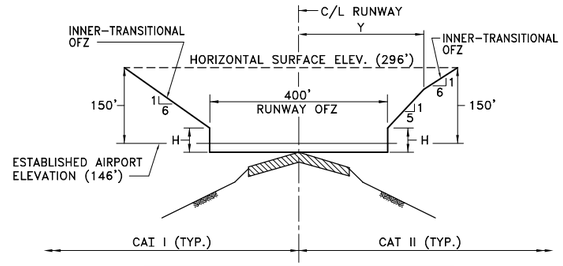
   c. AC 70/7460-2, 'PROPOSED CONSTRUCTION OF OBJECTS THAT MAY AFFECT THE NAVIGABLE AIRSPACE', CURRENT EDITION, PROVIDES INFORMATION TO PERSONS PROPOSING TO ERECT OR ALTER AN OBJECT THAT MAY AFFECT NAVIGABLE AIRSPACE. THE AC EXPLAINS THE REQUIREMENT TO NOTIFY THE FAA BEFORE CONSTRUCTION BEGINS AND THE FAA'S RESPONSIBILITY TO RESPOND TO THESE NOTICES.

   d. AC 150/5300-13, 'AIRPORT DESIGN', CURRENT EDITION, ESTABLISHES DESIGN, OPERATIONAL, AND MAINTENANCE STANDARDS FOR AIRPORTS. STANDARD TERMS USED IN THE CONTRACT PLANS AND SPECIFICATIONS ARE DEFINED BELOW.

      i. OBSTACLE FREE ZONE (OFZ) – A VOLUME OF SPACE WHICH IS FREE OF ALL FIXED OBJECTS AND CLEAR OF VEHICLES IN THE PROXIMITY OF AN AIRPLANE CONDUCTING AN APPROACH, MISSED APPROACH, LANDING, TAKEOFF, OR DEPARTURE. AN OFZ TYPICAL SECTION IS SHOWN ON THIS SHEET.

      ii. OBJECT FREE AREA (OFA) – A TWO DIMENSIONAL GROUND AREA SURROUNDING RUNWAYS, TAXIWAYS, AND TAXILANES WHICH IS CLEAR OF OBJECTS EXCEPT FOR OBJECTS WHOSE LOCATION IS FIXED BY FUNCTION.

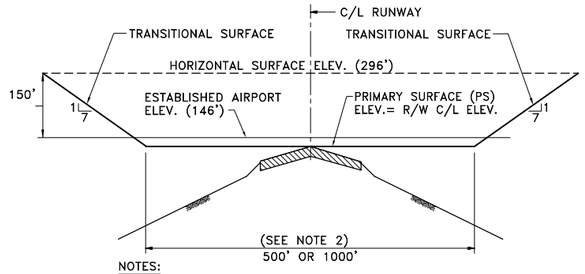
      iii. SAFETY AREA – THE SURFACE ADJACENT TO RUNWAYS, TAXIWAYS, AND TAXILANES OVER WHICH AIRCRAFT SHOULD, IN DRY WEATHER, BE ABLE TO CROSS AT NORMAL SPEEDS WITHOUT INCURRING ANY SIGNIFICANT DAMAGE. A SAFETY AREA IS GRADED, DRAINED AND COMPACTED. IT IS FREE OF ANY HOLES, TRENCHES, BUMPS OR OTHER SIGNIFICANT SURFACE VARIATIONS OR OBJECTS OTHER THAN THOSE WHICH MUST BE THERE BECAUSE OF THEIR ESSENTIAL AERONAUTICAL FUNCTION. THE SAFETY AREA REQUIRES THE CAPABILITY OF SUPPORTING MAINTENANCE VEHICLES AND AIRCRAFT RESCUE AND FIRE FIGHTING VEHICLES UNDER NORMAL (DRY) CONDITIONS.



RUNWAY	TYPE OF RUNWAY	H (FEET)	Y (FEET)
10	PRECISION (CAT III)	25.5	667.8
28	PRECISION (CAT II)	41.3	0
15R-33L	PRECISION (CAT I)	50.3	0
15L-33R	PRECISION (CAT I)	41.3	0
4-22	VISUAL	*	0

*VERTICAL TO A HEIGHT OF 150' ABOVE ESTABLISHED AIRPORT ELEVATION

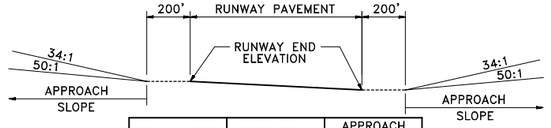
TYPICAL SECTION
OBSTACLE FREE ZONE (OFZ)
NOT TO SCALE



NOTES:

1. SEE "CONTRACTOR'S SAFETY REQUIREMENTS DURING CONSTRUCTION" AS CONTAINED IN THE PLANS REGARDING RESTRICTED AREAS IN THE VICINITY OF ACTIVE RUNWAYS AND TAXIWAYS.
2. IMAGINARY SURFACE REQUIREMENTS FOR EXISTING ACTIVE RUNWAYS (R/W) ARE SIMILAR EXCEPT PRIMARY SURFACES (PS) DIMENSIONS VARY:
   R/W 4-22 – 500' PS (250' LT. & RT. OF C/L)
   R/W 10-28 – 1000' PS (500' LT. & RT. OF C/L)
   R/W 15R-33L – 1000' PS (500' LT. & RT. OF C/L)
   R/W 15L-33R – 1000' PS (500' LT. & RT. OF C/L)

TYPICAL SECTION
F A R PART 77 IMAGINARY SURFACES
NOT TO SCALE



RUNWAY END	ELEVATION	APPROACH SLOPE
10	139.0	50:1
28	126.2	50:1
15R	138.6	50:1
33L	129.2	50:1
4	146.0	34:1
22	137.7	34:1
15L	141.5	50:1
33R	114.1	50:1

TYPICAL APPROACH PROFILE
F A R PART 77 IMAGINARY SURFACES
NOT TO SCALE

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DESIGNED:	– – –
DRAWN:	– – –
CHECKED:	– – –
APPROVED:	– – –

REVISION NO.	REVISION DATE	DESCRIPTIONS

BALTIMORE/WASHINGTON INTERNATIONAL Thurgood Marshall AIRPORT

MARYLAND DEPARTMENT OF TRANSPORTATION
MARYLAND AVIATION ADMINISTRATION

OFFICE OF DESIGN AND CONSTRUCTION

PROJECT TITLE: –
–

SHEET TITLE: **GENERAL CONSTRUCTION AND SAFETY NOTES II – SIDA**

SCALE: AS SHOWN

DATE: –

CONTRACT NO.:

SHEET NO.:

GENERAL CONSTRUCTION NOTES

1. THIS PROJECT IS FOR WORK AT BALTIMORE/WASHINGTON INTERNATIONAL THURGOOD MARSHALL AIRPORT, HEREAFTER REFERRED TO AS 'THE AIRPORT' OR 'BWI'.

2. THIS PROJECT SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE CONTRACT PLANS AND SPECIFICATIONS AND ANY RULES, REGULATIONS, STANDARDS, OR SPECIFICATIONS REFERENCED THEREIN. THE PROJECT IS SUBJECT TO INSPECTION BY REPRESENTATIVES OF THE MARYLAND AVIATION ADMINISTRATION (MAA), THE FEDERAL AVIATION ADMINISTRATION (FAA), AND OTHER GOVERNING AGENCIES.

3. PROJECT PHASING – THE PROJECT IS TO BE COMPLETED IN CLOSE CONFORMANCE WITH THE PHASING PLANS, IF PROVIDED, AND NOTES AS CONTAINED IN THE CONTRACT DOCUMENTS. CHANGES TO THE PHASING PLANS SHALL BE COORDINATED WITH THE ENGINEER AND REVIEWED WITH THE DESIGNER PRIOR TO IMPLEMENTATION.

4. PROJECT COMPLETION TIMES – THE CONTRACTOR IS EXPECTED TO COMPLETE CRITICAL PORTIONS OF THE PROJECT WITHIN THE SPECIFIED TIMEFRAMES AND TO COMPLETE THE ENTIRE PROJECT ON TIME. LIQUIDATED DAMAGES, IF SPECIFIED, WILL BE ASSESSED SHOULD THE TIMEFRAME BE EXCEEDED.

5. CONSTRUCTION LIMITS – ALL CONTRACTOR VEHICLES SHALL REMAIN WITHIN THE DESIGNATED CONSTRUCTION LIMITS OR HAUL ROUTES (UNLESS OTHERWISE AUTHORIZED).

6. DIMENSIONS IDENTIFIED ON THE PLANS SHALL BE VERIFIED IN THE FIELD. IN GENERAL, SMALL-SCALE DRAWINGS WITH GREATER RESOLUTION (I.E. 1"=50') GOVERN OVER LARGER SCALE DRAWINGS OF LESS RESOLUTION (I.E. 1"=500'), WRITTEN NOTES GOVERN OVER GRAPHIC REPRESENTATION AND SPECIFICATIONS GOVERN OVER DRAWINGS. ANY DISCREPANCIES SHALL BE REPORTED TO THE ENGINEER FOR CLARIFICATION.

7. EXISTING TOPOGRAPHIC FIELD SURVEYS WERE PROVIDED BY SURVEYORS NAME AND DATE. THE CONTROL ON THIS PROJECT IS TIED TO THE NAD 83/91 HORIZONTAL DATUM AND NAVD 88 VERTICAL DATUM. SURVEY UNITS SHALL BE IN U.S. SURVEY FOOT. PROJECT BENCHMARKS ARE SHOWN ON THE GENERAL PROJECT LAYOUT.

8. ALL THE PERMITS AND LICENSES REQUIRED FOR THE PROJECT WORK SHALL BE OBTAINED AT THE CONTRACTOR'S EXPENSE.

9. IN ACCORDANCE WITH THE SPECIFICATIONS, FEDERAL WAGE RATES SHALL BE POSTED OUTSIDE THE SITE FIELD OFFICE(S) IN A WEATHERPROOF ENCLOSURE. [FOR FEDERALLY FUNDED PROJECTS ONLY]

GENERAL AIRFIELD SAFETY DURING CONSTRUCTION

1. THE CONTRACTOR SHALL ACQUAINT SUPERVISORS AND EMPLOYEES WITH ACTIVITY AND OPERATIONS THAT ARE INHERENT TO THE AIRPORT AND SHALL CONDUCT CONSTRUCTION ACTIVITIES TO CONFORM TO ALL ROUTINE AND EMERGENCY AIR TRAFFIC REQUIREMENTS AND GUIDELINES FOR SAFETY SPECIFIED HEREIN.

2. THE CONTRACTOR AND HIS/HER SUBCONTRACTOR(S) SHALL PROTECT WORKERS, MAA AND AIRPORT TENANT EMPLOYEES, AND THE GENERAL PUBLIC. THE CONTRACTOR SHALL ALSO ENSURE THAT PROPERTY OR EQUIPMENT, UNRELATED TO WORK, WHICH BELONGS TO MAA OR AIRPORT TENANTS IS NOT DAMAGED DURING CONSTRUCTION.

3. THE CONTRACTOR SHALL NOT ALLOW EMPLOYEES, SUBCONTRACTORS, SUPPLIERS, OR ANY OTHER UNAUTHORIZED PERSON TO ENTER OR REMAIN IN ANY AIRPORT AREA WHICH WOULD BE HAZARDOUS TO PERSONS OR TO AIRCRAFT OPERATIONS.

4. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING ALL NECESSARY PROTECTIVE GEAR AND EQUIPMENT REQUIRED FOR THE PROTECTION OF THE CONTRACTOR'S PERSONNEL DURING CONSTRUCTION.

5. THE CONTRACTOR SHALL INSPECT ALL CONSTRUCTION AND STORAGE AREAS AS OFTEN AS NECESSARY AND PROMPTLY TAKE ALL STEPS NECESSARY TO PREVENT OR REMEDY ANY UNSAFE OR POTENTIALLY UNSAFE CONDITIONS OR ACTIVITIES DISCOVERED.

SITE ACCESS, CONTRACTOR STAGING, HAUL ROUTES, AND MATERIAL STORAGE

1. ACCESS TO THE SITE – THE CONTRACTOR'S ACCESS POINTS TO THE SITE SHALL BE AS SHOWN ON THE PROJECT SECURITY PLAN. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL VEHICLES AND PERSONNEL WHO ENTER THE AIRPORT THROUGH THESE ACCESS POINTS. THE CONTRACTOR IS RESPONSIBLE FOR TRANSPORTING EMPLOYEES TO AND FROM THE JOB SITE. PERSONAL VEHICLES SHALL NOT BE PARKED ANYWHERE WITHIN THE AIRPORT OPERATIONS AREA.

2. ALL OFF-SITE HAUL ROUTES SHALL BE SELECTED TO MINIMIZE DISTURBANCE TO THE PUBLIC. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO COORDINATE OFF-SITE HAUL ROUTES (STATE HIGHWAYS, COUNTY ROADS, OR CITY STREETS) WITH THE APPROPRIATE OWNER WHO HAS JURISDICTION OVER THE AFFECTED ROUTE. THE CONTRACTOR'S ON-AIRPORT HAUL ROUTES ARE INDICATED ON THE PROJECT SECURITY PLAN.

3. ON-SITE ROADS AND OTHER AIRFIELD PAVEMENTS USED AS HAUL ROUTES SHALL BE MAINTAINED BY THE CONTRACTOR AND SHALL BE RESTORED AT THE CONTRACTOR'S EXPENSE TO THEIR ORIGINAL CONDITION UPON COMPLETION OF BEING USED AS A HAUL ROUTE, UNLESS OTHERWISE DIRECTED BY THE CONTRACT DOCUMENTS OR BY THE ENGINEER. THE BEFORE AND AFTER CONDITION OF ALL ON-SITE HAUL ROUTES (TEMPORARY OR PERMANENT) SHALL BE JOINTLY INSPECTED AND DETERMINED BY THE CONTRACTOR AND THE ENGINEER THROUGH THE USE OF DIGITAL PHOTOGRAPHY AND/OR VIDEO. THE CONTRACTOR MAY NEED TO COORDINATE HAUL ROUTE USAGE WITH OTHER CONTRACTORS WORKING ON THE AIRPORT.

4. FENCING, DRAINAGE, GRADING AND OTHER MISCELLANEOUS CONSTRUCTION REQUIRED TO CONSTRUCT OR RESTORE TEMPORARY OR PERMANENT HAUL ROUTES OR ACCESS POINTS ON THE AIRPORT WILL BE THE CONTRACTOR'S RESPONSIBILITY AND SHALL BE APPROVED BY THE ENGINEER PRIOR TO COMMENCING THE WORK.

5. ALL ON-SITE ACCESS ROADS TO AIRPORT FACILITIES SHALL REMAIN OPEN AND MAINTAINED AT ALL TIMES.

6. CONTRACTOR'S STAGING AREA – AN AREA WILL BE MADE AVAILABLE FOR CONTRACTOR'S MOBILIZATION AND STORAGE. THE CONTRACTOR'S STAGING AREA SHALL BE FREE OF DEBRIS. IF DIRECTED BY THE ENGINEER, THE CONTRACTOR WILL BE REQUIRED TO STAKE OUT AND FLAG THE STAGING AREA LIMITS. UPON COMPLETION OF THE PROJECT, THE STAGING AREA SHALL BE RESTORED TO ITS ORIGINAL CONDITION.

7. ALL MATERIALS AND EQUIPMENT WHEN NOT IN USE SHALL BE PLACED IN APPROVED AREAS.

PROJECT COORDINATION

1. ALL COORDINATION BETWEEN THE CONTRACTOR AND MAA OFFICES SHALL BE DONE THROUGH THE ENGINEER EXCEPT AS NOTED UNDER EMERGENCY COORDINATION.

2. THE CONTRACTOR SHALL PROVIDE THE ENGINEER WITH A CURRENT LIST OF ALL EMPLOYEES WORKING ON THE AIRPORT INCLUDING SUBCONTRACTORS. THE LIST SHALL BE MAINTAINED CURRENT BY THE CONTRACTOR.

3. CONTRACTOR COORDINATION – CONSTRUCTION AND MAINTENANCE OPERATIONS BY OTHERS MAY OCCUR CONCURRENTLY AND IN THE VICINITY OF CONSTRUCTION ASSOCIATED WITH THIS PROJECT. THE CONTRACTOR SHALL COORDINATE OPERATIONS AND COOPERATE WITH MAINTENANCE CREWS AND OTHER CONTRACTORS WORKING ON THE AIRPORT.

4. COORDINATION WITH BWI AIRPORT FIRE RESCUE SERVICE (VIA THE ENGINEER):

   a. THE CONTRACTOR SHALL COMPLY WITH MARYLAND FIRE LAWS, NFPA 1 – UNIFORM FIRE CODE, ; CHAPTER 16, 'SAFETY DURING CONSTRUCTION AND DEMOLITION OPERATIONS' (CURRENT EDITIONS) AND CHAPTER 21, 'AIRPORTS'.

   b. OPEN FLAME, WELDING OR TORCH CUTTING OPERATIONS ARE PROHIBITED WITHOUT FIRST OBTAINING A BWI AIRPORT WELDING AND BURNING PERMIT. THE PERMIT IS AVAILABLE AT THE BWI FIRE MARSHAL'S OFFICE, 991 CORPORATE BLVD, LINTHICUM, MD 21090. THE PERMIT MAY BE REQUESTED FOR A PERIOD NOT TO EXCEED THIRTY DAYS. PRIOR TO COMMENCING WORK, ANY PERSON CONDUCTING OPEN FLAME/HOT WORK OPERATIONS SHALL BE FAMILIAR WITH THE LATEST EDITION OF NFPA 51B STANDARD FOR FIRE PREVENTION DURING WELDING, CUTTING, AND OTHER HOT WORK. ADEQUATE FIRE AND SAFETY PRECAUTIONS MUST BE TAKEN AND THE PROCEDURE APPROVED PRIOR TO COMMENCEMENT OF WORK. A FIRE WATCH IS REQUIRED.

   c. A HYDRANT USE PERMIT IS REQUIRED PRIOR TO CONNECTION TO ANY AIRPORT FIRE HYDRANT.

5. AIRPORT OPERATIONS COORDINATION (VIA THE ENGINEER):

   a. THE AIRPORT WILL BE IN OPERATION DURING THE CONSTRUCTION OF THIS PROJECT. THE CONTRACTOR SHALL BE REQUIRED TO COORDINATE ALL CONSTRUCTION ACTIVITIES WITH AIRPORT OPERATIONS AND COMPLY WITH ANY AND ALL RESTRICTIONS AND INSTRUCTIONS PROVIDED BY AIRPORT OPERATIONS.

   b. THE CONTRACTOR SHALL NOT BE ALLOWED TO IMPACT ANY NORMAL AIRPORT OPERATION WITHOUT PRIOR APPROVAL OF AIRPORT OPERATIONS.

   c. AT LEAST FOURTEEN CALENDAR DAYS BEFORE ACTUAL COMMENCEMENT OF CONSTRUCTION ACTIVITY, THE CONTRACTOR SHALL CONFIRM WITH THE ENGINEER, IN WRITING, THE PROPOSED TIME, DATE, AND AREA THAT CONSTRUCTION IS TO OCCUR.

6. UTILITIES:

   a. UNDERGROUND UTILITIES – LOCATIONS OF KNOWN UNDERGROUND UTILITIES SHOWN ON THE PLANS ARE APPROXIMATE. ALL UTILITY LOCATIONS SHALL BE FIELD VERIFIED BY THE CONTRACTOR PRIOR TO COMMENCING CONSTRUCTION. THE CONTRACTOR IS REQUIRED TO COMPLETE A DIGGING AUTHORIZATION FORM, AS SUPPLIED BY THE ENGINEER, PRIOR TO INITIATION OF EXCAVATION OPERATIONS.

   b. REPAIR OF UTILITIES DAMAGED DURING CONSTRUCTION MUST BE STARTED IMMEDIATELY AND CONTINUE UNTIL COMPLETED.

      i. ALL SUCH REPAIRS SHALL BE IN ACCORDANCE WITH THE CONTRACT SPECIFICATIONS OR AS DIRECTED BY THE ENGINEER AND SHALL BE AT THE CONTRACTOR'S EXPENSE.

      ii. IF FAA CABLES ARE DAMAGED, REPAIRS SHALL BE DONE IN ACCORDANCE WITH FAA REQUIREMENTS AND IN THE PRESENCE OF AN FAA REPRESENTATIVE. THE FAA MAY ELECT TO HAVE THE REPAIR PERFORMED BY OTHERS IN WHICH CASE THE CONTRACTOR SHALL BE RESPONSIBLE FOR PAYING THE INCURRED COSTS OF REPAIRS.

   c. UTILITIES NOTIFICATION – AT LEAST TWO WORKING DAYS PRIOR TO COMMENCING CONSTRUCTION OPERATIONS IN AN AREA WHICH MAY INVOLVE UNDERGROUND UTILITIES, THE CONTRACTOR SHALL NOTIFY THE ENGINEER AND THE OWNER OF EACH UNDERGROUND UTILITY AFFECTED.

      THE FOLLOWING LIST INCLUDES POSSIBLE UTILITIES WITHIN THE CONSTRUCTION LIMITS. ADDITIONAL UTILITIES NOT LISTED BELOW MAY ALSO BE ON-SITE.

      UTILITY OWNERSHIP:

MISS UTILITY CENTER	1-800-257-7777
BGE	(410) 685-0123
	(410) 234-5000
	1-800-685-0123
VERIZON REPAIR BURIED CABLE	(410) 954-2222
	1-800-275-2355
FAA AIRWAY FACILITIES SSC	(410) 859-7252
COMCAST	(410) 931-4600
	(410) 729-8000
MILLENIUM DIGITAL MEDIA	(410) 987-9300
ANNE ARUNDEL COUNTY UTILITY OPERATIONS BUREAU (WATER SUPPLY FROM AIRPORT PERIMETER TO METER)	
EMERGENCIES	(410) 222-8400
GENERAL INFORMATION	(410) 222-7520

EMERGENCY CONTACT INFORMATION

1. EXCEPT FOR EMERGENCIES, ALL CONTACT WITH AIRPORT PERSONNEL SHALL BE MADE THROUGH THE ENGINEER. FOR EMERGENCIES INVOLVING SAFETY (INJURIES, FIRES, SECURITY BREACHES, ETC.) THE CONTRACTOR SHALL MAKE DIRECT CONTACT WITH AIRPORT OPERATIONS FOLLOWED BY NOTIFICATION TO THE ENGINEER AS SOON AS POSSIBLE.
2. THE PROJECT SUPERVISORS SHALL HAVE THE FOLLOWING TELEPHONE NUMBERS WITH THEM AT ALL TIMES:

i.	MAA FIRE MARSHALL	(410) 859-7815/7511
ii.	BWI FIRE/RESCUE/MEDICAL EMERGENCY	(410) 859-7222
iii.	BWI POLICE EMERGENCY	(410) 859-7040
iv.	BWI DUTY AIRPORT OPERATIONS MGR	(410) 859-7018
v.	CONSOLIDATED DISPATCH CENTER	(410) 859-7117
vi.	BWI OFFICE OF AIRPORT SECURITY	(410) 859-7162
vii.	MDE OIL CONTROL PROGRAM (COMPLIANCE AND REMEDIATION)	(410) 537-3442

3. THE CONTRACTOR SHALL PROVIDE THE PHONE NUMBERS OF THREE PERSONNEL, INCLUDING THE PROJECT SUPERINTENDENT, WHO MAY BE CONTACTED IN AN EMERGENCY.

4. THE CONTRACTOR SHALL PROVIDE THE NAME AND PHONE NUMBERS OF THE PROJECT SECURITY COORDINATOR AND THE DESIGNATED ALTERNATE WHO SHALL BE ON CALL 24 HOURS PER DAY FOR CONTACT REGARDING SECURITY ISSUES.

CLIENT LOGO HERE.

DESIGNED: ---
DRAWN: ---
CHECKED: ---
APPROVED: ---

REVISION NO.	REVISION DATE	DESCRIPTIONS

BALTIMORE/WASHINGTON INTERNATIONAL Thurgood Marshall AIRPORT

MARYLAND DEPARTMENT OF TRANSPORTATION
MARYLAND AVIATION ADMINISTRATION

OFFICE OF DESIGN AND CONSTRUCTION

PROJECT TITLE: –
–

SHEET TITLE: GENERAL CONSTRUCTION AND SAFETY NOTES – STERILE BUILDING AREA

SCALE: AS SHOWN

DATE: –

CONTRACT NO.:

SHEET NO.:

GENERAL CONSTRUCTION NOTES

1. THIS PROJECT IS FOR WORK AT BALTIMORE/WASHINGTON INTERNATIONAL THURGOOD MARSHALL AIRPORT, HEREAFTER REFERRED TO AS 'THE AIRPORT' OR 'BWI'.

2. THIS PROJECT SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE CONTRACT PLANS AND SPECIFICATIONS AND ANY RULES, REGULATIONS, STANDARDS, OR SPECIFICATIONS REFERENCED THEREIN. THE PROJECT IS SUBJECT TO INSPECTION BY REPRESENTATIVES OF THE MARYLAND AVIATION ADMINISTRATION (MAA), THE FEDERAL AVIATION ADMINISTRATION (FAA), AND OTHER GOVERNING AGENCIES.

3. PROJECT PHASING – THE PROJECT IS TO BE COMPLETED IN CLOSE CONFORMANCE WITH THE PHASING PLANS, IF PROVIDED, AND NOTES AS CONTAINED IN THE CONTRACT DOCUMENTS. CHANGES TO THE PHASING PLANS SHALL BE COORDINATED WITH THE ENGINEER AND REVIEWED WITH THE DESIGNER PRIOR TO IMPLEMENTATION.

4. PROJECT COMPLETION TIMES – THE CONTRACTOR IS EXPECTED TO COMPLETE CRITICAL PORTIONS OF THE PROJECT WITHIN THE SPECIFIED TIMEFRAMES AND TO COMPLETE THE ENTIRE PROJECT ON TIME. LIQUIDATED DAMAGES, IF SPECIFIED, WILL BE ASSESSED SHOULD THE TIMEFRAME BE EXCEEDED.

5. CONSTRUCTION LIMITS – ALL CONTRACTOR VEHICLES SHALL REMAIN WITHIN THE DESIGNATED CONSTRUCTION LIMITS OR HAUL ROUTES (UNLESS OTHERWISE AUTHORIZED).

6. DIMENSIONS IDENTIFIED ON THE PLANS SHALL BE VERIFIED IN THE FIELD. IN GENERAL, SMALL-SCALE DRAWINGS WITH GREATER RESOLUTION (I.E. 1"=50') GOVERN OVER LARGER SCALE DRAWINGS OF LESS RESOLUTION (I.E. 1"=500'), WRITTEN NOTES GOVERN OVER GRAPHIC REPRESENTATION AND SPECIFICATIONS GOVERN OVER DRAWINGS. ANY DISCREPANCIES SHALL BE REPORTED TO THE ENGINEER FOR CLARIFICATION.

7. EXISTING TOPOGRAPHIC FIELD SURVEYS WERE PROVIDED BY SURVEYORS NAME AND DATE. THE CONTROL ON THIS PROJECT IS TIED TO THE NAD 83/91 HORIZONTAL DATUM AND NAVD 88 VERTICAL DATUM. SURVEY UNITS SHALL BE IN U.S. SURVEY FOOT. PROJECT BENCHMARKS ARE SHOWN ON THE GENERAL PROJECT LAYOUT.

8. THE CONTRACTOR SHALL PROVIDE AN ADEQUATE NUMBER OF WATER TRUCKS TO CONTROL DUST IN THE PROJECT WORK AREA, STAGING AREA, STORAGE AREAS, HAUL ROUTES AND THE WASTE SITE.

9. ALL THE PERMITS AND LICENSES REQUIRED FOR THE PROJECT WORK SHALL BE OBTAINED AT THE CONTRACTOR'S EXPENSE.

10. IN ACCORDANCE WITH THE SPECIFICATIONS, FEDERAL WAGE RATES SHALL BE POSTED OUTSIDE THE SITE FIELD OFFICE(S) IN A WEATHERPROOF ENCLOSURE. [FOR FEDERALLY FUNDED PROJECTS ONLY]

GENERAL AIRFIELD SAFETY DURING CONSTRUCTION

1. THE CONTRACTOR SHALL ACQUAINT SUPERVISORS AND EMPLOYEES WITH ACTIVITY AND OPERATIONS THAT ARE INHERENT TO THE AIRPORT AND SHALL CONDUCT CONSTRUCTION ACTIVITIES TO CONFORM TO ALL ROUTINE AND EMERGENCY AIR TRAFFIC REQUIREMENTS AND GUIDELINES FOR SAFETY SPECIFIED HEREIN.

2. THE CONTRACTOR AND HIS/HER SUBCONTRACTOR(S) SHALL PROTECT WORKERS, MAA AND AIRPORT TENANT EMPLOYEES, AND THE GENERAL PUBLIC. THE CONTRACTOR SHALL ALSO ENSURE THAT PROPERTY OR EQUIPMENT, UNRELATED TO WORK, WHICH BELONGS TO MAA OR AIRPORT TENANTS IS NOT DAMAGED DURING CONSTRUCTION.

3. THE CONTRACTOR SHALL NOT ALLOW EMPLOYEES, SUBCONTRACTORS, SUPPLIERS, OR ANY OTHER UNAUTHORIZED PERSON TO ENTER OR REMAIN IN ANY AIRPORT AREA WHICH WOULD BE HAZARDOUS TO PERSONS OR TO AIRCRAFT OPERATIONS.

4. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING ALL NECESSARY PROTECTIVE GEAR AND EQUIPMENT REQUIRED FOR THE PROTECTION OF THE CONTRACTOR'S PERSONNEL DURING CONSTRUCTION.

5. THE CONTRACTOR SHALL INSPECT ALL CONSTRUCTION AND STORAGE AREAS AS OFTEN AS NECESSARY AND PROMPTLY TAKE ALL STEPS NECESSARY TO PREVENT OR REMEDY ANY UNSAFE OR POTENTIALLY UNSAFE CONDITIONS OR ACTIVITIES DISCOVERED.

6. THE CONTRACTOR SHALL BE AWARE OF THE FOLLOWING TYPES OF SAFETY PROBLEMS AND/OR HAZARDS:

   a. UNMARKED UTILITY, NAVAID, WEATHER SERVICE, RUNWAY LIGHTING, OR OTHER POWER OR SIGNAL CABLES THAT COULD BE DAMAGED DURING CONSTRUCTION.

   b. OBJECTS, WHETHER OR NOT MARKED OR FLAGGED, OR ACTIVITIES ANYWHERE ON OR IN THE VICINITY OF THE AIRPORT WHICH COULD BE DISTRACTING, CONFUSING, OR ALARMING TO PILOTS DURING AIRCRAFT OPERATIONS.

   c. UNFLAGGED/UNLIGHTED LOW VISIBILITY ITEMS SUCH AS TALL CRANES, DRILLS, ETC. ANYWHERE IN THE VICINITY OF ACTIVE RUNWAYS OR IN ANY APPROACH OR DEPARTURE AREA. SUCH EQUIPMENT SHALL BE PARKED IN THE CONTRACTOR'S STAGING AREA AND THE BOOM(S) LOWERED TO THE GROUND WHEN NOT IN USE.

   d. MISLEADING OR MALFUNCTIONING LIGHTS OR UNLIGHTED/UNMARKED OBSTRUCTIONS IN THE APPROACH TO ANY ACTIVE RUNWAY.

   e. BIRD ATTRACTANTS SUCH AS EDIBLES (FOOD SCRAPS, ETC.), MISCELLANEOUS TRASH, OR PONDED WATER. FOOD SCRAPS AND MISCELLANEOUS TRASH SHALL BE SECURED BY THE CONTRACTOR AND DISPOSED OF USING PROPER SANITARY METHODS.

SITE ACCESS, CONTRACTOR STAGING, HAUL ROUTES, AND MATERIAL STORAGE

1. ACCESS TO THE SITE – THE CONTRACTOR'S ACCESS POINTS TO THE SITE SHALL BE AS SHOWN ON THE PROJECT SECURITY PLAN (CHANGE TO APPROPRIATE SHEET TITLE FOR PROJECTS WITHOUT A PROJECT SECURITY PLAN). THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL VEHICLES AND PERSONNEL WHO ENTER THE AIRPORT THROUGH THESE ACCESS POINTS. THE CONTRACTOR IS RESPONSIBLE FOR TRANSPORTING EMPLOYEES TO AND FROM THE JOB SITE IF SPACE IS NOT AVAILABLE ON SITE.

2. ALL OFF-SITE HAUL ROUTES SHALL BE SELECTED TO MINIMIZE DISTURBANCE TO THE PUBLIC. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO COORDINATE OFF-SITE HAUL ROUTES (STATE HIGHWAYS, COUNTY ROADS, OR CITY STREETS) WITH THE APPROPRIATE OWNER WHO HAS JURISDICTION OVER THE AFFECTED ROUTE. THE CONTRACTOR'S ON-AIRPORT HAUL ROUTES ARE INDICATED ON THE PROJECT SECURITY PLAN (CHANGE TO APPROPRIATE SHEET TITLE FOR PROJECTS WITHOUT A PROJECT SECURITY PLAN).

3. ON-SITE ROADS AND OTHER PAVEMENTS USED AS HAUL ROUTES SHALL BE MAINTAINED BY THE CONTRACTOR AND SHALL BE RESTORED AT THE CONTRACTOR'S EXPENSE TO THEIR ORIGINAL CONDITION UPON COMPLETION OF BEING USED AS A HAUL ROUTE, UNLESS OTHERWISE DIRECTED BY THE CONTRACT DOCUMENTS OR BY THE ENGINEER. THE BEFORE AND AFTER CONDITION OF ALL ON-SITE HAUL ROUTES (TEMPORARY OR PERMANENT) SHALL BE JOINTLY INSPECTED AND DETERMINED BY THE CONTRACTOR AND THE ENGINEER THROUGH THE USE OF DIGITAL PHOTOGRAPHY AND/OR VIDEO. THE CONTRACTOR MAY NEED TO COORDINATE HAUL ROUTE USAGE WITH OTHER CONTRACTORS WORKING ON THE AIRPORT.

4. FENCING, DRAINAGE, GRADING AND OTHER MISCELLANEOUS CONSTRUCTION REQUIRED TO CONSTRUCT OR RESTORE TEMPORARY OR PERMANENT HAUL ROUTES OR ACCESS POINTS ON THE AIRPORT WILL BE THE CONTRACTOR'S RESPONSIBILITY AND SHALL BE APPROVED BY THE ENGINEER PRIOR TO COMMENCING THE WORK.

5. ALL ON-SITE ACCESS ROADS TO AIRPORT FACILITIES SHALL REMAIN OPEN AND MAINTAINED AT ALL TIMES.

6. CONTRACTOR'S STAGING AREA – AN AREA WILL BE MADE AVAILABLE FOR CONTRACTOR'S MOBILIZATION AND STORAGE. THE CONTRACTOR'S STAGING AREA SHALL BE FREE OF DEBRIS. IF DIRECTED BY THE ENGINEER, THE CONTRACTOR WILL BE REQUIRED TO STAKE OUT AND FLAG THE STAGING AREA LIMITS. UPON COMPLETION OF THE PROJECT, THE STAGING AREA SHALL BE RESTORED TO ITS ORIGINAL CONDITION.

7. ALL MATERIALS AND EQUIPMENT (INCLUDING STOCKPILED MATERIAL) WHEN NOT IN USE SHALL BE PLACED IN APPROVED AREAS WHERE THEY WILL NOT CONSTITUTE A HAZARD TO AIRCRAFT OPERATIONS AND NOT PENETRATE CLEARANCE SURFACES SHOWN ON THE GENERAL CONSTRUCTION AND SAFETY NOTES.

   - THE FAR PART 77 APPROACH, PRIMARY, AND TRANSITIONAL SURFACES GOVERN STOCKPILES AND PARKED EQUIPMENT. UNDER NO CIRCUMSTANCES SHALL STOCKPILES, PARKED EQUIPMENT, OR OTHER CONSTRUCTION ITEMS PENETRATE THESE SURFACES ADJACENT TO AN ACTIVE RUNWAY.

   - EQUIPMENT SHALL BE PARKED AT THE CONTRACTOR'S STAGING AREA WHEN NOT IN USE. TALL EQUIPMENT SUCH AS CRANES SHALL BE LOWERED TO THE GROUND WHEN NOT IN USE. STOCKPILED MATERIAL SHALL BE CONSTRAINED IN A MANNER TO PREVENT MOVEMENT RESULTING FROM WIND CONDITIONS IN EXCESS OF 10 KNOTS.

PROJECT COORDINATION

1. ALL COORDINATION BETWEEN THE CONTRACTOR AND MAA OFFICES SHALL BE DONE THROUGH THE ENGINEER EXCEPT AS NOTED UNDER EMERGENCY COORDINATION

2. THE CONTRACTOR SHALL PROVIDE THE ENGINEER WITH A CURRENT LIST OF ALL EMPLOYEES WORKING ON THE AIRPORT INCLUDING SUBCONTRACTORS. THE LIST SHALL BE MAINTAINED CURRENT BY THE CONTRACTOR.

3. CONTRACTOR COORDINATION – CONSTRUCTION AND MAINTENANCE OPERATIONS BY OTHERS MAY OCCUR CONCURRENTLY AND IN THE VICINITY OF CONSTRUCTION ASSOCIATED WITH THIS PROJECT. THE CONTRACTOR SHALL COORDINATE OPERATIONS AND COOPERATE WITH MAINTENANCE CREWS AND OTHER CONTRACTORS WORKING ON THE AIRPORT.

4. COORDINATION WITH BWI AIRPORT FIRE RESCUE SERVICE (VIA THE ENGINEER):

   a. THE CONTRACTOR SHALL COMPLY WITH MARYLAND FIRE LAWS, NFPA 1 – UNIFORM FIRE CODE, ; CHAPTER 16, 'SAFETY DURING CONSTRUCTION AND DEMOLITION OPERATIONS' (CURRENT EDITIONS) AND CHAPTER 21, 'AIRPORTS'.

   b. OPEN FLAME, WELDING OR TORCH CUTTING OPERATIONS ARE PROHIBITED WITHOUT FIRST OBTAINING A BWI AIRPORT WELDING AND BURNING PERMIT. THE PERMIT IS AVAILABLE AT THE BWI FIRE MARSHAL'S OFFICE, 991 CORPORATE BLVD, LINTHICUM, MD 21090. THE PERMIT MAY BE REQUESTED FOR A PERIOD NOT TO EXCEED THIRTY DAYS. PRIOR TO COMMENCING WORK, ANY PERSON CONDUCTING OPEN FLAME/HOT WORK OPERATIONS SHALL BE FAMILIAR WITH THE LATEST EDITION OF NFPA 51B STANDARD FOR FIRE PREVENTION DURING WELDING, CUTTING, AND OTHER HOT WORK. ADEQUATE FIRE AND SAFETY PRECAUTIONS MUST BE TAKEN AND THE PROCEDURE APPROVED PRIOR TO COMMENCEMENT OF WORK. A FIRE WATCH IS REQUIRED.

   c. A HYDRANT USE PERMIT IS REQUIRED PRIOR TO CONNECTION TO ANY AIRPORT FIRE HYDRANT.

5. PORTABLE FLOODLIGHTING – USE OF PORTABLE FLOODLIGHTING SHALL BE COORDINATED WITH AIRPORT OPERATIONS AND THE ENGINEER TO ENSURE THAT THE LIGHTING DOES NOT COMPROMISE THE CONTROL TOWER'S VISIBILITY OR THAT IT IS NOT POSITIONED SUCH THAT IT FACES INTO ANY RUNWAY APPROACH WHERE IT MIGHT CAUSE CONFUSION TO PILOTS. THE CONTRACTOR SHALL PROVIDE PORTABLE FLOODLIGHTING AS REQUIRED FOR NIGHT CONSTRUCTION OPERATIONS.

6. FLAGMEN AND VEHICLE ESCORTS – THE CONTRACTOR SHALL FURNISH FLAGMEN AS NECESSARY TO CONTROL CONSTRUCTION TRAFFIC UNLESS OTHERWISE DIRECTED BY THE ENGINEER OR AIRPORT OPERATIONS.

7. UTILITIES:

   a. UNDERGROUND UTILITIES – LOCATIONS OF KNOWN UNDERGROUND UTILITIES SHOWN ON THE PLANS ARE APPROXIMATE. ALL UTILITY LOCATIONS SHALL BE FIELD VERIFIED BY THE CONTRACTOR PRIOR TO COMMENCING CONSTRUCTION. THE CONTRACTOR IS REQUIRED TO COMPLETE A DIGGING AUTHORIZATION FORM, AS SUPPLIED BY THE ENGINEER, PRIOR TO INITIATION OF EXCAVATION OPERATIONS.

   b. REPAIR OF UTILITIES DAMAGED DURING CONSTRUCTION MUST BE STARTED IMMEDIATELY AND CONTINUE UNTIL COMPLETED.

      i. ALL SUCH REPAIRS SHALL BE IN ACCORDANCE WITH THE CONTRACT SPECIFICATIONS OR AS DIRECTED BY THE ENGINEER AND SHALL BE AT THE CONTRACTOR'S EXPENSE.

      ii. IF FAA CABLES ARE DAMAGED, REPAIRS SHALL BE DONE IN ACCORDANCE WITH FAA REQUIREMENTS AND IN THE PRESENCE OF AN FAA REPRESENTATIVE. THE FAA MAY ELECT TO HAVE THE REPAIR PERFORMED BY OTHERS IN WHICH CASE THE CONTRACTOR SHALL BE RESPONSIBLE FOR PAYING THE INCURRED COSTS OF REPAIRS.

   c. UTILITIES NOTIFICATION – AT LEAST TWO WORKING DAYS PRIOR TO COMMENCING CONSTRUCTION OPERATIONS IN AN AREA WHICH MAY INVOLVE UNDERGROUND UTILITIES, THE CONTRACTOR SHALL NOTIFY THE ENGINEER AND THE OWNER OF EACH UNDERGROUND UTILITY AFFECTED.

      THE FOLLOWING LIST INCLUDES POSSIBLE UTILITIES WITHIN THE CONSTRUCTION LIMITS. ADDITIONAL UTILITIES NOT LISTED BELOW MAY ALSO BE ON-SITE.

      UTILITY OWNERSHIP:

MISS UTILITY CENTER	1-800-257-7777
BGE	(410) 685-0123 (410) 234-5000 1-800-685-0123
VERIZON REPAIR BURIED CABLE	(410) 954-2222 1-800-275-2355
FAA AIRWAY FACILITIES SSC	(410) 859-7252
COMCAST	(410) 931-4600 (410) 729-8000
MILLENIUM DIGITAL MEDIA	(410) 987-9300
ANNE ARUNDEL COUNTY UTILITY OPERATIONS BUREAU (WATER SUPPLY FROM AIRPORT PERIMETER TO METER)	
EMERGENCIES	(410) 222-8400
GENERAL INFORMATION	(410) 222-7520

EMERGENCY CONTACT INFORMATION

1. EXCEPT FOR EMERGENCIES, ALL CONTACT WITH AIRPORT PERSONNEL SHALL BE MADE THROUGH THE ENGINEER. FOR EMERGENCIES INVOLVING SAFETY (INJURIES, FIRES, SECURITY BREACHES, ETC.) THE CONTRACTOR SHALL MAKE DIRECT CONTACT WITH AIRPORT OPERATIONS FOLLOWED BY NOTIFICATION TO THE ENGINEER AS SOON AS POSSIBLE.
2. THE PROJECT SUPERVISORS SHALL HAVE THE FOLLOWING TELEPHONE NUMBERS WITH THEM AT ALL TIMES:

i.	MAA FIRE MARSHALL	(410) 859-7815/7511
ii.	BWI FIRE/RESCUE/MEDICAL EMERGENCY	(410) 859-7222
iii.	BWI POLICE EMERGENCY	(410) 859-7040
iv.	BWI DUTY AIRPORT OPERATIONS MGR	(410) 859-7018
v.	CONSOLIDATED DISPATCH CENTER	(410) 859-7117
vi.	BWI OFFICE OF AIRPORT SECURITY	(410) 859-7162
vii.	FAA AIR TRAFFIC CONTROL TOWER	(410) 859-7636
viii.	MDE OIL CONTROL PROGRAM (COMPLIANCE AND REMEDIATION)	(410) 537-3442

3. THE CONTRACTOR SHALL PROVIDE THE PHONE NUMBERS OF THREE PERSONNEL, INCLUDING THE PROJECT SUPERINTENDENT, WHO MAY BE CONTACTED IN AN EMERGENCY.
4. THE CONTRACTOR SHALL PROVIDE THE NAME AND PHONE NUMBERS OF THE PROJECT SECURITY COORDINATOR AND THE DESIGNATED ALTERNATE WHO SHALL BE ON CALL 24 HOURS PER DAY FOR CONTACT REGARDING SECURITY ISSUES (REMOVE NOTE IF NOT APPLICABLE).

RELATED DOCUMENTS

1. FAA ADVISORY CIRCULARS (AC's), ORDERS AND FEDERAL AVIATION REGULATIONS (FAR's) – THE FOLLOWING PUBLICATIONS CONTAIN DEFINITIONS OR DESCRIPTIONS OF CRITICAL AIRPORT OPERATING AREAS. COPIES OF THESE PUBLICATIONS ARE AVAILABLE THROUGH THE FAA AT WWW.FAA.GOV AND CAN BE REVIEWED AT THE OFFICES OF THE MAA.

   THE ITEMS OUTLINED BELOW PERTAIN TO AIRFIELD SAFETY REQUIREMENTS AND ARE REFERENCED THROUGHOUT THE CONTRACT DOCUMENTS.

   a. AC 150/5370-2, 'OPERATIONAL SAFETY ON AIRPORTS DURING CONSTRUCTION', CURRENT EDITION, SETS FORTH GUIDELINES TO ASSIST AIRPORT OPERATORS IN COMPLYING WITH FAR PART 139, "CERTIFICATION AND OPERATION: LAND AIRPORTS SERVING CERTAIN AIR CARRIERS" AND WITH THE REQUIREMENTS OF FEDERALLY FUNDED AIRPORT CONSTRUCTION PROJECTS.

   b. FAR PART 77 'OBJECTS AFFECTING NAVIGABLE AIRSPACE', CURRENT EDITION:

      i. ESTABLISHES STANDARDS FOR DETERMINING OBSTRUCTIONS TO NAVIGABLE AIRSPACE. IMAGINARY SURFACES ARE DEFINED IN THE PUBLICATION AND ARE SHOWN ON THIS SHEET.

      ii. ESTABLISHES REQUIREMENTS FOR FILING NOTICE TO THE FAA FOR CERTAIN PROPOSED CONSTRUCTION OR ALTERATION PROPOSALS. COMPLETION OF THE 'NOTICE OF PROPOSED CONSTRUCTION OR ALTERATION' FORM (FAA FORM 7460-1) IS DISCUSSED IN AC 70/7460-1 'OBSTRUCTION MARKING AND LIGHTING', CURRENT EDITION.

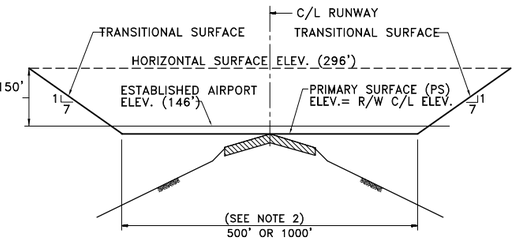
   c. AC 70/7460-2, 'PROPOSED CONSTRUCTION OF OBJECTS THAT MAY AFFECT THE NAVIGABLE AIRSPACE', CURRENT EDITION, PROVIDES INFORMATION TO PERSONS PROPOSING TO ERECT OR ALTER AN OBJECT THAT MAY AFFECT NAVIGABLE AIRSPACE. THE AC EXPLAINS THE REQUIREMENT TO NOTIFY THE FAA BEFORE CONSTRUCTION BEGINS AND THE FAA'S RESPONSIBILITY TO RESPOND TO THESE NOTICES.

   d. AC 150/5300-13, 'AIRPORT DESIGN', CURRENT EDITION, ESTABLISHES DESIGN, OPERATIONAL, AND MAINTENANCE STANDARDS FOR AIRPORTS. STANDARD TERMS USED IN THE CONTRACT PLANS AND SPECIFICATIONS ARE DEFINED BELOW.

      i. OBSTACLE FREE ZONE (OFZ) – A VOLUME OF SPACE WHICH IS FREE OF ALL FIXED OBJECTS AND CLEAR OF VEHICLES IN THE PROXIMITY OF AN AIRPLANE CONDUCTING AN APPROACH, MISSED APPROACH, LANDING, TAKEOFF, OR DEPARTURE. AN OFZ TYPICAL SECTION IS SHOWN ON THIS SHEET.

      ii. OBJECT FREE AREA (OFA) – A TWO DIMENSIONAL GROUND AREA SURROUNDING RUNWAYS, TAXIWAYS, AND TAXILANES WHICH IS CLEAR OF OBJECTS EXCEPT FOR OBJECTS WHOSE LOCATION IS FIXED BY FUNCTION.

      iii. SAFETY AREA – THE SURFACE ADJACENT TO RUNWAYS, TAXIWAYS, AND TAXILANES OVER WHICH AIRCRAFT SHOULD, IN DRY WEATHER, BE ABLE TO CROSS AT NORMAL SPEEDS WITHOUT INCURRING ANY SIGNIFICANT DAMAGE. A SAFETY AREA IS GRADED, DRAINED AND COMPACTED. IT IS FREE OF ANY HOLES, TRENCHES, BUMPS OR OTHER SIGNIFICANT SURFACE VARIATIONS OR OBJECTS OTHER THAN THOSE WHICH MUST BE THERE BECAUSE OF THEIR ESSENTIAL AERONAUTICAL FUNCTION. THE SAFETY AREA REQUIRES THE CAPABILITY OF SUPPORTING MAINTENANCE VEHICLES AND AIRCRAFT RESCUE AND FIRE FIGHTING VEHICLES UNDER NORMAL (DRY) CONDITIONS.

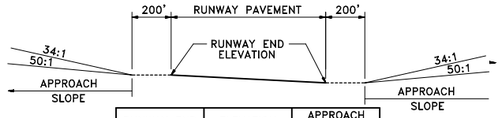


NOTES:

1. SEE "CONTRACTOR'S SAFETY REQUIREMENTS DURING CONSTRUCTION" AS CONTAINED IN THE PLANS REGARDING RESTRICTED AREAS IN THE VICINITY OF ACTIVE RUNWAYS AND TAXIWAYS.
2. IMAGINARY SURFACE REQUIREMENTS FOR EXISTING ACTIVE RUNWAYS (R/W) ARE SIMILAR EXCEPT PRIMARY SURFACES (PS) DIMENSIONS VARY:

R/W 4-22	– 500' PS (250' LT. & RT. OF C/L)
R/W 10-28	– 1000' PS (500' LT. & RT. OF C/L)
R/W 15R-33L	– 1000' PS (500' LT. & RT. OF C/L)
R/W 15L-33R	– 1000' PS (500' LT. & RT. OF C/L)

TYPICAL SECTION
F A R PART 77 IMAGINARY SURFACES
NOT TO SCALE



RUNWAY END	ELEVATION	APPROACH SLOPE
10	139.0	50:1
28	126.2	50:1
15R	138.6	50:1
33L	129.2	50:1
4	146.0	34:1
22	137.7	34:1
15L	141.5	50:1
33R	114.1	50:1

TYPICAL APPROACH PROFILE
F A R PART 77 IMAGINARY SURFACES
NOT TO SCALE

CLIENT LOGO HERE.

DESIGNED:	– – –
DRAWN:	– – –
CHECKED:	– – –
APPROVED:	– – –

REVISION NO.	REVISION DATE	DESCRIPTIONS

BALTIMORE/WASHINGTON INTERNATIONAL Thurgood Marshall AIRPORT

MARYLAND DEPARTMENT OF TRANSPORTATION
MARYLAND AVIATION ADMINISTRATION
OFFICE OF DESIGN AND CONSTRUCTION

PROJECT TITLE: –
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SHEET TITLE: GENERAL CONSTRUCTION AND SAFETY NOTES – NON SECURE AREAS

SCALE: AS SHOWN

DATE: –

CONTRACT NO.:

SHEET NO.:

GENERAL CONSTRUCTION NOTES

1. THIS PROJECT IS FOR WORK AT MARTIN STATE AIRPORT (MTN), HEREAFTER REFERRED TO AS 'THE AIRPORT'.

2. THIS PROJECT SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE CONTRACT PLANS AND SPECIFICATIONS AND ANY RULES, REGULATIONS, STANDARDS, OR SPECIFICATIONS REFERENCED THEREIN. THE PROJECT IS SUBJECT TO INSPECTION BY REPRESENTATIVES OF THE MARYLAND AVIATION ADMINISTRATION (MAA), THE FEDERAL AVIATION ADMINISTRATION (FAA), AND OTHER GOVERNING AGENCIES.

3. PROJECT PHASING – THE PROJECT IS TO BE COMPLETED IN CLOSE CONFORMANCE WITH THE PHASING PLANS AND NOTES AS CONTAINED IN THE CONTRACT DOCUMENTS. UPON COMPLETION OF ANY STAGE OR PHASE OF WORK, THE ENGINEER WILL ARRANGE A PHYSICAL INSPECTION OF THE AREA WITH AIRPORT OPERATIONS PERSONNEL PRIOR TO THE OPENING OF ANY TAXIWAY, RUNWAY, RAMP AREA OR AIRPORT ROADWAY THAT HAS BEEN CLOSED FOR WORK OR USED FOR A CROSSING POINT OR HAUL ROUTE BY THE CONTRACTOR.

4. PROJECT COMPLETION TIMES – THE CONTRACTOR IS EXPECTED TO COMPLETE CRITICAL PORTIONS OF THE PROJECT WITHIN THE SPECIFIED TIMEFRAMES AND TO COMPLETE THE ENTIRE PROJECT ON TIME. LIQUIDATED DAMAGES, IF SPECIFIED, WILL BE ASSESSED SHOULD THE TIMEFRAME BE EXCEEDED.

5. AIRPORT OPERATIONS – THE AIRPORT WILL BE IN OPERATION DURING THE CONSTRUCTION OF THIS PROJECT. RUNWAY 15-33 WILL OPERATE AS A 3,000 FOOT RUNWAY DAWN TO DUSK DAILY. COORDINATION OF WORK WITH AIRPORT OPERATIONS IS MANDATORY TO MINIMIZE IMPACTS TO AIRPORT USERS.

6. CONTRACTOR COORDINATION – CONSTRUCTION AND MAINTENANCE OPERATIONS BY OTHERS MAY OCCUR CONCURRENTLY AND IN THE VICINITY OF CONSTRUCTION ASSOCIATED WITH THIS PROJECT. THE CONTRACTOR SHALL COORDINATE OPERATIONS AND COOPERATE WITH MAINTENANCE CREWS AND OTHER CONTRACTORS WORKING AT THE AIRPORT. CONTRACTOR COORDINATION WITH APPROPRIATE GOVERNMENT AND UTILITY AGENCIES IS ALSO REQUIRED PRIOR TO AND DURING CONSTRUCTION.

7. FACILITY CLOSURES – PRIOR TO CONSTRUCTION, THE CONTRACTOR SHALL ARRANGE TO MEET WITH AIRPORT OPERATIONS, THE FAA, AND THE ENGINEER TO EVALUATE AND ESTABLISH ANY RUNWAY AND TAXIWAY CLOSURE TIMES AND DURATIONS. TO THE EXTENT POSSIBLE, THE CONTRACTOR SHALL COORDINATE CONSTRUCTION TO COINCIDE WITH RUNWAY AND TAXIWAY CLOSURES ALREADY SCHEDULED FOR CONSTRUCTION AND MAINTENANCE OPERATIONS BY OTHERS.

8. WASTE MATERIALS (i.e. TREES, STUMPS, EXCESS SOIL, ETC.) SHALL BE DISPOSED OF OFF AIRPORT PROPERTY. TRASH (i.e. CUPS, CANS, BOTTLES, PAPER, ETC.) SHALL BE DISPOSED OF THROUGH PROPER SANITARY METHODS.

9. EXISTING AIRFIELD LIGHTING SYSTEMS – INTERRUPTION OF EXISTING AIRFIELD LIGHTING SYSTEMS NOT INCLUDED IN THIS PROJECT SHALL NOT BE PERMITTED. ALL AIRFIELD LIGHTING CIRCUITS AFFECTED BY THIS PROJECT SHALL BE TEMPORARILY MAINTAINED BY THE CONTRACTOR DURING OPERATIONAL PERIODS.

10. PORTABLE FLOODLIGHTING – THE CONTRACTOR SHALL PROVIDE PORTABLE FLOODLIGHTING AS REQUIRED FOR NIGHT CONSTRUCTION OPERATIONS. THE CONTRACTOR SHALL PROVIDE SUFFICIENT UNITS SO THAT ALL WORK AREAS ARE ILLUMINATED TO A LEVEL OF FIVE (5) HORIZONTAL FOOT CANDLES. THE LIGHTING LEVELS SHALL BE CALCULATED AND MEASURED IN ACCORDANCE WITH THE CURRENT STANDARDS OF THE ILLUMINATION ENGINEERING SOCIETY. THE CONTRACTOR SHALL COORDINATE THE USE OF FLOODLIGHTING WITH THE CONTROL TOWER TO ENSURE THAT THE LIGHTING DOES NOT COMPROMISE THE CONTROL TOWER'S VISIBILITY OR CAUSE CONFUSION TO PILOTS.

11. THE CONTRACTOR SHALL PROVIDE TIMBER AND BUCKET TYPE CONSTRUCTION BARRICADES WITH FLASHING RED LIGHTS AS SHOWN ON THE DRAWINGS TO DELINEATE THE WORK AREAS WHEN CLOSED TO AIRPORT TRAFFIC. OPEN TRENCHES, EXCAVATIONS AND STOCKPILE MATERIAL LOCATED IN THE AOA SHALL BE PROMINENTLY MARKED WITH ORANGE FLAGS AND LIGHTED BY APPROVED LIGHT UNITS DURING HOURS OF LIMITED VISIBILITY AND DARKNESS.

12. THE CONTRACTOR SHALL PROVIDE AN ADEQUATE NUMBER OF WATER TRUCKS TO CONTROL DUST IN THE PROJECT WORK AREA, STAGING/STORAGE AREAS, HAUL ROUTES AND THE WASTE SITE.

13. ALL THE PERMITS AND LICENSES REQUIRED FOR THE PROJECT WORK SHALL BE OBTAINED AT THE CONTRACTOR'S EXPENSE.

14. EXISTING TOPOGRAPHIC FIELD SURVEYS AND UTILITY SURVEYS FOR THIS PROJECT WERE PERFORMED BY SURVEYOR NAME AND DATE PERFORMED. THE CONTROL ON THIS PROJECT IS TIED TO THE NAD 83/91 HORIZONTAL DATUM AND NAVD 88 VERTICAL DATUM.

15. IN ACCORDANCE WITH THE SPECIFICATIONS, FEDERAL WAGE RATES SHALL BE POSTED OUTSIDE THE SITE FIELD OFFICE(S) IN A WEATHERPROOF ENCLOSURE. (FOR FEDERALLY FUNDED PROJECTS ONLY.)

GENERAL AIRFIELD SAFETY DURING CONSTRUCTION

1. THE CONTRACTOR SHALL ACQUAINT SUPERVISORS AND EMPLOYEES WITH ACTIVITY AND OPERATIONS THAT ARE INHERENT TO THE AIRPORT AND SHALL CONDUCT CONSTRUCTION ACTIVITIES TO CONFORM TO ALL ROUTINE AND EMERGENCY AIR TRAFFIC REQUIREMENTS AND GUIDELINES FOR SAFETY SPECIFIED HEREIN.

2. THE CONTRACTOR AND HIS/HER SUBCONTRACTOR(S) SHALL PROTECT WORKERS, MAA AND AIRPORT TENANT EMPLOYEES, AND THE GENERAL PUBLIC. THE CONTRACTOR SHALL ALSO ENSURE THAT PROPERTY OR EQUIPMENT, UNRELATED TO WORK, WHICH BELONGS TO MAA OR AIRPORT TENANTS IS NOT DAMAGED DURING CONSTRUCTION.

3. THE CONTRACTOR SHALL NOT ALLOW EMPLOYEES, SUBCONTRACTORS, SUPPLIERS, OR ANY OTHER UNAUTHORIZED PERSON TO ENTER OR REMAIN IN ANY AIRPORT AREA WHICH WOULD BE HAZARDOUS TO PERSONS OR TO AIRCRAFT OPERATIONS.

4. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING ALL NECESSARY PROTECTIVE GEAR AND EQUIPMENT REQUIRED FOR THE PROTECTION OF THE CONTRACTOR'S PERSONNEL DURING CONSTRUCTION.

5. DURING PERFORMANCE OF THIS CONTRACT, THE AIRPORT RUNWAYS, TAXIWAYS, AND AIRCRAFT PARKING APRONS SHALL REMAIN IN USE BY AIRCRAFT TO THE MAXIMUM EXTENT POSSIBLE. ALL AIRCRAFT TRAFFIC ON THESE SURFACES SHALL HAVE PRIORITY OVER CONTRACTOR'S TRAFFIC. WHILE USE OF AREAS NEAR THE CONTRACTOR'S WORK MAY BE CONTROLLED TO MINIMIZE DISTURBANCE TO THE CONTRACTOR'S OPERATION, THE OWNER RESERVES THE RIGHT TO ORDER THE CONTRACTOR, AT ANY TIME, TO VACATE ANY AREA NECESSARY TO MAINTAIN SAFE AIRCRAFT OPERATIONS.

6. ALL WORK TO BE PERFORMED WITHIN CERTAIN LIMITS OF AN ACTIVE RUNWAY, TAXIWAY, OR APRON UNDER OPERATIONAL CONDITIONS SHALL BE PERFORMED WHEN THE RUNWAY, TAXIWAY OR APRON IS NOT IN USE. SUCH WORK SHALL ONLY BE ACCOMPLISHED WITH PRIOR PERMISSION FROM THE ENGINEER. REQUESTS FOR RUNWAY CLOSURES SHALL BE MADE AT LEAST 7 DAYS IN ADVANCE. REQUESTS FOR TAXIWAY OR APRON CLOSURES SHALL BE MADE AT LEAST 96 HOURS IN ADVANCE.

7. THE CONTRACTOR SHALL INSPECT ALL CONSTRUCTION AND STORAGE AREAS AS OFTEN AS NECESSARY AND PROMPTLY TAKE ALL STEPS NECESSARY TO PREVENT OR REMEDY ANY UNSAFE OR POTENTIALLY UNSAFE CONDITIONS OR ACTIVITIES DISCOVERED.

8. THE CONTRACTOR SHALL BE AWARE OF THE FOLLOWING TYPES OF SAFETY PROBLEMS AND/OR HAZARDS:

   a. TRENCHES, HOLES, OR EXCAVATION ON OR ADJACENT TO ANY OPEN RUNWAY OR IN SAFETY AREAS.

   b. PAVEMENT DROP-OFFS OR PAVEMENT TURF-LIPS GREATER THAN 1½ INCHES WHETHER PERMANENT OR TEMPORARY.

   c. UNMARKED/UNLIGHTED HOLES OR EXCAVATION IN ANY APRON, OPEN TAXIWAY, OPEN TAXILANE, OR RELATED SAFETY AREA.

   d. MOUNDS OR PILES OF EARTH, CONSTRUCTION MATERIALS, TEMPORARY STRUCTURES, OR OTHER OBJECTS IN THE VICINITY OF ANY OPEN RUNWAY, TAXIWAY, TAXILANE, OR IN A RELATED SAFETY AREA, APPROACH, OR DEPARTURE AREA.

   e. VEHICLES OR EQUIPMENT, WHETHER OPERATING OR IDLE, ON ANY OPEN RUNWAY, TAXIWAY, TAXILANE, OR IN ANY RELATED SAFETY AREA, APPROACH, OR DEPARTURE AREA.

   f. VEHICLES, EQUIPMENT, EXCAVATION, STOCKPILES, OR OTHER MATERIALS WHICH COULD DEGRADE OR OTHERWISE INTERFERE WITH ELECTRONIC SIGNALS FROM RADIOS OR ELECTRONIC NAVIGATIONAL AIDS (NAVAIDS).

   g. UNMARKED UTILITY, NAVAID, WEATHER SERVICE, RUNWAY LIGHTING, OR OTHER POWER OR SIGNAL CABLES THAT COULD BE DAMAGED DURING CONSTRUCTION.

   h. OBJECTS, WHETHER OR NOT MARKED OR FLAGGED, OR ACTIVITIES ANYWHERE ON OR IN THE VICINITY OF THE AIRPORT WHICH COULD BE DISTRACTING, CONFUSING, OR ALARMING TO PILOTS DURING AIRCRAFT OPERATIONS.

   i. UNFLAGGED/UNLIGHTED LOW VISIBILITY ITEMS SUCH AS TALL CRANES, DRILLS, ETC. ANYWHERE IN THE VICINITY OF ACTIVE RUNWAYS OR IN ANY APPROACH OR DEPARTURE AREA. SUCH EQUIPMENT SHALL BE PARKED IN THE CONTRACTOR'S STAGING AREA AND THE BOOM(S) LOWERED TO THE GROUND WHEN NOT IN USE.

   j. MISLEADING OR MALFUNCTIONING LIGHTS OR UNLIGHTED/UNMARKED OBSTRUCTIONS IN THE APPROACH TO ANY ACTIVE RUNWAY.

   k. INADEQUATE APPROACH OR DEPARTURE SURFACES (THESE SURFACES ARE NEEDED TO ASSURE ADEQUATE LANDING OR TAKEOFF CLEARANCE OVER OBSTRUCTIONS, INCLUDING THE CONTRACTOR'S WORK AND STORAGE AREAS).

   l. MARKING AND LIGHTING OF RUNWAYS, TAXIWAYS OR TAXILANES THAT COULD BE CONFUSING OR MISLEADING TO PILOTS, INCLUDING IMPROPERLY MARKED DISPLACED OR RELOCATED THRESHOLDS.

   m. INADEQUATE OR IMPROPER METHODS OF MARKING, BARRICADING, AND LIGHTING OF TEMPORARILY CLOSED PORTIONS OF THE AIRPORT AOA.

   n. WATER, SNOW, DIRT, DEBRIS, OR OTHER TRANSIENT ACCUMULATION WHICH TEMPORARILY OBSCURES PAVEMENT MARKINGS OR PAVEMENT EDGES, OR DIMINISHES THE VISIBILITY OF RUNWAY OR TAXIWAY LIGHTING.

   o. BIRD ATTRACTANTS SUCH AS EDIBLES (FOOD SCRAPS, ETC.), MISCELLANEOUS TRASH, OR PONDED WATER. FOOD SCRAPS AND MISCELLANEOUS TRASH SHALL BE SECURED BY THE CONTRACTOR AND DISPOSED OF USING PROPER SANITARY METHODS.

   p. FOREIGN OBJECTS DEBRIS:

   i. DEBRIS, WASTE, LOOSE MATERIAL (INCLUDING DUST AND DIRT), TRASH OR OTHER MATERIALS WHETHER ON RUNWAYS, TAXIWAYS, APRONS, OR IN RELATED SAFETY AREAS IS CONSIDERED FOREIGN OBJECT DEBRIS AND PRESENTS THE POTENTIAL FOR DAMAGE TO AIRCRAFT. SUCH MATERIAL SHALL NOT BE ALLOWED ON ANY AIRCRAFT MOVEMENT AREAS (REGARDLESS OF WHETHER THE AREA IS OPEN OR CLOSED) OR ADJACENT GRASSED AREAS. ANY DEBRIS (WHETHER CAUSED BY THE CONTRACTOR OR NOT) OBSERVED TO BE WITHIN THESE AREAS SHALL BE REMOVED IMMEDIATELY AND CONTINUOUSLY BY THE CONTRACTOR.

   ii. THE CONTRACTOR SHALL BE REQUIRED TO HAVE A VACUUM SWEEPER WITH PLASTIC BRUSHES (NOT STEEL) AND OPERATOR ON SITE AND READY AT ALL TIMES DURING CONSTRUCTION ACTIVITY.

   iii. WHERE TRAVEL ON OR ACROSS RUNWAYS, RAMP AREAS, TAXIWAYS, OR AIRCRAFT APRONS IS REQUIRED, THE CONTRACTOR SHALL PROVIDE ADEQUATE PERSONNEL AND EQUIPMENT TO KEEP SUCH SURFACES CLEAR OF DEBRIS.

   iv. ALL MATERIALS THAT COULD BLOW ACROSS ANY PAVEMENTS SHALL BE SECURED BY THE CONTRACTOR AND DISPOSED OF USING PROPER SANITARY METHODS.

   q. INADEQUATE BARRICADING OR OTHER MARKING WHICH IS PLACED TO SEPARATE CONSTRUCTION OR MAINTENANCE AREAS FROM OPEN AIRCRAFT OPERATING AREAS.

   r. FAILURE TO CONTROL UNAUTHORIZED VEHICLE AND HUMAN ACCESS THROUGH ACTIVE AIRCRAFT OPERATING AREAS.

   s. FAILURE TO MAINTAIN RADIO COMMUNICATION BETWEEN CONSTRUCTION AND MAINTENANCE VEHICLES AND ATCT.

   t. CONSTRUCTION AND MAINTENANCE ACTIVITIES OR MATERIALS WHICH COULD HAMPER THE RESPONSE OF AIRCRAFT RESCUE AND FIRE FIGHTING EQUIPMENT FROM REACHING AIRCRAFT, ALL OR ANY PART OF THE RUNWAY/TAXIWAY SYSTEM, RUNWAY APPROACH AND DEPARTURE AREAS, AND AIRCRAFT PARKING LOCATIONS.

9. THE CONTRACTOR SHALL CONDUCT ACTIVITIES SO AS NOT TO VIOLATE ANY SAFETY STANDARDS CONTAINED HEREIN. THE CONTRACTOR SHALL INSPECT ALL CONSTRUCTION AND STORAGE AREAS AS OFTEN AS NECESSARY AND PROMPTLY TAKE ALL STEPS NECESSARY TO PREVENT OR REMEDY ANY UNSAFE OR POTENTIALLY UNSAFE CONDITIONS OR ACTIVITIES DISCOVERED.

10. AT LEAST 48 HOURS BEFORE ACTUAL COMMENCEMENT OF CONSTRUCTION ACTIVITY, THE CONTRACTOR SHALL NOTIFY MAA, IN WRITING, INDICATING THE PROPOSED TIME, DATE, AND AREA OF WHICH COMMENCEMENT IS TO OCCUR. UPON COMPLETION OF WORK AND RETURN OF ALL RELATED AREAS TO STANDARD CONDITIONS, THE CONTRACTOR SHALL AGAIN NOTIFY MAA, IN WRITING, AND DESCRIBE THE AREA THAT IS COMPLETE AND AVAILABLE FOR NORMAL AIRPORT OPERATIONS. MAA REQUIRES THIS INFORMATION SO THEY MAY ISSUE APPROPRIATE NOTICE TO AIRMEN (NOTAM) CONCERNING CONSTRUCTION ACTIVITY ON THE AIRFIELD.

11. MOTORIZED VEHICLES – THIS PROJECT INCLUDES WORK WITHIN THE ACTIVE AIRCRAFT OPERATIONS AREA (AOA) (i.e. THE SECURE PORTION OF THE AIRPORT). ALL PERMITTED VEHICLES SHALL DISPLAY IN FULL VIEW ABOVE THE VEHICLE A 3 FOOT BY 3 FOOT OR LARGER, ORANGE AND WHITE CHECKERBOARD, PLASTIC FLAG. EACH CHECKERBOARD COLOR SHALL BE 1 FOOT SQUARE. ANY VEHICLE OPERATING IN THE AOA DURING THE HOURS OF DARKNESS SHOULD BE EQUIPPED WITH A FLASHING AMBER (YELLOW) DOME-TYPE LIGHT, MOUNTED ON TOP OF THE VEHICLE AND OF SUCH INTENSITY TO CONFORM TO LOCAL CODES FOR MAINTENANCE AND EMERGENCY VEHICLES. DARKNESS SHALL BE DEFINED AS ONE HOUR BEFORE OFFICIAL SUNSET UNTIL ONE HOUR AFTER SUNRISE. ALL VEHICLES OPERATING WITHIN THE AIRFIELD BOUNDARY SHALL BE IDENTIFIED WITH A SIGN ON EACH SIDE OF THE VEHICLE BEARING THE CONTRACTOR'S NAME WITH A 12 INCH MINIMUM LETTER HEIGHT.

12. RADIO COMMUNICATIONS – RADIO COMMUNICATIONS ARE REQUIRED BETWEEN THE CONTRACTOR'S REPRESENTATIVE AND THE AIR TRAFFIC CONTROL TOWER (ATCT). RADIO CONTACT IS REQUIRED AT ALL TIMES WHILE THE CONTRACTOR HAS PERSONNEL AND EQUIPMENT ON THE PROJECT SITE AND WHILE THEY ARE IN AN ACTIVE AIR OPERATIONS AREA (AOA). RADIOS SHALL BE FURNISHED BY THE CONTRACTOR AND SHALL BE CAPABLE OF TRANSMITTING AND RECEIVING AT A GROUND CONTROL FREQUENCY OF 121.8 MHZ. THIS FREQUENCY IS TO BE UTILIZED WHEN CROSSING ACTIVE FACILITIES. SUFFICIENT RADIOS SHALL BE ON SITE AND OPERATING AT ALL TIMES SO THAT INSTRUCTIONS OR COMMUNICATIONS MAY BE DISPATCHED TO ALL CREWS WITHIN AN ACTIVE AOA WITHIN ONE MINUTE AFTER RECEIPT OF DIRECTION FROM THE ATCT.

13. FLAGMEN – IN ACCORDANCE WITH THE SPECIFICATIONS, THE CONTRACTOR SHALL FURNISH, AT HIS OWN EXPENSE, FLAGMEN AS NECESSARY TO CONTROL CONSTRUCTION TRAFFIC UNLESS OTHERWISE DIRECTED BY THE ENGINEER. ALL CONTRACTOR VEHICLES THAT ARE REQUIRED TO CROSS ACTIVE RUNWAYS, RUNWAY SAFETY AREAS, TAXIWAYS AND APRONS SHALL DO SO UNDER THE DIRECT CONTROL OF A COMPETENT FLAGMAN WHO IS IN DIRECT RADIO CONTACT WITH FAA ATCT GROUND CONTROL. ALL AIRCRAFT TRAFFIC ON RUNWAYS, TAXIWAYS AND APRONS SHALL HAVE PRIORITY OVER CONTRACTOR'S TRAFFIC. AT NO TIME SHALL THE CONTRACTOR'S VEHICLES OR PERSONNEL BE ALLOWED TO ENTER OR CROSS ACTIVE RUNWAYS OR CLEAR ZONES WITHOUT PROPER AUTHORIZATION OBTAINED THROUGH GROUND CONTROL.

14. OPEN FLAME, WELDING OR TORCH CUTTING OPERATIONS ARE PROHIBITED UNLESS ADEQUATE FIRE AND SAFETY PRECAUTIONS HAVE BEEN TAKEN AND THE PROCEDURE PREVIOUSLY APPROVED BY THE ENGINEER. A FIRE WATCH IS REQUIRED. OPEN FLAME OPERATIONS REQUIRE A BURNING/WELDING PERMIT OBTAINABLE AT AIRPORT OPERATIONS 410-682-8831.

SITE ACCESS, CONTRACTOR STAGING, HAUL ROUTES AND MATERIAL STORAGE

1. ACCESS TO THE SITE – THE CONTRACTOR'S ACCESS POINTS TO THE SITE SHALL BE AS SHOWN ON THE GENERAL PROJECT LAYOUT. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL VEHICLES AND PERSONNEL WHO ENTER THE AIRPORT THROUGH THESE ACCESS POINTS. GATES SHALL BE SECURED WHEN NOT IN USE. THE CONTRACTOR SHALL PROVIDE AIRPORT OPERATIONS WITH A SCHEDULE OF TIMES THAT THE GATE WILL BE MANNED FOR ENTRY BY THE CONTRACTOR.

2. ALL OFF-SITE HAUL ROUTES SHALL BE SELECTED TO MINIMIZE DISTURBANCE TO THE PUBLIC. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO COORDINATE OFF-SITE HAUL ROUTES (STATE HIGHWAYS, COUNTY ROADS, OR CITY STREETS) WITH THE APPROPRIATE OWNER WHO HAS JURISDICTION OVER THE AFFECTED ROUTE. THE CONTRACTOR'S ON-AIRPORT HAUL ROUTES ARE INDICATED ON THE GENERAL PROJECT LAYOUT. THESE SHALL BE EXISTING HAUL ROADS, WHERE AVAILABLE, OR ALONG TAXIWAY/TAXILANE PAVEMENTS UNLESS OTHERWISE INDICATED IN THE CONTRACT DRAWINGS.

3. ON-SITE ROADS AND OTHER AIRFIELD PAVEMENTS USED AS HAUL ROUTES SHALL BE MAINTAINED BY THE CONTRACTOR AND SHALL BE RESTORED AT THE CONTRACTOR'S EXPENSE TO THEIR ORIGINAL CONDITION UPON COMPLETION OF BEING USED AS A HAUL ROUTE, UNLESS OTHERWISE DIRECTED BY THE CONTRACT DOCUMENTS OR BY THE ENGINEER. THE BEFORE AND AFTER CONDITION OF ALL ON-SITE HAUL ROUTES (TEMPORARY OR PERMANENT) SHALL BE JOINTLY INSPECTED AND DETERMINED BY THE CONTRACTOR AND THE ENGINEER THROUGH THE USE OF DIGITAL PHOTOGRAPHY AND/OR VIDEO. THE CONTRACTOR MAY NEED TO COORDINATE HAUL ROUTE USAGE WITH OTHER CONTRACTORS WORKING ON THE AIRPORT.

4. FENCING, DRAINAGE, GRADING AND OTHER MISCELLANEOUS CONSTRUCTION REQUIRED TO CONSTRUCT OR RESTORE TEMPORARY OR PERMANENT HAUL ROUTES OR ACCESS POINTS ON THE AIRPORT WILL BE THE CONTRACTOR'S RESPONSIBILITY AND SHALL BE APPROVED BY THE ENGINEER PRIOR TO COMMENCING THE WORK.

5. ALL ON-SITE ACCESS ROADS TO AIRPORT FACILITIES SHALL REMAIN OPEN AND MAINTAINED AT ALL TIMES.

6. CONTRACTOR'S STAGING AREA – AN AREA WILL BE MADE AVAILABLE FOR CONTRACTOR'S MOBILIZATION AND STORAGE. THE CONTRACTOR'S STAGING AREA SHALL BE FREE OF DEBRIS. IF DIRECTED BY THE ENGINEER, THE CONTRACTOR WILL BE REQUIRED TO STAKE OUT AND FLAG THE STAGING AREA LIMITS. NO STAGING WILL BE ALLOWED WITHIN RUNWAY SAFETY AREAS. UPON COMPLETION OF THE PROJECT, THE STAGING AREA SHALL BE RESTORED TO ITS ORIGINAL CONDITION AT THE CONTRACTOR'S EXPENSE.

7. ALL MATERIALS AND EQUIPMENT (INCLUDING STOCKPILED MATERIAL) WHEN NOT IN USE SHALL BE PLACED IN APPROVED AREAS WHERE THEY WILL NOT CONSTITUTE A HAZARD TO AIRCRAFT OPERATIONS AND NOT PENETRATE CLEARANCE SURFACES SHOWN ON THE GENERAL PROJECT LAYOUT.

   - THE OBSTACLE FREE ZONE (OFZ) GOVERNS EQUIPMENT CLEARANCE DURING CONSTRUCTION ADJACENT TO AN ACTIVE RUNWAY. UNDER NO CIRCUMSTANCES SHALL ANY MEN OR EQUIPMENT PENETRATE THESE SURFACES UNLESS PRIOR ARRANGEMENTS HAVE BEEN MADE WITH AIRPORT OPERATIONS.

   - THE FAR PART 77 APPROACH, PRIMARY, AND TRANSITIONAL SURFACES GOVERN STOCKPILES AND PARKED EQUIPMENT. UNDER NO CIRCUMSTANCES SHALL STOCKPILES, PARKED EQUIPMENT, OR OTHER CONSTRUCTION ITEMS PENETRATE THESE SURFACES ADJACENT TO AN ACTIVE RUNWAY.

8. EQUIPMENT SHALL BE PARKED AT THE CONTRACTOR'S STAGING AREA WHEN NOT IN USE. TALL EQUIPMENT SUCH AS CRANES SHALL BE LOWERED TO THE GROUND WHEN NOT IN USE. STOCKPILED MATERIAL SHALL BE CONSTRAINED IN A MANNER TO PREVENT MOVEMENT RESULTING FROM AIRCRAFT JET BLAST OR WIND CONDITIONS IN EXCESS OF 10 KNOTS.

9. ALL CONTRACTOR VEHICLES AND TRAFFIC (UNLESS OTHERWISE AUTHORIZED) SHALL REMAIN WITHIN THE DESIGNATED CONSTRUCTION LIMITS OR HAUL ROUTES.

SECURITY

1. THE AIRPORT WILL NOT PROVIDE AIRFIELD OPERATIONS AREA ESCORTS. THE CONTRACTOR MUST PROVIDE RADIOS TO THE CREW AND AQUAINT PERTINENT PERSONNEL WITH THE PROPER PROCEDURES IN COMMUNICATIONS WITH GROUND CONTROL.

2. THE CONTRACTOR SHALL PROVIDE THE ENGINEER WITH A CURRENT LIST OF ALL EMPLOYEES WORKING ON THE AIRPORT. THE LIST SHALL BE MAINTAINED CURRENT BY THE CONTRACTOR AND APPLIES TO BOTH THE CONTRACTOR AND SUBCONTRACTORS.

UTILITIES

1. UNDERGROUND UTILITIES – LOCATIONS OF KNOWN UNDERGROUND UTILITIES SHOWN ON THE PLANS ARE APPROXIMATE. ALL UTILITY LOCATIONS SHALL BE FIELD VERIFIED BY THE CONTRACTOR PRIOR TO COMMENCING CONSTRUCTION. THE CONTRACTOR IS REQUIRED TO COMPLETE A DIGGING AUTHORIZATION FORM, AS SUPPLIED BY THE ENGINEER, PRIOR TO INITIATION OF EXCAVATION OPERATIONS.

2. REPAIR OF UTILITIES DAMAGED DURING CONSTRUCTION MUST BE STARTED IMMEDIATELY AND CONTINUE UNTIL COMPLETED.

3. ALL SUCH REPAIRS SHALL BE IN ACCORDANCE WITH THE CONTRACT SPECIFICATIONS OR AS DIRECTED BY THE ENGINEER AND SHALL BE AT THE CONTRACTOR'S EXPENSE.

4. IF FAA CABLES ARE DAMAGED, REPAIRS SHALL BE DONE IN ACCORDANCE WITH FAA REQUIREMENTS AND IN THE PRESENCE OF AN FAA REPRESENTATIVE. THE FAA MAY ELECT TO HAVE THE REPAIR PERFORMED BY OTHERS IN WHICH CASE THE CONTRACTOR SHALL BE RESPONSIBLE FOR PAYING THE INCURRED COSTS OF REPAIRS.

5. UTILITIES NOTIFICATION – AT LEAST TWO WORKING DAYS PRIOR TO COMMENCING CONSTRUCTION OPERATIONS IN AN AREA WHICH MAY INVOLVE UNDERGROUND UTILITIES, THE CONTRACTOR SHALL NOTIFY THE ENGINEER AND THE OWNER OF EACH UNDERGROUND UTILITY AFFECTED.

6. THE FOLLOWING LIST INCLUDES POSSIBLE UTILITIES WITHIN THE CONSTRUCTION LIMITS. ADDITIONAL UTILITIES NOT LISTED BELOW MAY ALSO BE ON-SITE.

UTILITY OWNERSHIP:	
MISS UTILITY CENTER	1-800-257-7777
BGE	410-685-0123/410-234-5000/1-800-685-0123
VERIZON REPAIR BURIED CABLE	(410) 954-2222 1-800-275-2355
FAA AIRWAY FACILITIES SSC	(410) 859-7252

EMERGENCY CONTACT INFORMATION

1. EXCEPT FOR EMERGENCIES, ALL CONTACT WITH AIRPORT PERSONNEL SHALL BE MADE THROUGH THE ENGINEER. FOR EMERGENCIES INVOLVING SAFETY (INJURIES, FIRES, SECURITY BREACHES, ETC.) THE CONTRACTOR SHALL MAKE DIRECT CONTACT WITH AIRPORT OPERATIONS FOLLOWED BY NOTIFICATION TO THE ENGINEER AS SOON AS POSSIBLE.

2. THE PROJECT SUPERVISORS SHALL HAVE THE FOLLOWING TELEPHONE NUMBERS WITH THEM AT ALL TIMES:

a.	MAA FIRE MARSHALL	410-859-7815/7511
b.	MTN FIRE/POLICE EMERGENCY	911
c.	MTN OPERATIONS	410-682-8831
d.	MTN ATCT	410-682-8856
e.	MDE OIL CONTROL PROGRAM (COMPLIANCE AND REMEDIATION)	410-537-3442

3. THE CONTRACTOR SHALL PROVIDE THE PHONE NUMBERS OF THREE PERSONNEL, INCLUDING THE PROJECT SUPERINTENDENT, WHO MAY BE CONTACTED IN AN EMERGENCY. PERSONNEL SHALL BE ON CALL 24 HOURS PER DAY FOR MAINTAINING AIRPORT HAZARD LIGHTING AND BARRICADES.

COMPANY NAME

COMPANY NAME
COMPANY ADDRESS
CITY, STATE ZIP CODE
COMPANY PHONE NO. COMPANY FAX NO.

DESIGNED:	–
DRAWN:	–
CHECKED:	–
APPROVED:	–

REVISION NO.	REVISION DATE	DESCRIPTIONS

MARTIN STATE AIRPORT

MARYLAND DEPARTMENT OF TRANSPORTATION
MARYLAND AVIATION ADMINISTRATION

OFFICE OF ENGINEERING AND CONSTRUCTION MANAGEMENT
DIVISION OF FACILITIES DESIGN

PROJECT TITLE: PROJECT TITLE

SHEET TITLE: GENERAL CONSTRUCTION AND SAFETY NOTES I

SCALE: NONE

DATE: JULY 2009

CONTRACT NO.: MAA-CO-XX-XXX

SHEET NO.:

RELATED DOCUMENTS

1. FAA ADVISORY CIRCULARS (AC's), ORDERS AND FEDERAL AVIATION REGULATIONS (FAR's) – THE FOLLOWING PUBLICATIONS CONTAIN DEFINITIONS OR DESCRIPTIONS OF CRITICAL AIRPORT OPERATING AREAS. COPIES OF THESE PUBLICATIONS ARE AVAILABLE THROUGH THE FAA AT WWW.FAA.GOV AND CAN BE REVIEWED AT THE OFFICES OF THE MAA.

   THE ITEMS OUTLINED BELOW PERTAIN TO AIRFIELD SAFETY REQUIREMENTS AND ARE REFERENCED THROUGHOUT THE CONTRACT DOCUMENTS.

   a. AC 150/5370-2, 'OPERATIONAL SAFETY ON AIRPORTS DURING CONSTRUCTION', CURRENT EDITION, SETS FORTH GUIDELINES TO ASSIST AIRPORT OPERATORS IN COMPLYING WITH FAR PART 139, "CERTIFICATION AND OPERATION: LAND AIRPORTS SERVING CERTAIN AIR CARRIERS" AND WITH THE REQUIREMENTS OF FEDERALLY FUNDED AIRPORT CONSTRUCTION PROJECTS.

   b. FAR PART 77 'OBJECTS AFFECTING NAVIGABLE AIRSPACE', CURRENT EDITION:

   i. ESTABLISHES STANDARDS FOR DETERMINING OBSTRUCTIONS TO NAVIGABLE AIRSPACE. IMAGINARY SURFACES ARE DEFINED IN THE PUBLICATION AND ARE SHOWN ON THIS SHEET.

   ii. ESTABLISHES REQUIREMENTS FOR FILING NOTICE TO THE FAA FOR CERTAIN PROPOSED CONSTRUCTION OR ALTERATION PROPOSALS. COMPLETION OF THE 'NOTICE OF PROPOSED CONSTRUCTION OR ALTERATION' FORM (FAA FORM 7460-1) IS DISCUSSED IN AC 70/7460-1 'OBSTRUCTION MARKING AND LIGHTING', CURRENT EDITION.

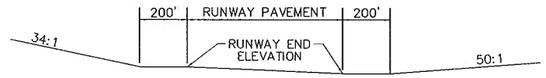
   c. AC 70/7460-2, 'PROPOSED CONSTRUCTION OF OBJECTS THAT MAY AFFECT THE NAVIGABLE AIRSPACE', CURRENT EDITION, PROVIDES INFORMATION TO PERSONS PROPOSING TO ERECT OR ALTER AN OBJECT THAT MAY AFFECT NAVIGABLE AIRSPACE. THE AC EXPLAINS THE REQUIREMENT TO NOTIFY THE FAA BEFORE CONSTRUCTION BEGINS AND THE FAA'S RESPONSIBILITY TO RESPOND TO THESE NOTICES.

   d. AC 150/5300-13, 'AIRPORT DESIGN', CURRENT EDITION, ESTABLISHES DESIGN, OPERATIONAL, AND MAINTENANCE STANDARDS FOR AIRPORTS. STANDARD TERMS USED IN THE CONTRACT PLANS AND SPECIFICATIONS ARE DEFINED BELOW.

   i. OBSTACLE FREE ZONE (OFZ) – A VOLUME OF SPACE WHICH IS FREE OF ALL FIXED OBJECTS AND CLEAR OF VEHICLES IN THE PROXIMITY OF AN AIRPLANE CONDUCTING AN APPROACH, MISSED APPROACH, LANDING, TAKEOFF, OR DEPARTURE. AN OFZ TYPICAL SECTION IS SHOWN ON GENERAL PROJECT LAYOUT.

   ii. OBJECT FREE AREA (OFA) – A TWO DIMENSIONAL GROUND AREA SURROUNDING RUNWAYS, TAXIWAYS, AND TAXILANES WHICH IS CLEAR OF OBJECTS EXCEPT FOR OBJECTS WHOSE LOCATION IS FIXED BY FUNCTION.

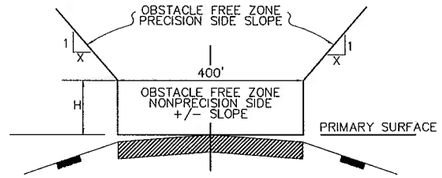
   iii. SAFETY AREA – THE SURFACE ADJACENT TO RUNWAYS, TAXIWAYS, AND TAXILANES OVER WHICH AIRCRAFT SHOULD, IN DRY WEATHER, BE ABLE TO CROSS AT NORMAL SPEEDS WITHOUT INCURRING ANY SIGNIFICANT DAMAGE. A SAFETY AREA IS GRADED, DRAINED AND COMPACTED. IT IS FREE OF ANY HOLES, TRENCHES, BUMPS OR OTHER SIGNIFICANT SURFACE VARIATIONS OR OBJECTS OTHER THAN THOSE WHICH MUST BE THERE BECAUSE OF THEIR ESSENTIAL AERONAUTICAL FUNCTION. THE SAFETY AREA REQUIRES THE CAPABILITY OF SUPPORTING MAINTENANCE VEHICLES AND AIRCRAFT RESCUE AND FIRE FIGHTING VEHICLES UNDER NORMAL (DRY) CONDITIONS.



RUNWAY END	ELEVATION	APPROACH SLOPE
15	24.5	34:1
33	10.3	50:1

TYPICAL PROFILE
F A R PART 77 IMAGINARY SURFACES

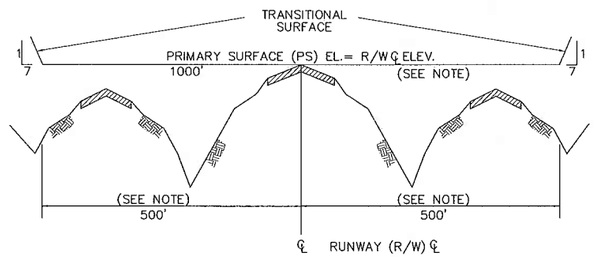
NOT TO SCALE



RUNWAY END	TYPE OF RUNWAY	SIDE SLOPE–X	H
15–33	PRECISION	6:1	41.0

TYPICAL SECTION
RUNWAY OBSTACLE FREE ZONE

NOT TO SCALE



NOTE
SEE "SAFETY REQUIREMENTS DURING CONSTRUCTION" AS CONTAINED IN THE SPECIFICATIONS, AND PLANS REGARDING RESTRICTED AREAS IN THE VICINITY OF ACTIVE RUNWAYS AND TAXIWAYS.

TYPICAL SECTION
F A R PART 77 IMAGINARY SURFACES

NOT TO SCALE

COMPANY NAME

COMPANY NAME
COMPANY ADDRESS
CITY, STATE ZIP CODE
COMPANY PHONE NO. COMPANY FAX NO.

DESIGNED: –
DRAWN: –
CHECKED: –
APPROVED: –

REVISION NO.	REVISION DATE	DESCRIPTIONS
	8/7/06	CONFORMED DRAWINGS

MARTIN STATE AIRPORT

MARYLAND DEPARTMENT OF TRANSPORTATION
MARYLAND AVIATION ADMINISTRATION

OFFICE OF ENGINEERING AND CONSTRUCTION MANAGEMENT
DIVISION OF FACILITIES DESIGN

PROJECT TITLE: PROJECT TITLE

SHEET TITLE: GENERAL CONSTRUCTION AND SAFETY NOTES II

SCALE: NONE

DATE: JULY 2009

CONTRACT NO.: MAA-CO-XX-XXX

SHEET NO.:

SEDIMENT CONTROL LEGEND

(CONSULTANT CAN MODIFY PER PROJECT SPECIFIC.)

EARTH DIKE	A-2 / B-3
SWALE	A-2 / B-3
PERIMETER DIKE/SWALE	PD/S-1
PIPE SLOPE DRAIN	PSD-12
ROCK OUTLET PROTECTION	
STONE CHECK DAM	
STONE OUTLET STRUCTURE	
SILT FENCE	SF
SUPER SILT FENCE	SSF
STRAW BALE DIKE	SBD
STANDARD INLET PROTECTION	SIP
AT GRADE INLET PROTECTION	AGIP
CURB INLET PROTECTION	CIP
MEDIAN INLET PROTECTION	MIP
GABION INFLOW PROTECTION	GM
RIP-RAP INFLOW PROTECTION	RRP
SUMP PIT	SP
STABILIZED CONSTRUCTION ENTRANCE	SCE-AASHTO
REMOVABLE PUMPING STATION	RPS
LIMIT OF DISTURBANCE	LOD
DRAINAGE BOUNDARY	
TREE PROTECTION FENCE	
ROOT PRUNING	

MDE NO. XX-SF-XXXX
NOTE TO CONTRACTOR:
SEDIMENT CONTROL WILL BE STRICTLY ENFORCED

FOR EROSION AND SEDIMENT CONTROL ONLY.

COMPANY NAME

COMPANY NAME
COMPANY ADDRESS
CITY, STATE ZIP CODE
COMPANY PHONE NO. COMPANY FAX NO.

DESIGNED: ---
DRAWN: ---
CHECKED: ---
APPROVED: ---

REVISION NO.	REVISION DATE	DESCRIPTIONS

BWI THURGOOD MARSHALL OR MARTIN STATE LOGO

MARYLAND DEPARTMENT OF TRANSPORTATION
MARYLAND AVIATION ADMINISTRATION

OFFICE OF ENGINEERING AND CONSTRUCTION MANAGEMENT
DIVISION OF FACILITIES DESIGN

PROJECT TITLE:

SHEET TITLE: EROSION AND SEDIMENT CONTROL PLAN

SCALE:

DATE: DATE

CONTRACT NO.:

SHEET NO.:

PATH/FILENAME

GENERAL NOTES

1. DESCRIPTION

THIS WORK SHALL CONSIST OF THE APPLICATION OF MEASURES THROUGH-OUT THE LIFE OF THE PROJECT TO CONTROL EROSION AND MINIMIZE THE SEDIMENTATION OF RIVERS, STREAMS AND IMPOUNDMENTS (LAKES, RESERVOIRS, BAYS, AND COASTAL WATERS). THE MEASURES SHALL INCLUDE BUT ARE NOT LIMITED TO THE USE OF BERMS, DIKES, DAMS, SEDIMENT BASINS AND/OR TRAPS, GEOTEXTILES, STONE CHECKS, SILT FENCES, SURFACE ROUGHING, MATS & NETS, AGGREGATE, MULCH, GRASSES, SLOPE DRAINS AND OTHER APPROVED METHODS. EROSION AND SEDIMENT CONTROL MEASURES AS DESCRIBED HEREIN AND APPROVED BY M.D.E. SHALL BE APPLIED TO ERODIBLE MATERIAL EXPOSED BY ANY ACTIVITY ON THIS PROJECT.

EROSION AND SEDIMENT CONTROL MEASURES SHALL BE COORDINATED WITH THE CONSTRUCTION OF THE PAVEMENT, DRAINAGE FACILITIES SUCH AS PIPES, CULVERTS, HEADWALLS, DITCH PAVING, FLUMES, ETC., WHICH SHALL BE CONSTRUCTED CONCURRENT WITH THE COMMENCEMENT OF THE GRADING OPERATION TO ASSURE ECONOMICAL, EFFECTIVE AND CONTINUOUS EROSION AND SEDIMENT CONTROL.

2. TEMPORARY CONTROLS

IN ACCORDANCE WITH THE DEPARTMENT OF THE ENVIRONMENT, TITLE 4, SUBTITLE 106, SEDIMENT CONTROL, ANNOTATED CODE OF MARYLAND REGULATIONS, AND GENERAL PROVISION 7.12 OF THE MARYLAND DEPARTMENT OF TRANSPORTATION, STATE HIGHWAY ADMINISTRATION STANDARD SPECIFICATIONS FOR CONSTRUCTION AND MATERIALS, THE CONTRACTOR WILL PROVIDE TEMPORARY POLLUTION CONTROL MEASURES FOR THE PURPOSE OF CORRECTING CONDITIONS THAT DEVELOP DURING CONSTRUCTION NOT FORESEEN DURING THE DESIGN OF THE PROJECT AND FOR THE PURPOSE OF PROVIDING CONTINUOUS EROSION AND SEDIMENT CONTROL FOR THE DURATION OF THE PROJECT.

3. STANDARDS & SPECIFICATIONS

THIS PLAN WILL BE IN ACCORDANCE WITH THE STATE HIGHWAY ADMINISTRATION'S STANDARD SPECIFICATIONS TITLED "STANDARD SPECIFICATIONS FOR CONSTRUCTION & MATERIALS" DATED OCTOBER 1993, AND REVISIONS THEREOF, AND ADDITIONS THERETO INCLUDED IN THESE CONTRACT DOCUMENTS.

THE 1994 "MARYLAND STANDARDS AND SPECIFICATIONS FOR SOIL EROSION AND SEDIMENT CONTROL" (AND AMENDMENTS) WILL BE AN ACCEPTABLE REFERENCE FOR THIS PROJECT.

THIS INFORMATION MUST BE PRESENT ON THE PROJECT AT ALL TIMES.

4. DEFINITIONS

CLEARING: SHALL MEAN THE CLEARING OF TREES, BRUSH, SHRUBS, DOWN TIMBER, ROTTEN WOOD, RUBBISH, AND ANY OTHER VEGETATION (EXCEPT WHERE EXCLUDED BY THE DEFINITION FOR GRUBBING), AS WELL AS THE REMOVAL OF FENCES AND INCIDENTAL STRUCTURES.

GRUBBING: SHALL MEAN THE REMOVAL FROM THE GROUND OF STUMPS, ROOTS AND STUBS, BRUSH, FOREST LITTER, ORGANIC MATERIAL, AND DEBRIS.

DISTURBED AREA: SHALL MEAN AN AREA WHERE GRUBBING AND/OR GRADING HAS BEEN INITIATED.

STABILIZATION/STABILIZED: (CASE 1) – TO MEET THE REQUIREMENTS TO PROCEED WITH THE NEXT GRADING UNIT(S) OR OPERATION SHALL MEAN THE PLACEMENT OF SEED AND MULCH, SOD, ETC.

(CASE 2) – TO MEET THE REQUIREMENT FOR REMOVAL OF THE CONTROLS SHALL MEAN THAT THE COMPLETE GROWTH OF VEGETATION HAS OCCURRED (I.E., 3" HEIGHT OF PERMANENT GRASS OVER ALL AREAS).

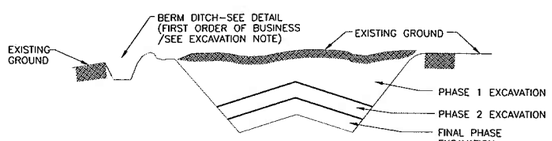
5. CLEARING AND GRUBBING

EROSION AND SEDIMENT CONTROL MEASURES WILL BE IMPLEMENTED AT THE BEGINNING OF THE GRUBBING PORTION OF THIS OPERATION. GRUBBING WILL BE RESTRICTED TO THE GRADING UNIT CURRENTLY ACTIVE.

6. EXCAVATION

IF BERM DITCHES ARE TO BE USED IN A CUT SECTION, THEY WILL BE EXCAVATED AND STABILIZED AS THE FIRST ORDER OF BUSINESS AS DIRECTED BY THE ENGINEER.

ALL CUT SLOPES SHALL BE DRESSED, PREPARED, SEEDED, AND MULCHED AS THE WORK PROGRESSES. SLOPES SHALL BE EXCAVATED AND STABILIZED IN EQUAL INCREMENTS NOT TO EXCEED 15 FEET



CONSTRUCTION SEQUENCE:

1. EXCAVATE AND STABILIZE BERM, SIDE AND OUTLET DITCHES.
2. PERFORM PHASE 1 EXCAVATION, DRESS, SEED & MULCH SLOPES WITH PERMANENT SEED & MULCH.
3. PERFORM PHASE 2 EXCAVATION, DRESS, SEED & MULCH SLOPES WITH PERMANENT SEED & MULCH.
4. PERFORM FINAL PHASE EXCAVATION, DRESS, SEED & MULCH SLOPES WITH PERMANENT SEED & MULCH. STABILIZE SURFACE DRAIN DITCHES, OVERSEED PHASE 1 & 2 SLOPES, IF REQUIRED, AS DETERMINED BY THE ENGINEER.

OVERSEED PHASE 1 SLOPES, IF REQUIRED.

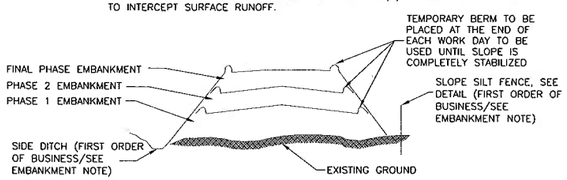
PHASING PLAN-CUT SECTION

NOTE: ONCE THE EXCAVATION WITHIN A SPECIFIC AREA HAS BEGUN, THE OPERATION SHALL BE CONTINUOUS FROM GRUBBING THROUGH THE COMPLETION OF THE GRADING AND PLACEMENT OF PERMANENT SEED AND MULCH. ANY INTERRUPTIONS IN THE OPERATION OF 14 DAYS OR MORE MUST BE APPROVED BY THE ENGINEER. ANY VIOLATION OF THIS REQUIREMENT WILL RESULT IN THE CONTRACTOR ASSUMING THE RESPONSIBILITY OF PLACING TEMPORARY STABILIZATION AT HIS OWN COST AND EXPENSE.

7. EMBANKMENT

THE FIRST ORDER OF BUSINESS WILL BE THE EXCAVATION AND STABILIZATION OF SIDE DITCHES AND PLACEMENT OF PERIMETER CONTROL (SILT FENCE, ETC.). THE EMBANKMENT WILL BE MADE IN LIFTS MEETING THE SAME HEIGHT REQUIREMENTS AS PREVIOUSLY STATED FOR CUT SECTIONS. THE SLOPES WILL BE STABILIZED IMMEDIATELY FOLLOWING THE COMPLETION OF THE INTERMEDIATE STAGE(S).

AT THE END OF EACH WORK DAY, TEMPORARY BERMS (EARTH) AND SLOPE DRAINS WILL BE CONSTRUCTED ALONG THE TOP EDGE(S) OF THE EMBANKMENT TO INTERCEPT SURFACE RUNOFF.



CONSTRUCTION SEQUENCE:

1. EXCAVATE AND STABILIZE SIDE DITCH AND/OR INSTALL PROPOSED CONTROLS AT THE TOE OF SLOPE.
2. PLACE PHASE 1 EMBANKMENT, PROVIDE TEMPORARY SEEDING OR STRAW MULCH.
3. PLACE PHASE 2 EMBANKMENT, DRESS. PROVIDE TEMPORARY SEEDING OR STRAW MULCH.
4. PLACE FINAL PHASE EMBANKMENT, DRESS. PREPARE & PLACE PERMANENT SEED & MULCH ON THE ENTIRE SLOPE.

PHASING PLAN-FILL SECTION

8. STABILIZATION / LIMITS OF DISTURBANCE

OTHER THAN LISTED BELOW, ONE UNIT EQUALING 20 ACRES (872,800 SQUARE FEET) THAT HAS BEEN CLEARED CAN BE ACTIVELY GRADED AT ONE TIME. ONCE GRADING BEGINS IN THE FIRST UNIT, A SECOND UNIT MAY BE GRUBBED, TWO UNITS (ONE GRADED AND ONE GRUBBED) WILL BE ALLOWED PER GRADING OPERATION. A GRADING OPERATION IS DEFINED AS THE CONTRACTOR'S ABILITY TO PROVIDE ADEQUATE RESOURCES TO PERFORM THE GRADING IN A TIMELY MANNER AND PROVIDE AND MAINTAIN THE PROPER EROSION AND SEDIMENT CONTROL MEASURES. THE DISTRICT ENGINEER OR HIS DESIGNATE WILL BE THE FINAL AUTHORITY IN THIS DETERMINATION. A GRADING UNIT NEED NOT BE 20 CONTINUOUS ACRES. ALL APPROPRIATE PERIMETER CONTROLS WILL BE INSTALLED PRIOR TO ANY GRUBBING OPERATION. AREAS ARE TO BE PERMANENTLY OR TEMPORARILY SEEDED AND MULCHED WHEN SITE DEVELOPMENT WORK, GRADING OR OTHER EARTH DISTURBING ACTIVITIES CEASE TO BE CONTINUOUS FOR A PERIOD TO EXCEED 14 CALENDAR DAYS. UPON COMPLETION OF THE GRADING OR CONSTRUCTION, THE AREA WILL BE PERMANENTLY STABILIZED WITHIN 7 CALENDAR DAYS. THIS PERTAINS TO OTHER PERIMETER CONTROLS, DIKES, SWALES, DITCHES, PERIMETER SLOPES, AND OTHER SLOPES GREATER THAN 3:1 SLOPES LESS THAN 3:1 NEED NOT BE TEMPORARILY STABILIZED, HOWEVER, THE PERMANENT STABILIZATION WITHIN 7 DAYS IS REQUIRED. ONCE THE EXCAVATION OR EMBANKMENT REACHES THE "BOTTOM OR SUBGRADE," (I.E., CAPPING MATERIAL OR AGGREGATE SUBGRADE IN PLACE), THOSE AREAS IN WHICH PAVING WILL BE PLACED WILL BE EXEMPT FROM THE STABILIZATION REQUIREMENTS." ROADWAYS AND HAUL ROADS ACTIVELY BEING USED FOR DAILY CONVEYANCE OF EQUIPMENT WILL ALSO BE EXEMPT FROM THE STABILIZATION REQUIREMENTS. AREAS BETWEEN "TEMPORARY BERMS" EXCEPT MEDIAN AREAS NEED NOT BE STABILIZED UPON COMPLETION OF GRADING. THE 7 / 14 DAY REQUIREMENTS IS TAKEN TO MEAN THAT THE STABILIZATION OPERATION IS COMPLETE OR NEARING COMPLETION.

WHEN BALANCING EARTHWORK (BORROW FROM A CUT USED AS FILL AT A LOCATION DISTANT FROM THE CUT), CONSIDERATION WILL BE ALLOWED FOR GREATER THAN ONE UNIT OF GRADING. IN SUCH CASES, ONE UNIT OF CUT AND ONE GRADING UNIT OF FILL WILL BE ALLOWED TO BE GRUBBED AND GRADED. GREATER THAN ONE UNIT OF GRUBBED AND GRADED AREA SHALL BE ALLOWED FOR INTERCHANGE CONSTRUCTION. WHEN WET SOIL CONDITIONS ARE ENCOUNTERED, THE CONTRACTOR WILL BE ALLOWED TO GRUB AND GRADE ANOTHER UNIT PROVIDING THE INITIAL UNIT HAS BEEN PROPERLY STABILIZED.

NO SLOPE SHALL BE LEFT DISTURBED WITHOUT BENEFIT OF SURFACE ROUGHENING FOR MORE THAN 5 DAYS.

THE MOST STRINGENT REQUIREMENTS FOR STABILIZATION UNDER EXCAVATION, EMBANKMENT OR STABILIZATION/LIMITS OF DISTURBANCE WILL BE PREFERENTIALLY ENFORCED.

9. MAINTENANCE

SEDIMENT TRAPS, SEDIMENT BASINS, DITCHES, STRAW BALES, SILT FENCES, STONE OUTLET STRUCTURES, EARTH BERMS, ETC. SHALL BE MAINTAINED DURING THE CONSTRUCTION SEASON AS WELL AS THE WINTER MONTHS AND OTHER TIMES WHEN THE PROJECT IS CLOSED DOWN. THE MAINTENANCE INTERVAL SHALL BE AS SPECIFIED IN THE DOT/SHA STANDARD SPECIFICATIONS, THE SPECIAL PROVISIONS AND PLANS OR WHEN DIRECTED BY THE ENGINEER.

TRAPS WILL BE CLEANED WHEN THEY ARE 50% FILLED. SILT FENCE STONE OUTLET STRUCTURES AND STRAW BALES SHALL HAVE SEDIMENTATION REMOVED WHEN IT REACHES 50% THE HEIGHT OF THE CONTROL DEVICE. THESE SPOILS WILL BE REMOVED TO AN APPROVED SITE.

CONTROLS WILL BE INSPECTED IMMEDIATELY FOLLOWING RAIN STORMS. THE CONTRACTOR WILL IMMEDIATELY REPAIR CONTROLS WHEN DAMAGED.

ACCESS SHALL BE MAINTAINED TO ALL SEDIMENT CONTROL REQUIRING MAINTENANCE UNTIL THOSE CONTROLS ARE NO LONGER REQUIRED.

MAINTENANCE OF THE CONTROL DEVICES IS ESSENTIAL. LACK OF COOPERATION ON THE PART OF THE CONTRACTOR WILL BE CONSIDERED AS A MAJOR VIOLATION TO THE PLAN AND GROUNDS FOR A "SHUT DOWN" OF THE PROJECT. THE CONTRACTOR SHALL PROVIDE A POINT OF CONTACT TO ADDRESS MAINTENANCE ISSUES.

10. EROSION AND SEDIMENT CONTROL EXCAVATION

THIS ITEM HAS BEEN ESTABLISHED TO INCLUDE THE EXCAVATION, BACKFILLING AND MAINTENANCE OF SEDIMENT TRAPS. IT SHALL ALSO INCLUDE THE REMOVAL OF SILT IN AND AROUND SEDIMENT BASINS, SILT FENCE, STRAW BALE DITCH CHECKS, TEMPORARY STONE OUTLET STRUCTURE, EARTH BERMS, SWALES AND DITCHES. MEASUREMENT AND PAYMENT WILL BE BASED ON THE CUBIC YARD WHICH SHALL INCLUDE ALL EQUIPMENT, TOOLS AND LABOR REQUIRED.

11. STOCKPILED MATERIAL

SALVAGED TOPSOIL WILL BE PLACED ON WELL DRAINED LAND AWAY FROM LIVE STREAMS AND IN ACCORDANCE WITH APPROVED EROSION AND SEDIMENT CONTROL MEASURES. IT SHALL BE PLACED IN PILES OF NEAT CONFORMATIONS AND SEEDED WITH TEMPORARY SEED IMMEDIATELY AFTER FINAL SHAPING OF THE PILE IN ACCORDANCE WITH SECTION 704 OF THE DOT/SHA STANDARD SPECIFICATIONS. THE CONTRACTOR WILL PROVIDE AN ADEQUATE QUANTITY OF SILT FENCE TO CONTROL THE PERIMETER OF THE STOCKPILE UNTIL SUITABLE VEGETATION IS ESTABLISHED. IF HE ELECTS, THE CONTRACTOR, WITH THE APPROVAL OF THE ENGINEER, MAY CONSTRUCT AN EARTH BERM IN LIEU OF SILT FENCE. THE COST FOR THESE CONTROLS WILL BE IN ACCORDANCE WITH THE APPROPRIATE CONTRACT ITEMS.

12. EXCAVATED MATERIAL

MATERIALS EXCAVATED FOR THE CONSTRUCTION OF SEDIMENT TRAPS WILL NOT BE STOCKPILED IN THE AREA OF THE TRAP. IT WILL EITHER BE PLACED IN AN EMBANKMENT OR WASTED AS DIRECTED BY THE ENGINEER. EXCAVATION FROM CUTS TO BE USED FOR EMBANKMENTS WILL NOT BE STOCKPILED UNLESS PERIMETER CONTROLS ARE UTILIZED. COSTS FOR THESE CONTROLS WILL BE BORNE BY THE CONTRACTOR. IF THIS MATERIAL IS STOCKPILED UNDER THE DIRECTION OF THE ENGINEER, THE ADMINISTRATION WILL ASSUME THE COSTS OF THE CONTROLS.

13. DEWATERING DISCHARGE

SEDIMENT – LADEN DEWATERING DISCHARGE MUST BE DIRECTED TO AN APPROVED SEDIMENT TRAPPING MEASURE PRIOR TO RELEASE FROM THE SITE.

14. TEMPORARY SLOPE DRAINS

ALL TEMPORARY SLOPE DRAINS WILL DISCHARGE INTO THE BACK OF SEDIMENT TRAPS, INTO SEDIMENT BASINS, OR DITCHES DISCHARGING INTO TRAPS OR BASINS.

15. GEOTEXTILE

GEOTEXTILE WILL BE USED WITH ALL RIPRAP DITCHES (BY TYPE), TEMPORARY STONE OUTLET STRUCTURES (T.S.O.S.) AND STABILIZED CONSTRUCTION ENTRANCES (S.C.E.), BOTH LIGHT AND HEAVY DUTY.

A LIGHT DUTY S.C.E. IS USED WHERE MOST TRAVEL WILL BE SINGLE AXLE VEHICLES WITH AN OCCASIONAL MULTI-AXLE TRUCK AND THE AREA HAS BEEN GRADED TO OR NEAR SUBGRADE. A HEAVY DUTY S.C.E. IS WHERE THE AREA IS ROUGH GRADED AND THE MAJORITY OF THE TRAFFIC IS MULTI-AXLED.

TO PREVENT DAMAGE TO THE GEOTEXTILE, THE MAXIMUM DROP HEIGHT FOR THE MATERIALS SHALL BE:

MATERIAL	MAXIMUM DROP HEIGHT
4" – 12" STONE FOR T.S.O.S.	3 FT.
CLASS I RIPRAP	3 FT.
CLASS II, III RIPRAP	PLACED WITHOUT FREEFALL

THE FABRIC SHALL BE INERT TO COMMONLY ENCOUNTERED CHEMICALS, HYDRO-CARBONS, MILDEW, ROT RESISTANT AND CONFORM TO THE FOLLOWING PROPERTIES:

GEOTEXTILES SHALL MEET THE CLASS SPECIFIED IN THE SPECIAL PROVISIONS, PLANS OR STANDARDS, AND SHALL BE MANUFACTURED FROM FIBERS CONSISTING OF LONG CHAIN SYNTHETIC POLYMERS, COMPOSED AS A MINIMUM OF 85 PERCENT BY WEIGHT OF POLYOLEPHINS, POLYESTERS OR POLYAMIDES. THE GEOTEXTILE SHALL RESIST DETERIORATION FROM ULTRAVIOLET EXPOSURE. GEOTEXTILES USED IN THE CONSTRUCTION OF SILT FENCE SHALL CONTAIN SUFFICIENT AMOUNTS OF ULTRAVIOLET RAY INHIBITORS AND STABILIZERS TO PROVIDE A MINIMUM OF 12 MONTHS OF EXPECTED USABLE CONSTRUCTION LIFE AT A TEMPERATURE RANGE OF 0 TO 120 DEGREES F.

ALL VALUES SPECIFIED ARE MINIMUM OR MAXIMUM ROLL VALUES.

CLASS F GEOTEXTILES (SILT FENCE) SHALL HAVE A 50 LB./IN. MINIMUM TENSILE STRENGTH AND A 20 LB./IN. MINIMUM TENSILE MODULUS WHEN TESTED IN ACCORDANCE WITH MSMT 509. THE MATERIAL SHALL ALSO HAVE A 0.3 GAL/SQ. FT./ MINUTE MINIMUM LOW RATE AND A 75 PERCENT MINIMUM FILTERING EFFICIENCY WHEN TESTED IN ACCORDANCE WITH MSMT 322.

CLASSES A THROUGH E SHALL HAVE A 0.01 CM/SECOND MINIMUM PERMEABILITY WHEN TESTED IN ACCORDANCE WITH MSMT 507, AND AN APPARENT MINIMUM ELONGATION OF 20 PERCENT WHEN TESTED IN ACCORDANCE WITH THE GRAB TENSILE STRENGTH REQUIREMENTS SPECIFIED BELOW. CLASSES A THROUGH E SHALL ALSO MEET THE FOLLOWING ADDITIONAL REQUIREMENTS:

CLASS	APPARENT OPENING SIZE MM. MAX.	GRAB TENSILE STRENGTH LB. MIN.	BURST STRENGTH PSI, MIN.
A	0.30	250	500
B	0.60	200	320
C	0.30	200	320
D	0.60	90	145
E	0.30	90	145

THE PROPERTIES SHALL BE DETERMINED IN ACCORDANCE WITH THE FOLLOWING PROCEDURES:

APPARENT OPENING SIZE:	MSMT 323
GRAB TENSILE STRENGTH:	ASTM D 1682, GRAB TEST 4 X 8 IN. SPECIMEN, 1 X 2 IN. CLAMPS, 12 IN. / MINUTE STRAIN RATE, BOTH PRINCIPAL DIRECTIONS OF GEOTEXTILE
BURST STRENGTH:	ASTM D 3786

16. NOTE TO CONTRACTOR

THE CONTRACTOR WILL NOTE THAT NO CONSTRUCTION ACTIVITIES WILL BE UNDERTAKEN WITHIN SPECIFIED AREAS OF THE PROJECT WITHOUT PRIOR NOTIFICATION OF SUCH ACTIVITIES TO THE ENGINEER. ALL WORK IN THESE AREAS WILL BE MONITORED BY A RESPONSIBLE PARTY DESIGNATED BY THE CONTRACTOR TO ASSURE THAT REASONABLE CARE BE TAKEN WHILE WORKING THESE ENVIRONMENTALLY SENSITIVE AREAS. THESE AREAS ARE AS FOLLOWS:

(NOT APPLICABLE TO THIS PROJECT)

17. CONTRACTOR PAYMENT

THE CONTRACTOR WILL ONLY BE COMPENSATED FOR WORK THAT IS DONE IN ACCORDANCE WITH THE SPECIFICATION, SPECIAL PROVISIONS AND THESE PLANS. ANY CORRECTIONS BROUGHT ABOUT BY NON-COMPLIANCE OR ERRORS BY THE CONTRACTOR WILL BE MADE AT HIS EXPENSE.

MDE NO. XX-SF-XXXX
NOTE TO CONTRACTOR:
SEDIMENT CONTROL WILL BE STRICTLY ENFORCED

FOR EROSION AND SEDIMENT CONTROL ONLY.

COMPANY NAME

COMPANY NAME
COMPANY ADDRESS
CITY, STATE ZIP CODE
COMPANY PHONE NO. COMPANY FAX NO.

DESIGNED:	---
DRAWN:	---
CHECKED:	---
APPROVED:	---

REVISION NO.	REVISION DATE	DESCRIPTIONS

BWI THURGOOD MARSHALL OR MARTIN STATE LOGO

MARYLAND DEPARTMENT OF TRANSPORTATION
MARYLAND AVIATION ADMINISTRATION

OFFICE OF ENGINEERING AND CONSTRUCTION MANAGEMENT
DIVISION OF FACILITIES DESIGN

PROJECT TITLE:

SHEET TITLE: EROSION AND SEDIMENT CONTROL NOTES I

SCALE:

DATE: DATE

CONTRACT NO.:

SHEET NO.:

PATH/FILENAME

STANDARD EROSION AND SEDIMENT CONTROL NOTES

1. THE CONTRACTOR SHALL NOTIFY THE ADMINISTRATION (WMA) AT (410) 537-3510 SEVEN (7) DAYS BEFORE COMMENCING ANY LAND DISTURBING ACTIVITY AND, UNLESS WAIVED BY THE ADMINISTRATION, SHALL BE REQUIRED TO HOLD A PRE-CONSTRUCTION MEETING BETWEEN PROJECT REPRESENTATIVES AND A REPRESENTATIVE OF WMA.

2. THE CONTRACTOR MUST NOTIFY WMA IN WRITING AND BY TELEPHONE AT THE FOLLOWING POINTS:

   A. THE REQUIRED PRE-CONSTRUCTION MEETING.

   B. FOLLOWING INSTALLATION OF SEDIMENT CONTROL MEASURES.

   C. DURING THE INSTALLATION OF SEDIMENT BASINS (TO BE CONVERTED INTO PERMANENT STORMWATER MANAGEMENT STRUCTURES) AT THE REQUIRED INSPECTION POINTS (SEE INSPECTION CHECKLIST ON PLAN). NOTIFICATION PRIOR TO COMMENCING CONSTRUCTION OF EACH STEP IS MANDATORY.

   D. PRIOR TO REMOVAL OR MODIFICATION OF ANY SEDIMENT CONTROL STRUCTURE(S).

   E. PRIOR TO REMOVAL OF ALL SEDIMENT CONTROL DEVICES.

   F. PRIOR TO FINAL ACCEPTANCE.

3. THE CONTRACTOR SHALL CONSTRUCT ALL EROSION AND SEDIMENT CONTROL MEASURES PER THE APPROVED PLAN AND CONSTRUCTION SEQUENCE AND SHALL HAVE THEM INSPECTED AND APPROVED BY THE AGENCY INSPECTOR OR WMA INSPECTOR PRIOR TO BEGINNING ANY OTHER LAND DISTURBANCES. MINOR SEDIMENT CONTROL DEVICE LOCATION ADJUSTMENTS MAY BE MADE IN THE FIELD WITH THE APPROVAL OF THE WMA INSPECTOR. THE CONTRACTOR SHALL ENSURE THAT ALL RUNOFF FROM DISTURBED AREAS IS DIRECTED TO THE SEDIMENT CONTROL DEVICES, AND SHALL NOT REMOVE ANY EROSION OR SEDIMENT CONTROL MEASURE WITHOUT PRIOR PERMISSION FROM WMA INSPECTOR AND AGENCY INSPECTOR. THE CONTRACTOR MUST OBTAIN PRIOR AGENCY AND WMA APPROVAL FOR CHANGES TO THE SEDIMENT CONTROL PLAN AND/OR SEQUENCE OF CONSTRUCTION.

4. THE CONTRACTOR SHALL PROTECT ALL POINTS OF CONSTRUCTION INGRESS AND EGRESS TO PREVENT THE DEPOSITION OF MATERIALS ONTO PUBLIC ROADS. ALL MATERIALS DEPOSITED ONTO PUBLIC ROADS SHALL BE REMOVED IMMEDIATELY.

5. THE CONTRACTOR SHALL INSPECT DAILY AND MAINTAIN CONTINUOUSLY IN AN EFFECTIVE OPERATING CONDITION ALL EROSION AND SEDIMENT CONTROL MEASURES UNTIL SUCH TIMES AS THEY ARE REMOVED WITH PRIOR PERMISSION FROM WMA INSPECTOR AND AGENCY INSPECTOR.

6. ALL SEDIMENT BASINS, TRAP EMBANKMENTS AND SLOPES, PERIMETER DIKES, SWALES, AND ALL DISTURBED SLOPES STEEPER OR EQUAL TO 3:1 SHALL BE STABILIZED WITH SOD OR SEED AND ANCHORED STRAW MULCH, OR OTHER APPROVED STABILIZATION MEASURES, AS SOON AS POSSIBLE BUT NO LATER THAN SEVEN (7) CALENDAR DAYS AFTER ESTABLISHMENT. ALL AREAS DISTURBED OUTSIDE OF THE PERIMETER SEDIMENT CONTROL SYSTEM MUST BE MINIMIZED. MAINTENANCE MUST BE PERFORMED AS NECESSARY TO ENSURE CONTINUED STABILIZATION. (REQUIREMENT FOR STABILIZATION MAY BE REDUCED TO THREE (3) DAYS FOR SENSITIVE AREAS.)

7. THE CONTRACTOR SHALL APPLY SOD OR SEED AND ANCHORED STRAW MULCH, OR OTHER APPROVED STABILIZATION MEASURES TO ALL DISTURBED AREAS AND STOCKPILES WITHIN FOURTEEN (14) CALENDAR DAYS AFTER STRIPPING AND GRADING ACTIVITIES HAVE CEASED IN THE AREA. MAINTENANCE SHALL BE PERFORMED AS NECESSARY TO ENSURE CONTINUED STABILIZATION. (REQUIREMENT MAY BE REDUCED TO SEVEN (7) DAYS FOR SENSITIVE AREAS.)

8. PRIOR TO REMOVAL OF SEDIMENT CONTROL MEASURES, THE CONTRACTOR SHALL STABILIZE AND HAVE ESTABLISHED PERMANENT STABILIZATION FOR ALL CONTRIBUTORY DISTURBED AREAS USING SOD OR AN APPROVED PERMANENT SEED MIXTURE WITH REQUIRED SOIL AMENDMENTS AND AN APPROVED ANCHOR MULCH. WOOD FIBER MULCH MAY ONLY BE USED IN SEEDING SEASON WHERE THE SLOPE DOES NOT EXCEED 10% AND GRADING HAS BEEN DONE TO PROMOTE SHEET FLOW DRAINAGE. AREAS BROUGHT TO FINISHED GRADE DURING THE SEEDING SEASON SHALL BE PERMANENTLY STABILIZED AS SOON AS POSSIBLE, BUT NO LATER THAN FOURTEEN (14) CALENDAR DAYS AFTER ESTABLISHMENT. WHEN PROPERTY IS BROUGHT TO FINISHED GRADE DURING THE MONTHS OF NOVEMBER THROUGH FEBRUARY, AND PERMANENT STABILIZATION IS FOUND TO BE IMPRACTICAL, TEMPORARY SEED AND ANCHORED STRAW MULCH SHALL BE APPLIED TO DISTURBED AREAS. THE FINAL PERMANENT STABILIZATION OF SUCH PROPERTY SHALL BE APPLIED BY MARCH 15 OR EARLIER IF GROUND AND WEATHER CONDITIONS ALLOW.

9. THE SITE'S APPROVAL LETTER, APPROVED EROSION AND SEDIMENT CONTROL PLANS, DAILY LOG BOOKS, AND TEST REPORTS SHALL BE AVAILABLE AT THE SITE FOR INSPECTION BY DULY AUTHORIZED OFFICIALS OF WMA AND AGENCY RESPONSIBLE FOR PROJECT.

10. SURFACE DRAINAGE FLOWS OVER UNSTABILIZED CUT AND FILL SLOPES SHALL BE CONTROLLED BY EITHER PREVENTING DRAINAGE FLOWS FROM TRAVERSING THE SLOPES OR BY INSTALLING PROTECTIVE DEVICES TO LOWER THE WATER DOWNSLOPE WITHOUT CAUSING EROSION. DIKES SHALL BE INSTALLED AND MAINTAINED AT THE TOP OF A CUT OR FILL SLOPE UNTIL THE SLOPE AND DRAINAGE AREA TO IT ARE FULLY STABILIZED, AT WHICH TIME THEY MUST BE REMOVED AND FINAL GRADING DONE TO PROMOTE SHEET FLOW DRAINAGE. PROTECTIVE METHODS MUST BE PROVIDED AT POINTS OF CONCENTRATED FLOW WHERE EROSION IS LIKELY TO OCCUR.

11. PERMANENT SWALES OR OTHER POINTS OF CONCENTRATED WATER FLOW SHALL BE STABILIZED WITH SOD OR SEED WITH AN APPROVED EROSION CONTROL MATTING, RIPRAP OR OTHER APPROVED STABILIZATION MEASURES.

12. TEMPORARY SEDIMENT CONTROL DEVICES MAY BE REMOVED, WITH PERMISSION OF WMA INSPECTOR AND AGENCY INSPECTORS, WITHIN THIRTY (30) CALENDAR DAYS FOLLOWING ESTABLISHMENT OF PERMANENT STABILIZATION IN ALL CONTRIBUTORY DRAINAGE AREAS. STORMWATER MANAGEMENT STRUCTURES USED TEMPORARILY FOR SEDIMENT CONTROL SHALL BE CONVERTED TO THE PERMANENT CONFIGURATION WITHIN THIS TIME PERIOD AS WELL.

13. NO PERMANENT CUT OR FILL SLOPE WITH A GRADIENT STEEPER THAN 3:1 WILL BE PERMITTED IN LAWN MAINTENANCE AREAS. A SLOPE GRADIENT OF UP TO 2:1 WILL BE PERMITTED IN NON-MAINTENANCE AREAS PROVIDED THAT THOSE AREAS ARE INDICATED ON THE EROSION AND SEDIMENT CONTROL PLAN WITH A LOW-MAINTENANCE GROUND COVER SPECIFIED FOR PERMANENT STABILIZATION. SLOPE GRADIENT STEEPER THAN 2:1 WILL NOT BE PERMITTED WITH VEGETATIVE STABILIZATION.

14. FOR FINISHED GRADING, THE CONTRACTOR SHALL PROVIDE ADEQUATE GRADIENTS TO PREVENT THE WATER FROM PONDING FOR MORE THAN TWENTY-FOUR (24) HOURS AFTER THE END OF A RAINFALL EVENT. DRAINAGE COURSES AND SWALE FLOW AREAS, MAY TAKE AS LONG AS FOURTY-EIGHT (48) HOURS AFTER THE END OF A RAINFALL EVENT TO DRAIN. AREAS DESIGNED TO HAVE STANDING WATER SHALL NOT BE REQUIRED TO MEET THIS REQUIREMENT.

15. SEDIMENT TRAPS OR BASINS ARE NOT PERMITTED WITHIN 20 FEET OF A FOUNDATION WHICH IS EXISTING OR UNDER CONSTRUCTION. NO STRUCTURE MAY BE CONSTRUCTED WITHIN 20 FEET OF AN ACTIVE SEDIMENT TRAP OR BASIN.

16. THE WMA INSPECTOR HAS THE OPTION OF REQUIRING ADDITIONAL SAFETY OR SEDIMENT CONTROL MEASURES, IF DEEMED NECESSARY.

17. ALL TRAP DEPTH DIMENSIONS ARE RELATIVE TO THE OUTLET ELEVATION. ALL TRAPS MUST HAVE A STABLE OUTFALL. ALL TRAPS AND BASINS SHALL HAVE STABLE INFLOW POINTS.

18. VEGETATIVE STABILIZATION SHALL BE PERFORMED IN ACCORDANCE WITH THE STANDARDS AND SPECIFICATIONS FOR SOIL EROSION AND SEDIMENT CONTROL. REFER TO APPROPRIATE SPECIFICATIONS FOR TEMPORARY SEEDING, PERMANENT SEEDING, MULCHING, SODDING, AND GROUND COVERS.

19. SEDIMENT SHALL BE REMOVED AND THE TRAP OR BASIN RESTORED TO ITS ORIGINAL DIMENSIONS WHEN SEDIMENT HAS ACCUMULATED TO ONE QUARTER OF THE TOTAL DEPTH OF THE TRAP OR BASIN. TOTAL DEPTH SHALL BE MEASURED FROM THE TRAP OR BASIN BOTTOM TO THE CREST OF THE OUTLET.

20. SEDIMENT REMOVED FROM TRAPS (AND BASINS) SHALL BE PLACED AND STABILIZED IN APPROVED AREAS, BUT NOT WITHIN A FLOODPLAIN, WETLAND OR TREE-SAVE AREA. WHEN PUMPING SEDIMENT LADEN WATER, THE DISCHARGE MUST BE DIRECTED TO A SEDIMENT TRAPPING DEVICE PRIOR TO RELEASE FROM THE SITE. A SUMP PIT MAY BE USED IF SEDIMENT TRAPS THEMSELVES ARE BEING PUMPED OUT.

21. ALL WATER REMOVED FROM EXCAVATED AREAS (E.G. UTILITY TRENCHES) SHALL BE PASSED THROUGH AN APPROVED DEWATERING PRATICE OR PUMPED TO A SEDIMENT TRAP OR BASIN PRIOR TO DISCHARGE FROM THE SITE (I.E. VIA FUNCTIONAL STORM DRAIN SYSTEM OR TO STABLE GROUND SURFACE).

22. SEDIMENT CONTROL FOR UTILITY CONSTRUCTION FOR AREAS OUTSIDE OF DESIGNED CONTROLS OR AS DIRECTED BY ENGINEER OR WMA INSPECTOR:

   A. CALL "MISS UTILITY" AT 1-800-257-7777 48 HOURS PRIOR TO THE START OF WORK.

   B. EXCAVATED TRENCH MATERIAL SHALL BE PLACED ON THE HIGH SIDE OF THE TRENCH.

   C. TRENCHES FOR UTILITY INSTALLATION SHALL BE BACKFILED, COMPACTED AND STABILIZED AT THE END OF EACH WORKING DAY. NO MORE TRENCH SHALL BE OPENED THAN CAN BE COMPLETED THE SAME DAY, UNLESS;

   D. TEMPORARY SILT FENCE SHALL BE PLACED IMMEDIATELY DOWNSTREAM OF ANY DISTURBED AREA INTENDED TO REMAIN DISTURBED FOR MORE THAN ONE DAY.

23. WHERE DEEMED APPROPRIATE BY THE ENGINEER OR INSPECTOR, SEDIMENT BASINS AND TRAPS MAY NEED TO BE SURROUNDED WITH AN APPROVED SAFETY FENCE. THE FENCE MUST CONFORM TO LOCAL ORDINANCES AND REGULATIONS. THE DEVELOPER OR OWNER SHALL CHECK WITH LOCAL BUILDING OFFICIALS ON APPLICABLE SAFETY REQUIREMENTS. WHERE SAFETY FENCE IS DEEMED APPROPRIATE AND LOCAL ORDINANCES DO NOT SPECIFY FENCING SIZES AND TYPES, THE FOLLOWING SHALL BE USED AS A MINIMUM STANDARD: THE SAFETY FENCE MUST BE MADE OF WELDED WIRE AND AT LEAST 42 INCHES HIGH, HAVE POSTS SPACED NO FURTHER APART THAN 8 FEET, HAVE MESH OPENINGS NO GREATER THAN 2 INCHES IN WIDTH AND 4 INCHES IN HEIGHT WITH A MINIMUM OF 14 GAUGE WIRE. SAFETY FENCE MUST BE MAINTAINED AND IN GOOD CONDITION AT ALL TIMES.

24. OFF-SITE SPOIL OR BORROW AREAS ON STATE OF FEDERAL PROPERTY MUST HAVE PRIOR APPROVAL BY WMA AND OTHER APPLICABLE STATE, FEDERAL, AND LOCAL AGENCIES; OTHERWISE APPROVAL MUST BE GRANTED BY THE LOCAL AUTHORITIES. ALL WASTE AND BORROW AREAS OFF-SITE MUST BE PROTECTED BY SEDIMENT CONTROL MEASURES AND STABILIZED.

25. SITES WHERE INFILTRATION DEVICES ARE USED FOR THE CONTROL OF STORMWATER, EXTREME CARE MUST BE TAKEN TO PREVENT RUNOFF FROM UNSTABILIZED AREAS FROM ENTERING THE STRUCTURE DURING CONSTRUCTION. SEDIMENT CONTROL DEVICES PLACED IN INFILTRATION AREAS MUST HAVE BOTTOM ELEVATIONS AT LEAST TWO (2) FEET HIGHER THAN THE FINISH GRADE BOTTOM ELEVATION OF THE INFILTRATION PRACTICE. WHEN CONVERTING A SEDIMENT TRAP TO AN INFILTRATION DEVICE, ALL ACCUMULATED SEDIMENT MUST BE REMOVED AND DISPOSED OF PRIOR TO FINAL GRADING OF INFILTRATION DEVICE.

26. WHEN A STORM DRAIN SYSTEM OUTFALL IS DIRECTED TO A SEDIMENT TRAP OR SEDIMENT BASIN AND THE SYSTEM IS TO BE USED FOR TEMPORARILY CONVEYING SEDIMENT LADEN WATER, ALL STORM DRAIN INLETS IN NON-SUMP AREAS SHALL HAVE TEMPORARY ASPHALT BERMS CONSTRUCTED AT THE TIME OF BASE PAVING TO DIRECT GUTTER FLOW INTO THE INLETS TO AVOID SURCHARGING AND OVERFLOW OF INLETS IN SUMP AREAS.

27. SITE INFORMATION:

A.	TOTAL AREA OF FACILITY	(CONSULTANT TO FILL IN)
B.	TOTAL AREA OF PROJECT SITE	(CONSULTANT TO FILL IN)
C.	AREA DISTURBED	(CONSULTANT TO FILL IN)
D.	AREA TO BE ROOFED OR PAVED	(CONSULTANT TO FILL IN)
E.	TOTAL CUT	(CONSULTANT TO FILL IN)
F.	TOTAL FILL	(CONSULTANT TO FILL IN)
G.	OFF-SITE WASTE/BORROW AREA LOCATION	(CONSULTANT TO FILL IN OR QUOTE TO BE DETERMINED)

DESIGN CERTIFICATION

I HEREBY CERTIFY THAT THIS PLAN HAS BEEN DESIGNED IN ACCORDANCE WITH THE 1994 MARYLAND STANDARDS AND SPECIFICATIONS FOR SOIL EROSION AND SEDIMENT CONTROL, THE 2000 MARYLAND STORMWATER DESIGN MANUAL, VOLUMES I & II AND THE MARYLAND DEPARTMENT OF THE ENVIRONMENT EROSION AND SEDIMENT CONTROL AND STORMWATER MANAGEMENT REGULATIONS.

Date _____ Designer's Signature _____

Md. Registration No.
P.E., R.L.S. OR R.L.A. (Circle) _____ Printed Name _____

STANDARD STABILIZATION NOTE

FOLLOWING INITIAL SOIL DISTURBANCE OR REDISTURBANCE, PERMANENT OR TEMPORARY STABILIZATION SHALL BE COMPLETED WITHIN SEVEN (7) CALENDAR DAYS AS TO THE SURFACE OF ALL PERIMETER CONTROLS, DIKES, SWALES, DITCHES, PERIMETER SLOPES, AND ALL SLOPES GREATER THAN 3 HORIZONTAL TO 1 VERTICAL (3:1); AND FOURTEEN (14) DAYS AS TO ALL OTHER DISTURBED OR GRADED AREAS ON THE PROJECT SITE.

OWNER'S/DEVELOPER'S CERTIFICATION

I/WE HEREBY CERTIFY THAT ALL CLEARING, GRADING, CONSTRUCTION, AND/OR DEVELOPMENT WILL BE DONE PURSUANT TO THIS PLAN AND THAT ANY RESPONSIBLE PERSONNEL INVOLVED IN THE CONSTRUCTION PROJECT WILL HAVE A CERTIFICATE OR ATTENDANCE AT A MARYLAND DEPARTMENT OF THE ENVIRONMENT APPROVED TRAINING PROGRAM FOR THE CONTROL OF EROSION AND SEDIMENT BEFORE BEGINNING THE PROJECT. I HEREBY AUTHORIZE THE RIGHT OF ENTRY FOR PERIODIC ON-SITE EVALUATION BY STATE OF MARYLAND, DEPARTMENT OF THE ENVIRONMENT, COMPLIANCE INSPECTORS.

Date _____ Owner/Developer Signature _____

Card No. _____ Printed Name and Title _____

STORMWATER MANAGEMENT "AS-BUILT" CERTIFICATION

I HEREBY CERTIFY THAT THE STORMWATER MANAGEMENT FACILITY (FACILITITES) SHOWN ON THE PLANS AND INDIVIDUALLY IDENTIFIED BELOW HAS (HAVE) BEEN CONSTRUCTED IN ACCORDANCE WITH THE PLANS INCLUDED UNDER THE MARYLAND DEPARTMENT OF THE ENVIRONMENT APPROVAL, NUMBER __-SF-_____. EXCEPT AS NOTED IN RED ON THE "AS-BUILT" DRAWINGS. FURTHERMORE, THE RED-NOTED EXCEPTIONS DO NOT ADVERSELY AFFECT THE INTENDED PERFORMANCE OF THE FACILITY (FACILITIES).

_____ _____

_____ _____

_____ _____

FACILITY IDENTIFICATION (IDENTIFY EACH FACILITY INDIVIDUALLY)

_____ _____

NAME (PRINTED) SIGNATURE

_____ _____

MARYLAND REGISTRATION NUMBER DATE

"CERTIFY" means to state or declare a professional opinion based on sufficient and appropriate onsite inspections and material tests conducted during construction.

EROSION AND SEDIMENT CONTROL SEQUENCE OF CONSTRUCTION

REFER TO THE STANDARD EROSION AND SEDIMENT CONTROL NOTES FOR THE INITIAL SEQUENCE OF OPERATION ITEMS NOT SPECIFICALLY IDENTIFIED IN THE SEQUENCE OF CONSTRUCTION BELOW, IN ADDITION TO CONSTRUCTION PHASING PLANS.

1. NOTIFY MDE WMA COMPLIANCE INSPECTOR AT (410) 537-3510 AT LEAST SEVEN (7) DAYS PRIOR TO BEGINNING EARTH DISTURBANCE TO SCHEDULE A PRE-CONSTRUCTION MEETING.
2. THE LIMITS OF DISTURBANCE MUST BE FIELD MARKED PRIOR TO CLEARING OF TREES, INSTALLATION OF SEDIMENT CONTROL MEASURES, CONSTRUCTION, OR OTHER LAND DISTURBING ACTIVITIES.
3. THE CONTRACTOR MUST OBTAIN APPROVAL FROM THE MDE INSPECTOR, CERTIFYING THAT THE LIMITS OF DISTURBANCE AND TREE PROTECTION MEASURES ARE CORRECTLY MARKED AND INSTALLED PRIOR TO COMMENCING ANY CLEARING.

INITIAL PHASE

1. CLEAR AND GRADE FOR INSTALLATION OF SEDIMENT CONTROL DEVICES.
2. INSTALL INITIAL SEDIMENT CONTROL DEVICES. INSTALL **(CONSULTANT TO LIST DEVICES USED ON PLANS HERE)**
3. ONCE THE SEDIMENT CONTROL DEVICES ARE INSTALLED, THE CONTRACTOR MUST OBTAIN WRITTEN APPROVAL FROM THE MDE INSPECTOR BEFORE PROCEEDING WITH ANY ADDITIONAL GRADING OR CONSTRUCTION.
4. **(CONSULTANT TO ESTABLISH SEQUENCING HERE)**
5. THE CONTRACTOR SHALL OBTAIN WRITTEN APPROVAL FROM MDE INSPECTOR, PRIOR TO THE REMOVAL OF ANY SEDIMENT CONTROL DEVICE.
6. STABILIZE ALL REMAINING DISTURBED AREAS. REMOVE REMAINING SEDIMENT CONTROL DEVICES UPON FINAL APPROVAL OF THE MDE INSPECTOR.

FINAL PHASE (IF REQUIRED)

1. THE LIMITS OF DISTURBANCE MUST BE FIELD MARKED PRIOR TO CLEARING OF TREES, INSTALLATION OF SEDIMENT CONTROL MEASURES, CONSTRUCTION, OR OTHER LAND DISTURBING ACTIVITIES.
2. THE CONTRACTOR MUST OBTAIN APPROVAL FROM THE MDE INSPECTOR, CERTIFYING THAT THE LIMITS OF DISTURBANCE AND TREE PROTECTION MEASURES ARE CORRECTLY MARKED AND INSTALLED PRIOR TO COMMENCING ANY CLEARING.
3. WITH THE APPROVAL OF THE MDE INSPECTOR, CLEAR AND GRADE FOR INSTALLATION OF SEDIMENT CONTROL DEVICES.
4. INSTALL INITIAL SEDIMENT CONTROL DEVICES. INSTALL **(CONSULTANT TO LIST DEVICES USED ON PLANS HERE)**
5. ONCE THE SEDIMENT CONTROL DEVICES ARE INSTALLED, THE CONTRACTOR MUST OBTAIN WRITTEN APPROVAL FROM THE MDE INSPECTOR BEFORE PROCEEDING WITH ANY ADDITIONAL GRADING OR CONSTRUCTION.
6. **(CONSULTANT TO ESTABLISH SEQUENCING HERE)**
7. THE CONTRACTOR SHALL OBTAIN WRITTEN APPROVAL FROM MDE INSPECTOR, PRIOR TO THE REMOVAL OF ANY SEDIMENT CONTROL DEVICE.
8. STABILIZE ALL REMAINING DISTURBED AREAS. REMOVE REMAINING SEDIMENT CONTROL DEVICES UPON FINAL APPROVAL OF THE MDE INSPECTOR.

MDE NO. XX-SF-XXXX
NOTE TO CONTRACTOR:
SEDIMENT CONTROL WILL BE STRICTLY ENFORCED

FOR EROSION AND SEDIMENT CONTROL ONLY.

COMPANY NAME

COMPANY NAME
COMPANY ADDRESS
CITY, STATE ZIP CODE
COMPANY PHONE NO. COMPANY FAX NO.

DESIGNED: ---
DRAWN: ---
CHECKED: ---
APPROVED: ---

REVISION NO.	REVISION DATE	DESCRIPTIONS

BWI THURGOOD MARSHALL OR MARTIN STATE LOGO

MARYLAND DEPARTMENT OF TRANSPORTATION
MARYLAND AVIATION ADMINISTRATION

OFFICE OF ENGINEERING AND CONSTRUCTION MANAGEMENT
DIVISION OF FACILITIES DESIGN

PROJECT TITLE:

SHEET TITLE: EROSION AND SEDIMENT CONTROL NOTES II

SCALE:

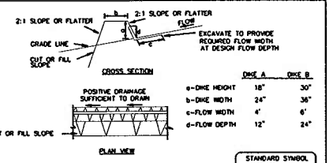
DATE: DATE

CONTRACT NO.:

SHEET NO.:

PATH/FILENAME

DETAIL 1 - EARTH DIKE



	DIKE A	DIKE B
a-DIKE HEIGHT	18"	30"
b-DIKE WIDTH	24"	36"
c-FLOW WIDTH	4'	6'
d-FLOW DEPTH	12"	24"

STANDARD SYMBOL: A-2 B-3

FLOW CHANNEL STABILIZATION
GRADE 0.5% MIN. 10% MAX.

1. SEED AND COVER WITH STRAW MULCH.
2. SEED AND COVER WITH EROSION CONTROL MATTING OR LINE WITH SOD.
3. 4" - 7" STONE OR RECYCLED CONCRETE EQUIVALENT PRESSED INTO THE SOIL 7" MINIMUM

CONSTRUCTION SPECIFICATIONS

1. ALL TEMPORARY EARTH DIKES SHALL HAVE UNINTERRUPTED POSITIVE GRADE TO AN OUTLET. SPOT ELEVATIONS MAY BE NECESSARY FOR GRADES LESS THAN 1%.
2. RUNOFF DIVERTED FROM A DISTURBED AREA SHALL BE CONVEYED TO A SEDIMENT TRAPPING DEVICE.
3. RUNOFF DIVERTED FROM AN UNDISTURBED AREA SHALL OUTLET DIRECTLY INTO AN UNDISTURBED, STABILIZED AREA AT A NON-EROSIVE VELOCITY.
4. ALL TREES, BRUSH, STUMPS, OBSTRUCTIONS, AND OTHER OBJECTIONAL MATERIAL SHALL BE REMOVED AND DISPOSED OF SO AS NOT TO INTERFERE WITH THE PROPER FUNCTIONING OF THE DIKE.
5. THE DIKE SHALL BE EXCAVATED OR SHAPED TO LINE, GRADE AND CROSS SECTION AS REQUIRED TO MEET THE CRITERIA SPECIFIED HEREIN AND BE FREE OF BANK PROJECTIONS OR OTHER IRREGULARITIES WHICH WILL IMPEDE NORMAL FLOW.
6. FILL SHALL BE COMPACTED BY EARTH MOVING EQUIPMENT.
7. ALL EARTH REMOVED AND NOT NEEDED FOR CONSTRUCTION SHALL BE PLACED SO THAT IT WILL NOT INTERFERE WITH THE FUNCTIONING OF THE DIKE.
8. INSPECTION AND MAINTENANCE MUST BE PROVIDED PERIODICALLY AND AFTER EACH RAIN EVENT.

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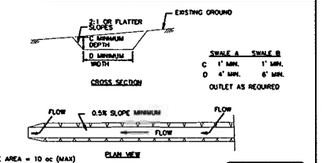
DETAIL 2 - TEMPORARY SWALE



	SWALE A	SWALE B
C	1' MIN.	1' MIN.
D	4' MIN.	6' MIN.

OUTLET AS REQUIRED

DRAINAGE AREA = 10 ac (MAX)
SLOPE = 10% (MAX)

FLOW CHANNEL STABILIZATION
GRADE 0.5% MIN. 10% MAX.

STANDARD SYMBOL: A - 2 / B - 3

1. SEED AND COVER WITH STRAW MULCH.
2. SEED AND COVER WITH EROSION CONTROL MATTING OR LINE WITH SOD.
3. 4"-7" STONE OR RECYCLED CONCRETE EQUIVALENT PRESSED INTO SOIL IN A MINIMUM 7" LAYER.

CONSTRUCTION SPECIFICATIONS

1. ALL TEMPORARY SWALES SHALL HAVE UNINTERRUPTED POSITIVE GRADE TO AN OUTLET. SPOT ELEVATIONS MAY BE NECESSARY FOR GRADES LESS THAN 1%.
2. RUNOFF DIVERTED FROM A DISTURBED AREA SHALL BE CONVEYED TO A SEDIMENT TRAPPING DEVICE.
3. RUNOFF DIVERTED FROM AN UNDISTURBED AREA SHALL OUTLET DIRECTLY INTO AN UNDISTURBED STABILIZED AREA AT A NON-EROSIVE VELOCITY.
4. ALL TREES, BRUSH, STUMPS, OBSTRUCTIONS, AND OTHER OBJECTIONAL MATERIAL SHALL BE REMOVED AND DISPOSED OF SO AS NOT TO INTERFERE WITH THE PROPER FUNCTIONING OF THE SWALE.
5. THE SWALE SHALL BE EXCAVATED OR SHAPED TO LINE, GRADE AND CROSS SECTION AS REQUIRED TO MEET THE CRITERIA SPECIFIED HEREIN AND BE FREE OF BANK PROJECTIONS OR OTHER IRREGULARITIES WHICH WILL IMPEDE NORMAL FLOW.
6. FILL, IF NECESSARY, SHALL BE COMPACTED BY EARTH MOVING EQUIPMENT.
7. ALL EARTH REMOVED AND NOT NEEDED FOR CONSTRUCTION SHALL BE PLACED SO THAT IT WILL NOT INTERFERE WITH THE FUNCTIONING OF THE SWALE.
8. INSPECTION AND MAINTENANCE MUST BE PROVIDED PERIODICALLY AND AFTER EACH RAIN EVENT.

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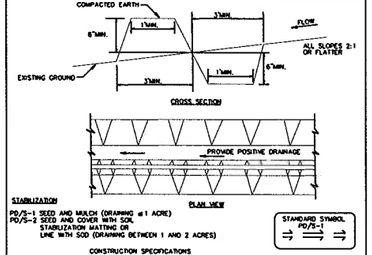
DETAIL 3 - PERIMETER DIKE / SWALE



STABILIZATION

PD/S-1 SEED AND MULCH (DRAWING at 1 ACRE)
PD/S-2 SEED AND COVER WITH SOD, STABILIZATION MATTING OR LINE WITH SOD (DRAWING BETWEEN 1 AND 2 ACRES)

STANDARD SYMBOL: PD/S-1

1. ALL PERIMETER DIKE/SWALES SHALL HAVE AN UNINTERRUPTED POSITIVE GRADE TO AN OUTLET. SPOT ELEVATIONS MAY BE NECESSARY FOR GRADES LESS THAN 1%.
2. RUNOFF DIVERTED FROM A DISTURBED AREA SHALL BE CONVEYED TO A SEDIMENT TRAPPING DEVICE.
3. RUNOFF DIVERTED FROM AN UNDISTURBED AREA SHALL OUTLET INTO AN UNDISTURBED STABILIZED AREA AT A NON-EROSIVE VELOCITY.
4. THE SWALE SHALL BE EXCAVATED OR SHAPED TO LINE, GRADE, AND CROSS-SECTION AS REQUIRED TO MEET THE CRITERIA SPECIFIED IN THE STANDARD.
5. FILL SHALL BE COMPACTED BY EARTH MOVING EQUIPMENT.
6. STABILIZATION WITH SEED AND MULCH OR AS SPECIFIED OF THE AREA DISTURBED BY THE DIKE AND SWALE SHALL BE COMPLETED WITHIN 7 DAYS UPON REMOVAL.
7. INSPECTION AND REQUIRED MAINTENANCE SHALL BE PROVIDED AFTER EACH RAIN EVENT.

NOTE: THE MAXIMUM DRAINAGE AREA FOR THIS PRACTICE IS 2 ACRES.

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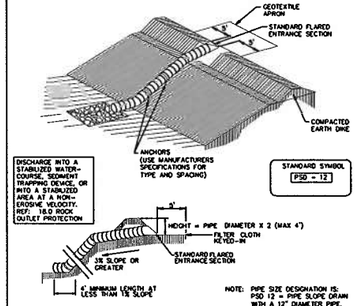
DETAIL 4 - PIPE SLOPE DRAIN



STANDARD SYMBOL: PSD - 12

NOTE: PIPE SIZE DESIGNATION IS: PSD 12 = PIPE SLOPE DRAIN WITH A 12" DIAMETER PIPE.

TABLE 6 DESIGN CRITERIA FOR PIPE SLOPE DRAIN

SIZE	PIPE/TUBING DIAMETER (D) IN	MAXIMUM DRAINAGE AREA (ACRES)
PSD-12	12	0.5
PSD-18	18	1.5
PSD-21	21	2.5
PSD-24	24	3.5
PSD-24 (2)	24	5.0

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PIPE SLOPE DRAIN

CONSTRUCTION SPECIFICATIONS - PIPE SLOPE DRAIN

1. THE PIPE SLOPE DRAIN (PSD) SHALL HAVE A SLOPE OF 3 PERCENT OR STEEPER.
2. THE TOP OF THE EARTH DIKE OVER THE INLET PIPE SHALL BE AT LEAST 2 TIMES THE PIPE DIAMETER MEASURED AT THE INVERT OF THE PIPE.
3. FLEXIBLE TUBING IS PREFERRED. HOWEVER, CORRUGATED METAL PIPE OR EQUIVALENT PVC PIPE CAN BE USED. ALL CONNECTIONS SHALL BE WATERTIGHT.
4. A FLARED END SECTION SHALL BE ATTACHED TO THE INLET END OF PIPE WITH A WATERTIGHT CONNECTION. FILTER CLOTH SHALL BE PLACED UNDER THE INLET OF THE PIPE SLOPE DRAIN AND SHALL EXTEND OUT 5' FROM THE INLET. THE FILTER CLOTH SHALL BE "KEYED IN" ON ALL SIDES.
5. THE PIPE SLOPE DRAIN SHALL BE SECURELY ANCHORED TO THE SLOPE BY STAKING AT THE GROMMETS PROVIDED. SPACING FOR ANCHORS SHALL BE AS PROVIDED BY MANUFACTURER'S SPECIFICATION. IN NO CASE SHALL LESS THAN TWO (2) ANCHORS BE PROVIDED, EQUALLY SPACED ALONG THE LENGTH OF PIPE. THESE DETAILS SHOULD BE PROVIDED BY PIPE SUPPLIERS.
6. THE SOIL AROUND AND UNDER THE PIPE AND END SECTION SHALL BE HAND TAMPED IN 4 INCH LIFTS TO THE TOP OF THE EARTH DIKE.
7. ALL PIPE CONNECTIONS SHALL BE WATERTIGHT.
8. WHENEVER POSSIBLE WHERE A PSD DRAINS AN UNSTABILIZED AREA, IT SHALL OUTLET INTO A SEDIMENT TRAP OR BASIN. IF THIS IS NOT POSSIBLE THEN THE SLOPE DRAIN WILL DISCHARGE INTO A STABLE CONVEYANCE THAT LEADS TO A SEDIMENT TRAP OR BASIN. WHEN DISCHARGING INTO A TRAP OR BASIN THE PSD SHALL DISCHARGE AT THE SAME ELEVATION AS THE WET POOL ELEVATION. THE DISCHARGE FROM THE PSD MUST BE AS FAR AWAY FROM THE SEDIMENT CONTROL OUTLET AS POSSIBLE.
9. WHEN THE DRAINAGE AREA IS STABILIZED, THE PSD SHALL DISCHARGE ONTO STABILIZED AREA AT A NON-EROSIVE VELOCITY.
10. INSPECTION AND ANY REQUIRED MAINTENANCE SHALL BE PERFORMED PERIODICALLY AND AFTER EACH RAIN EVENT.
11. THE INLET MUST BE KEPT OPEN AT ALL TIMES.

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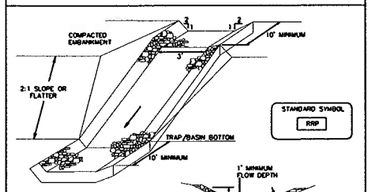
DETAIL 5 - RIP-RAP INFLOW PROTECTION



CONSTRUCTION SPECIFICATIONS

1. RIP-RAP LINED INFLOW CHANNELS SHALL BE 1' IN DEPTH, HAVE A TRAPEZOIDAL CROSS SECTION WITH 2:1 OR FLATTER SIDE SLOPES AND 3' (MIN.) BOTTOM WIDTH. THE CHANNEL SHALL BE LINED WITH 4" TO 12" RIP-RAP TO A DEPTH OF 18".
2. FILTER CLOTH SHALL BE INSTALLED UNDER ALL RIP-RAP. FILTER CLOTH SHALL BE GEOTEXTILE CLASS C.
3. ENTRANCE AND EXIT SECTIONS SHALL BE INSTALLED AS SHOWN ON THE DETAIL SECTION.
4. RIP-RAP USED FOR THE LINING MAY BE RECYCLED FOR PERMANENT OUTLET PROTECTION IF THE BASIN IS TO BE CONVERTED TO A STORMWATER MANAGEMENT FACILITY.
5. GABION INFLOW PROTECTION MAY BE USED IN LIEU OF RIP-RAP INFLOW PROTECTION.
6. RIP-RAP SHOULD BLEND INTO EXISTING GROUND.
7. RIP-RAP INFLOW PROTECTION SHALL BE USED WHERE THE SLOPE IS BETWEEN 6:1 AND 10:1. FOR SLOPES FLATTER THAN 10:1 USE EARTH DIKE OR TEMPORARY SWALE LINING CRITERIA.

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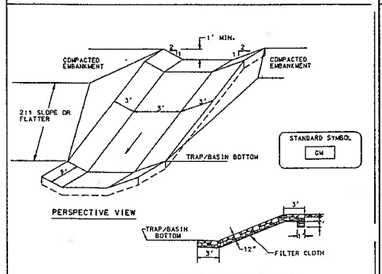
DETAIL 6 - GABION INFLOW PROTECTION



Construction Specifications

1. Gabion inflow protection shall be constructed of 9' x 3' x 9" gabion baskets forming a trapezoidal cross section 1' deep, with 2:1 side slopes, and a 3' bottom width.
2. Geotextile Class C shall be installed under all gabion baskets.
3. The stone used to fill the gabion baskets shall be 4" - 7".
4. Gabions shall be installed in accordance with manufacturers recommendations.
5. Gabion inflow Protection shall be used where concentrated flow is present on slopes steeper than 6%.

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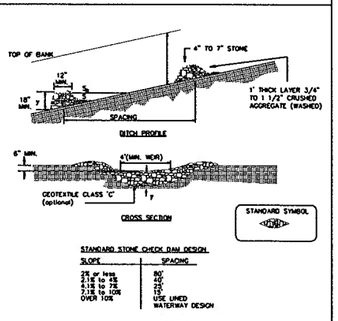
DETAIL 7 - STONE CHECK DAM



STANDARD SYMBOL: CD

STANDARD STONE CHECK DAM DESIGN

SLOPE	SPACING
2% or less	80'
2.1% to 5%	40'
5.1% to 7%	25'
7.1% to 10%	15'
OVER 10%	USE LINED WATERWAY DESIGN

CONSTRUCTION SPECIFICATIONS

1. SWALES AND DITCHES SHALL BE PREPARED IN ACCORDANCE WITH THE CONSTRUCTION SPECIFICATIONS DESCRIBED IN SECTION A-2, STANDARDS AND SPECIFICATIONS FOR TEMPORARY SWALE.
2. THE CHECK DAM SHALL BE CONSTRUCTED OF 4"-7" STONE. THE STONE SHALL BE PLACED SO THAT IT COMPLETELY COVERS THE WIDTH OF THE CHANNEL AND KEYED INTO THE CHANNEL BANKS.
3. THE TOP OF THE CHECK DAM SHALL BE CONSTRUCTED SO THE THE CENTER IS APPROXIMATELY 6" LOWER THAN THE OUTER EDGES, FORMING A WEIR THAT WATER CAN FLOW ACROSS.
4. THE MAXIMUM HEIGHT OF THE CHECK DAM AT THE CENTER SHALL NOT EXCEED 2'.
5. THE UPSTREAM SIDEOF THE CHECK DAM SHALL BE LINED WITH APPROXIMATELY 1' OF 3/4 " TO 1 1/2 " CRUSHED AGGREGATE.

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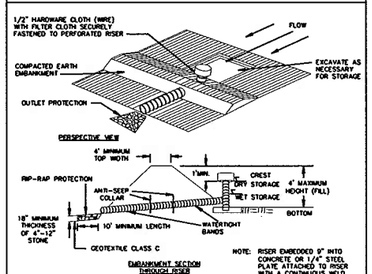
DETAIL 8 - PIPE OUTLET SEDIMENT TRAP - ST I



NOTE: RISER EMBEDDED 9" INTO CONCRETE OR 1/4" STEEL PLATE ATTACHED TO RISER WITH A CONTINUOUS WELD ON BOTTOM AND 2' OF STONE PLACED ON STEEL PLATE TWICE THE RISER DIAMETER (MIN.)

CONSTRUCTION SPECIFICATIONS

1. THE AREA UNDER THE EMBANKMENT SHALL BE CLEARED, GRUBBED AND STRIPPED OF ANY VEGETATION AND ROOT MAT. THE POOL AREA SHALL BE CLEARED.
2. THE FILL MATERIAL FOR THE EMBANKMENT SHALL BE FREE OF ROOTS OR OTHER WOODY VEGETATION AS WELL AS OVERSIZED STONES, ROCKS, ORGANIC MATERIAL, OR OTHER OBJECTIONABLE MATERIAL. THE EMBANKMENT SHALL BE COMPACTED BY TRAVERSING WITH EQUIPMENT WHILE IT IS BEING CONSTRUCTED.
3. THE TOTAL TRAP VOLUME AS MEASURED FROM THE BOTTOM TO RISER CREST ELEVATION SHALL BE 3600 CUBIC FEET PER ACRE OF DRAINAGE AREA (SEE TABLE 9). THE TOP OF EMBANKMENT MUST BE 2ft' ABOVE THE RISER CREST ELEVATION.
4. SEDIMENT SHALL BE REMOVED AND THE TRAP RESTORED TO ITS ORIGINAL DIMENSIONS WHEN THE SEDIMENT HAS ACCUMULATED TO ONE-HALF OF THE WET STORAGE DEPTH OF THE TRAP (9000ft'/AC). THE SEDIMENT SHALL BE DEPOSITED IN A SUITABLE AREA AND IN SUCH A MANNER THAT IT WILL NOT ERODE.
5. THE STRUCTURE SHALL BE INSPECTED PERIODICALLY AND AFTER EACH RAIN AND REPAIRS MADE AS NECESSARY.

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PIPE OUTLET SEDIMENT TRAP - ST I

6. CONSTRUCTION OPERATIONS SHALL BE CARRIED OUT IN SUCH A MANNER THAT EROSION AND WATER POLLUTION ARE ABATED. ONCE CONSTRUCTED, THE TOP AND OUTSIDE FACE OF THE EMBANKMENT SHALL BE STABILIZED WITH SEED AND MULCH. POINTS OF CONCENTRATED INFLOW SHALL BE PROTECTED IN ACCORDANCE WITH GRADE STABILIZATION STRUCTURE CRITERIA. THE REMAINDER OF THE INTERIOR SLOPES SHOULD BE STABILIZED (ONE TIME) WITH SEED AND MULCH UPON TRAP COMPLETION AND MONITORED AND MAINTAINED EROSION FREE DURING THE LIFE OF THE TRAP.
7. THE STRUCTURE SHALL BE REMOVED AND AREA STABILIZED WHEN THE DRAINAGE AREA HAS BEEN PROPERLY STABILIZED.
8. ALL CUT AND FILL SLOPES SHALL BE 2:1 OR FLATTER.
9. ALL PIPE CONNECTIONS SHALL BE WATERTIGHT.
10. ABOVE THE WET STORAGE ELEVATION, THE RISER SHALL BE PERFORATED WITH 1/2" WIDE BY 8" LONG SLITS OR 1" DIAMETER HOLES SPACED 8" VERTICALLY AND HORIZONTALLY. NO PERFORATIONS WILL BE ALLOWED WITHIN 6" OF THE HORIZONTAL BARREL.
11. THE RISER SHALL BE WRAPPED WITH 1/2" HARDWARE CLOTH (WIRE) THEN WRAPPED WITH GEOTEXTILE CLASS E. THE FILTER CLOTH SHALL EXTEND 8" ABOVE THE HIGHEST SLIT AND 8" BELOW THE LOWEST SLIT. WHERE ENDS OF FILTER CLOTH COME TOGETHER, THEY SHALL BE OVERLAPPED, FOLDED AND FASTENED TO PREVENT BYPASS. FILTER CLOTH SHALL BE REPLACED AS NECESSARY TO PREVENT CLOGGING.
12. STRAPS OR CONNECTING BANDS SHALL BE USED TO HOLD THE FILTER CLOTH AND WIRE FABRIC IN PLACE. THEY SHALL BE PLACED AT THE TOP AND BOTTOM OF THE CLOTH.
13. FILL MATERIAL AROUND THE PIPE SPILLWAY SHALL BE HAND COMPACTED IN 6" LAYERS. A MINIMUM OF 2' OF HAND-COMPACTED BACKFILL SHALL BE PLACED OVER THE PIPE SPILLWAY BEFORE CROSSING IT WITH CONSTRUCTION EQUIPMENT.
14. THE RISER SHALL BE ANCHORED WITH EITHER A CONCRETE BASE OR STEEL PLATE BASE TO PREVENT FLOTATION. CONCRETE BASES SHALL BE AT LEAST TWICE THE RISER DIAMETER AND 12" DEEP WITH THE RISER EMBEDDED 9". STEEL PLATE BASES SHALL BE AT LEAST TWICE THE RISER DIAMETER, 1/4" MINIMUM THICKNESS AND ATTACHED TO THE BOTTOM OF THE RISER BY A CONTINUOUS WELD TO FORM A WATERTIGHT CONNECTION. THEN PLACE 2' OF STONE, GRAVEL OR TAMPED EARTH ON THE PLATE.
15. ANTI SEEP COLLARS SHALL BE CONSTRUCTED IN ACCORDANCE WITH PLANS (REF. TABLE 18 AND DETAILS 13 AND 14).
16. CONCENTRIC TRASH RACK AND ANTI-VORTEX DEVICE DESIGN DETAILS ARE ON DETAIL 18.
17. REFER TO SECTION D FOR DEWATERING REQUIREMENTS OF SEDIMENT TRAPS.
18. OUTLET - AN OUTLET SHALL BE PROVIDED, WHICH INCLUDES A MEANS OF CONVEYING THE DISCHARGE IN AN EROSION FREE MANNER TO AN EXISTING STABLE CHANNEL.
19. WHERE DISCHARGE OCCURS AT THE PROPERTY LINE, LOCAL ORDINANCES AND DRAINAGE EASEMENT REQUIREMENTS SHALL BE MET.

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MDE NO. XX-SF-XXXX
NOTE TO CONTRACTOR:
SEDIMENT CONTROL WILL BE STRICTLY ENFORCED

FOR EROSION AND SEDIMENT CONTROL ONLY.

COMPANY NAME

COMPANY NAME
COMPANY ADDRESS
CITY, STATE ZIP CODE
COMPANY PHONE NO. COMPANY FAX NO.

DESIGNED: ---
DRAWN: ---
CHECKED: ---
APPROVED: ---

REVISION NO.	REVISION DATE	DESCRIPTIONS

BWI THURGOOD MARSHALL OR MARTIN STATE LOGO

MARYLAND DEPARTMENT OF TRANSPORTATION
MARYLAND AVIATION ADMINISTRATION

OFFICE OF ENGINEERING AND CONSTRUCTION MANAGEMENT
DIVISION OF FACILITIES DESIGN

PROJECT TITLE:

SHEET TITLE: EROSION AND SEDIMENT CONTROL DETAILS I

SCALE:

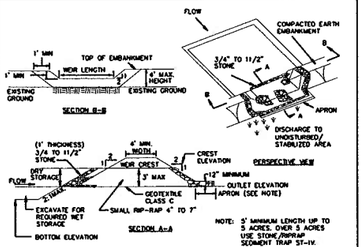
DATE: DATE

CONTRACT NO.:

SHEET NO.:

PATH/FILENAME

DETAIL 9 – STONE OUTLET SEDIMENT TRAP – ST II



CONSTRUCTION SPECIFICATIONS

1. AREA UNDER EMBANKMENT SHALL BE CLEARED, GRUBBED AND STRIPPED OF ANY VEGETATION AND ROOT MAT. THE POOL AREA SHALL BE CLEARED.
2. THE FILL MATERIAL FOR THE EMBANKMENT SHALL BE FREE OF ROOTS AND OTHER WOODY VEGETATION AS WELL AS OVER-SIZED STONES, ROCKS, ORGANIC MATERIAL OR OTHER OBJECTIONABLE MATERIAL. THE EMBANKMENT SHALL BE COMPACTED BY TRAVERSING WITH EQUIPMENT WHILE IT IS BEING CONSTRUCTED.
3. ALL CUT AND FILL SLOPES SHALL BE 2:1 OR FLATTER.
4. THE STONE USED IN THE OUTLET SHALL BE SMALL RIP-RAP 4" TO 7" IN SIZE WITH A 1' THICK LAYER OF 3/4" TO 1 1/2" WASHED AGGREGATE PLACED ON THE UPSTREAM FACE OF THE OUTLET. STONE FACING SHALL BE AS NECESSARY TO PREVENT CLOGGING. GEOTEXTILE CLASS C MAY BE SUBSTITUTED FOR THE STONE FACING BY PLACING IT ON THE INSIDE FACE OF THE STONE OUTLET.
5. SEDIMENT SHALL BE REMOVED AND TRAP RESTORED TO ITS ORIGINAL DIMENSIONS WHEN THE SEDIMENT HAS ACCUMULATED TO ONE HALF OF THE WET STORAGE DEPTH OF THE TRAP. REMOVED SEDIMENT SHALL BE DEPOSITED IN A SUITABLE AREA AND IN SUCH A MANNER THAT IT WILL NOT ERODE.

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STONE OUTLET SEDIMENT TRAP – ST II

6. THE STRUCTURE SHALL BE INSPECTED PERIODICALLY AND AFTER EACH RAIN AND REPAIRS MADE AS NEEDED.
7. CONSTRUCTION OF TRAPS SHALL BE CARRIED OUT IN SUCH A MANNER THAT SEDIMENT POLLUTION IS ABATED. ONCE CONSTRUCTED, THE TOP AND OUTSIDE FACE OF THE EMBANKMENT SHALL BE STABILIZED WITH SEED AND MULCH. POINTS OF CONCENTRATION INFLOW SHALL BE PROTECTED IN ACCORDANCE WITH GRADE STABILIZATION STRUCTURE CRITERIA. THE REMAINDER OF THE INTERIOR SLOPES SHOULD BE STABILIZED (ONE TIME) WITH SEED AND MULCH UPON TRAP COMPLETION AND MONITORED AND MAINTAINED EROSION FREE DURING THE LIFE OF THE TRAP.
8. THE STRUCTURE SHALL BE DEWATERED BY APPROVED METHODS, REMOVED AND THE AREA STABILIZED WHEN THE DRAINAGE AREA HAS BEEN PROPERLY STABILIZED.
9. REFER TO SECTION D FOR SPECIFICATIONS CONCERNING TRAP DEWATERING.
10. MINIMUM TRAP DEPTH SHALL BE MEASURED FROM THE WEIR ELEVATION.
11. THE ELEVATION OF THE TOP OF ANY DIKE DIRECTING WATER INTO THE TRAP MUST EQUAL OR EXCEED THE ELEVATION OF THE TRAP EMBANKMENT.
12. GEOTEXTILE CLASS C SHALL BE PLACED OVER THE BOTTOM AND SIDES OF THE OUTLET CHANNEL PRIOR TO THE PLACEMENT OF STONE. SECTIONS OF FILTER CLOTH MUST OVERLAP AT LEAST 1' WITH THE SECTION NEAREST THE ENTRANCE PLACED ON TOP. THE FILTER CLOTH SHALL BE EMBEDDED AT LEAST 6" INTO EXISTING GROUND AT THE ENTRANCE OF THE OUTLET CHANNEL.
13. OUTLET – AN OUTLET SHALL BE PROVIDED, INCLUDING A MEANS OF CONVEYING THE DISCHARGE IN AN EROSION FREE MANNER TO AN EXISTING STABLE CHANNEL.

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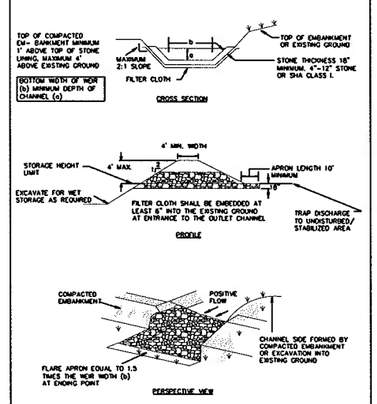
DETAIL 10 – RIP-RAP OUTLET SEDIMENT TRAP – ST III



NOTE: MAXIMUM DRAINAGE AREA= 10 ac.

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RIP-RAP OUTLET SEDIMENT TRAP – ST III

CONSTUCTION SPECIFICATIONS

1. THE AREA UNDER EMBANKMENT SHALL BE CLEARED, GRUBBED AND STRIPPED OF ANY VEGETATION AND ROOT MAT. THE POOL AREA SHALL BE CLEARED.
2. THE FILL MATERIAL FOR THE EMBANKMENT SHALL BE FREE OF ROOTS OR OTHER WOODY VEGETATION AS WELL AS OVER-SIZED STONES, ROCKS, ORGANIC MATERIAL OR OTHER OBJECTIONABLE MATERIAL. THE EMBANKMENT SHALL BE COMPACTED BY TRAVERSING WITH EQUIPMENT WHILE IT IS BEING CONSTRUCTED. MAXIMUM HEIGHT OF EMBANKMENT SHALL BE 4', MEASURED AT CENTERLINE OF EMBANKMENT.
3. ALL CUT AND FILL SLOPES SHALL BE 2:1 OR FLATTER.
4. ELEVATION OF THE TOP OF ANY DIKE DIRECTING WATER INTO TRAP MUST EQUAL OR EXCEED THE HEIGHT OF TRAP EMBANKMENT.
5. STORAGE AREA PROVIDED SHALL BE FIGURED BY COMPUTING THE VOLUME MEASURED FROM TOP OF EXCAVATION. (FOR STORAGE REQUIREMENTS SEE TABLE 10).
6. FILTER CLOTH SHALL BE PLACED OVER THE BOTTOM AND SIDES OF THE OUTLET CHANNEL PRIOR TO PLACEMENT OF STONE. SECTION OF FABRIC MUST OVERLAP AT LEAST 1' WITH SECTION NEAREST THE ENTRANCE PLACED ON TOP. FABRIC SHALL BE EMBEDDED AT LEAST 6" INTO EXISTING GROUND AT ENTRANCE OF OUTLET CHANNEL.
7. STONE USED IN THE OUTLET CHANNEL SHALL BE 4" – 7" PLACED 18" THICK.
8. OUTLET – AN OUTLET SHALL BE PROVIDED, WHICH INCLUDES A MEANS OF CONVEYING THE DISCHARGE IN AN EROSION FREE MANNER TO AN EXISTING STABLE CHANNEL. PROTECTION AGAINST SCOUR AT THE DISCHARGE END SHALL BE PROVIDED AS NECESSARY.
9. OUTLET CHANNEL MUST HAVE POSITIVE DRAINAGE FROM THE TRAP.
10. SEDIMENT SHALL BE REMOVED AND TRAP RESTORED TO ITS ORIGINAL DIMENSIONS WHEN THE SEDIMENT HAS ACCUMULATED TO 1/4 OF THE WET STORAGE DEPTH OF THE TRAP (1350 CF/AC). REMOVED SEDIMENT SHALL BE DEPOSITED IN A SUITABLE AREA AND IN SUCH A MANNER THAT IT WILL NOT ERODE.
11. THE STRUCTURE SHALL BE INSPECTED PERIODICALLY AFTER EACH RAIN AND REPAIRED AS NEEDED.
12. CONSTRUCTION OF TRAPS SHALL BE CARRIED OUT IN SUCH A MANNER THAT SEDIMENT POLLUTION IS ABATED. ONCE CONSTRUCTED, THE TOP AND OUTSIDE FACE OF THE EMBANKMENT SHALL BE STABILIZED WITH SEED AND MULCH. POINTS OF CONCENTRATED INFLOW SHALL BE PROTECTED IN ACCORDANCE WITH GRADE STABILIZATION STRUCTURE CRITERIA. THE REMAINDER OF THE INTERIOR SLOPES SHOULD BE STABILIZED (ONE TIME) WITH SEED AND MULCH UPON TRAP COMPLETION AND MONITORED AND MAINTAINED EROSION FREE DURING THE LIFE OF THE TRAP.
13. THE STRUCTURE SHALL BE DEWATERED BY APPROVED METHODS, REMOVED AND THE AREA STABILIZED WHEN THE DRAINAGE AREA HAS BEEN PROPERLY STABILIZED.

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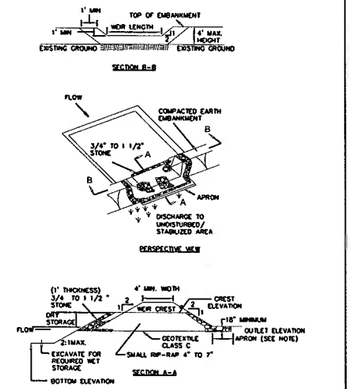
DETAIL 10A – STONE RIP-RAP OUTLET SEDIMENT TRAP – ST IV



NOTE: 5' MIN LENGTH UP TO 5 ACRES, OVER 5 ACRES USE 10' MIN

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STONE RIP-RAP OUTLET SEDIMENT TRAP – ST IV

CONSTUCTION SPECIFICATIONS

1. THE AREA UNDER EMBANKMENT SHALL BE CLEARED, GRUBBED AND STRIPPED OF ANY VEGETATION AND ROOT MAT. THE POOL AREA SHALL BE CLEARED.
2. THE FILL MATERIAL FOR THE EMBANKMENT SHALL BE FREE OF ROOTS OR OTHER WOODY VEGETATION AS WELL AS OVER-SIZED STONES, ROCKS, ORGANIC MATERIAL OR OTHER OBJECTIONABLE MATERIAL. THE EMBANKMENT SHALL BE COMPACTED BY TRAVERSING WITH EQUIPMENT WHILE IT IS BEING CONSTRUCTED. MAXIMUM HEIGHT OF EMBANKMENT SHALL BE 4', MEASURED AT CENTERLINE OF EMBANKMENT.
3. ALL CUT AND FILL SLOPES SHALL BE 2:1 OR FLATTER.
4. ELEVATION OF THE TOP OF ANY DIKE DIRECTING WATER INTO TRAP MUST EQUAL OR EXCEED THE HEIGHT OF TRAP EMBANKMENT.
5. STORAGE AREA PROVIDED SHALL BE FIGURED BY COMPUTING THE VOLUME MEASURED FROM TOP OF EXCAVATION. (FOR STORAGE REQUIREMENTS SEE TABLE 9).
6. GEOTEXTILE CLASS C SHALL BE PLACED OVER THE BOTTOM AND SIDES OF THE OUTLET CHANNELPRIOR TO PLACEMENT OF STONE. SECTION OF FABRIC MUST OVERLAP AT LEAST 1' WITH SECTION NEAREST THE ENTRANCE PLACED ON TOP. FABRIC SHALL BE EMBEDDED AT LEAST 6" INTO EXISTING GROUND AT ENTRANCE OF OUTLET CHANNEL.
7. 4" – 7" STONE SHALL BE USED TO CONSTRUCT THE WEIR AND 4" – 12" OR CLASS I RIP-RAP SHALL BE USED TO CONSTRUCT THE OUTLET CHANNEL.
8. OUTLET – AN OUTLET SHALL INCLUDE A MEANS OF CONVEYING THE DISCHARGE IN AN EROSION FREE MANNER TO AN EXISTING STABLE CHANNEL. PROTECTION AGAINST SCOUR AT THE DISCHARGE POINT SHALL BE PROVIDED AS NECESSARY.
9. OUTLET CHANNEL MUST HAVE POSITIVE DRAINAGE FROM THE TRAP.
10. SEDIMENT SHALL BE REMOVED AND TRAP RESTORED TO ITS ORIGINAL DIMENSIONS WHEN THE SEDIMENT HAS ACCUMULATED TO 1/2 OF THE WET STORAGE DEPTH OF THE TRAP (900 CF/AC). REMOVED SEDIMENT SHALL BE DEPOSITED IN A SUITABLE AREA AND IN SUCH A MANNER THAT IT WILL NOT ERODE.
11. THE STRUCTURE SHALL BE INSPECTED PERIODICALLY AFTER EACH RAIN AND REPAIRED AS NEEDED.
12. CONSTRUCTION OF TRAPS SHALL BE CARRIED OUT IN SUCH A MANNER THAT SEDIMENT POLLUTION IS ABATED. ONCE CONSTRUCTED, THE TOP AND OUTSIDE FACE OF THE EMBANKMENT SHALL BE STABILIZED WITH SEED AND MULCH. POINTS OF CONCENTRATED INFLOW SHOULD BE PROTECTED IN ACCORDANCE WITH GRADE STABILIZATION STRUCTURE CRITERIA. THE REMAINDER OF THE INTERIOR SLOPES SHOULD BE STABILIZED (ONE TIME) WITH SEED AND MULCH UPON TRAP COMPLETION AND MONITORED AND MAINTAINED EROSION FREE DURING THE LIFE OF THE TRAP.
13. THE STRUCTURE SHALL BE DEWATERED BY APPROVED METHODS, REMOVED AND THE AREA STABILIZED WHEN THE DRAINAGE AREA HAS BEEN PROPERLY STABILIZED.

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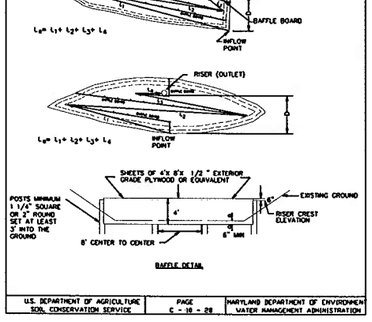
DETAIL 18 – SEDIMENT BASIN BAFFLES



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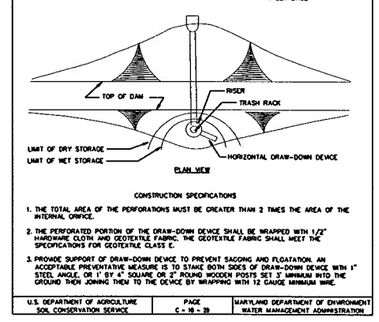
BASIN DRAWDOWN SCHEMATIC HORIZONTAL DRAW-DOWN DEVICE



CONSTRUCTION SPECIFICATIONS

1. THE TOTAL AREA OF THE PERFORATIONS MUST BE GREATER THAN 2 TIMES THE AREA OF THE INTERNAL ORIFICE.
2. THE PERFORATED PORTION OF THE DRAW-DOWN DEVICE SHALL BE WRAPPED WITH 1/2" HARDWARE CLOTH AND GEOTEXTILE FABRIC. THE GEOTEXTILE FABRIC SHALL MEET THE SPECIFICATIONS FOR GEOTEXTILE CLASS E.
3. PROVIDE SUPPORT OF DRAW-DOWN DEVICE TO PREVENT SAGGING AND FLOATATION. AN ACCEPTABLE PREVENTATIVE MEASURE IS TO STAKE BOTH SIDES OF DRAW-DOWN DEVICE WITH 1" STEEL ANGLE, OR 1" BY 4" SQUARE OR 2" ROUND WOODEN POSTS SET 3' MINIMUM INTO THE GROUND THEN JOINING THEM TO THE DEVICE BY WRAPPING WITH 12 GAUGE MINIMUM WIRE.

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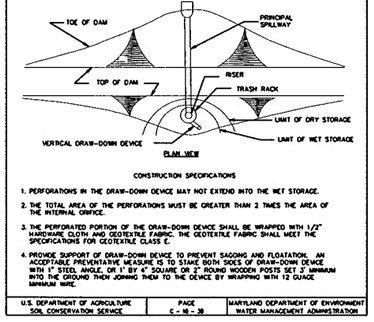
BASIN DRAWDOWN SCHEMATIC VERTICAL DRAW-DOWN DEVICE



CONSTRUCTION SPECIFICATIONS

1. PERFORATIONS IN THE DRAW-DOWN DEVICE MAY NOT EXTEND INTO THE WET STORAGE.
2. THE TOTAL AREA OF THE PERFORATIONS MUST BE GREATER THAN 2 TIMES THE AREA OF THE INTERNAL ORIFICE.
3. THE PERFORATED PORTION OF THE DRAW-DOWN DEVICE SHALL BE WRAPPED WITH 1/2" HARDWARE CLOTH AND GEOTEXTILE FABRIC. THE GEOTEXTILE FABRIC SHALL MEET THE SPECIFICATIONS FOR GEOTEXTILE CLASS E.
4. PROVIDE SUPPORT OF DRAW-DOWN DEVICE TO PREVENT SAGGING AND FLOATATION. AN ACCEPTABLE PREVENTATIVE MEASURE IS TO STAKE BOTH SIDES OF DRAW-DOWN DEVICE WITH 1" STEEL ANGLE, OR 1" BY 4" SQUARE OR 2" ROUND WOODEN POSTS SET 3' MINIMUM INTO THE GROUND THEN JOINING THEM TO THE DEVICE BY WRAPPING WITH 12 GAUGE MINIMUM WIRE.

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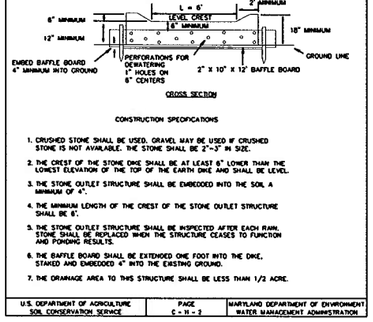
DETAIL 19 – STONE OUTLET STRUCTURE



CONSTRUCTION SPECIFICATIONS

1. CRUSHED STONE SHALL BE USED. GRAVEL MAY BE USED IF CRUSHED STONE IS NOT AVAILABLE. THE STONE SHALL BE 2"-3" IN SIZE.
2. THE CREST OF THE STONE DIKE SHALL BE AT LEAST 6" LOWER THAN THE LOWEST ELEVATION OF THE TOP OF THE EARTH DIKE AND SHALL BE LEVEL.
3. THE STONE OUTLET STRUCTURE SHALL BE EMBEDDED INTO THE SOIL A MINIMUM OF 6".
4. THE MINIMUM LENGTH OF THE CREST OF THE STONE OUTLET STRUCTURE SHALL BE 6'.
5. THE STONE OUTLET STRUCTURE SHALL BE INSPECTED AFTER EACH RAIN. STONE SHALL BE REPLACED WHEN THE STRUCTURE CEASES TO FUNCTION AND PONDING RESULTS.
6. THE BAFFLE BOARD SHALL BE EXTENDED ONE FOOT INTO THE DIKE, STAKED AND EMBEDDED 4" INTO THE EXISTING GROUND.
7. THE DRAINAGE AREA TO THIS STRUCTURE SHALL BE LESS THAN 1/2 ACRE.

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MDE NO. XX-SF-XXXX
NOTE TO CONTRACTOR:
SEDIMENT CONTROL WILL BE STRICTLY ENFORCED

FOR EROSION AND SEDIMENT CONTROL ONLY.

COMPANY NAME

COMPANY NAME
COMPANY ADDRESS
CITY, STATE ZIP CODE
COMPANY PHONE NO. COMPANY FAX NO.

DESIGNED: ---
DRAWN: ---
CHECKED: ---
APPROVED: ---

REVISION NO.	REVISION DATE	DESCRIPTIONS

BWI THURGOOD MARSHALL OR MARTIN STATE LOGO

MARYLAND DEPARTMENT OF TRANSPORTATION
MARYLAND AVIATION ADMINISTRATION

OFFICE OF ENGINEERING AND CONSTRUCTION MANAGEMENT
DIVISION OF FACILITIES DESIGN

PROJECT TITLE:

SHEET TITLE: EROSION AND SEDIMENT CONTROL DETAILS II

SCALE:

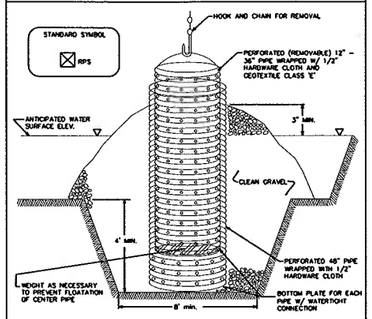
DATE: DATE

CONTRACT NO.:

SHEET NO.:

PATH/FILENAME

DETAIL 20A – REMOVABLE PUMPING STATION



ELEVATION (CUT AWAY)

CONSTRUCTION SPECIFICATIONS

1. THE OUTER PIPE SHOULD BE 48" DIA. OR SHALL, IN ANY CASE, BE AT LEAST 4" GREATER IN DIAMETER THAN THE CENTER PIPE. THE OUTER PIPE SHALL BE WRAPPED WITH 1/2" HARDWARE CLOTH TO PREVENT BACKFILL MATERIAL FROM ENTERING THE PERFORATIONS.
2. AFTER INSTALLING THE OUTER PIPE, BACKFILL AROUND OUTER PIPE WITH 2" AGGREGATE OR CLEAN GRAVEL.
3. THE INSIDE STAND PIPE (CENTER PIPE) SHOULD BE CONSTRUCTED BY PERFORATING A CORRUGATED OR PVC PIPE BETWEEN 12" AND 36" IN DIAMETER. THE PERFORATIONS SHALL BE 1/2" X 6" SLITS OR 1" DIAMETER HOLES 6" ON CENTER. THE CENTER PIPE SHALL BE WRAPPED WITH 1/2" HARDWARE CLOTH FIRST, THEN WRAPPED AGAIN WITH GEOTEXTILE CLASS E
4. THE CENTER PIPE SHOULD EXTEND 12" TO 18" ABOVE THE ANTICIPATED WATER SURFACE ELEVATION OR RISER CREST ELEVATION WHEN DEWATERING A BASIN.

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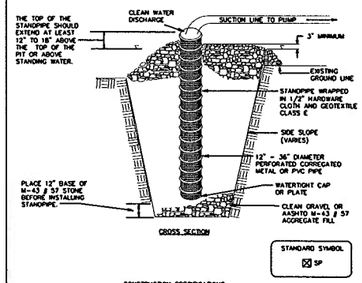
DETAIL 20B – SUMP PIT



CONSTRUCTION SPECIFICATIONS

1. PIT DIMENSIONS ARE VARIABLE, WITH THE MINIMUM DIAMETER BEING 2 TIMES THE STANDPIPE DIAMETER.
2. THE STANDPIPE SHOULD BE CONSTRUCTED BY PERFORATING A 12" TO 24" DIAMETER CORRUGATED OR PVC PIPE. THEN WRAPPING WITH 1/2" HARDWARE CLOTH AND GEOTEXTILE CLASS E. FIVE PERFORATIONS SHALL BE 1/2" X 6" SLITS OR 1" DIAMETER HOLES.
3. A BASE OF FILTER MATERIAL CONSISTING OF CLEAN GRAVEL OR #57 STONE SHOULD BE PLACED IN THE PIT TO A DEPTH OF 12". AFTER INSTALLING THE STANDPIPE, THE PIT SURROUNDING THE STANDPIPE SHOULD THEN BE BACKFILLED WITH THE SAME FILTER MATERIAL.
4. THE STANDPIPE SHOULD EXTEND 12" TO 18" ABOVE THE LIP OF THE PIT OR THE RISER CREST ELEVATION (BASIN DEWATERING ONLY) AND THE FILTER MATERIAL SHOULD EXTEND 3" MINIMUM ABOVE THE ANTICIPATED STANDING WATER ELEVATION.

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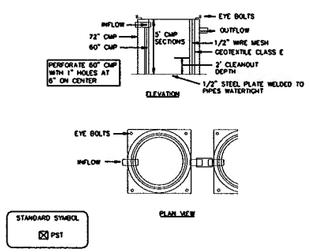
DETAIL 21 – PORTABLE SEDIMENT TANK



CONSTRUCTION SPECIFICATIONS

1. THE FOLLOWING FORMULA SHOULD BE USED IN DETERMINING THE STORAGE VOLUME OF THE SEDIMENT TANK: 1 CUBIC FOOT OF STORAGE FOR EACH GALLON PER MINUTE OF PUMP DISCHARGE CAPACITY.
2. AN EXAMPLE OF A TYPICAL SEDIMENT TANK IS SHOWN ABOVE. OTHER CONTAINER DESIGNS CAN BE USED IF THE STORAGE VOLUME IS ADEQUATE AND APPROVAL IS OBTAINED FROM THE LOCAL APPROVING AGENCY.
3. TANKS MAY BE CONNECTED IN SERIES.

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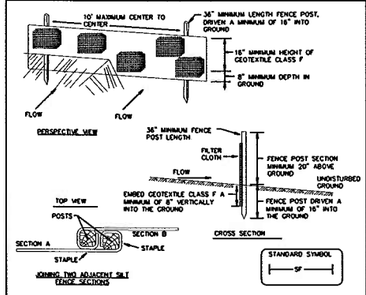
DETAIL 22 – SILT FENCE



CONSTRUCTION SPECIFICATIONS

1. FENCE POSTS SHALL BE A MINIMUM OF 36" LONG DRIVEN 16" MINIMUM INTO THE GROUND. WOOD POSTS SHALL BE 1 1/2" X 1 1/2" SQUARE (MINIMUM) CUT, OR 1 3/4" DIAMETER (MINIMUM) ROUND AND SHALL BE OF SOUND QUALITY HARDWOOD. STEEL POSTS WILL BE STANDARD "T" OR "U" SECTION WEIGHTING NOT LESS THAN 1.00 POND PER LINEAR FOOT.
2. GEOTEXTILE SHALL BE FASTENED SECURELY TO EACH FENCE POST WITH WIRE TIES OR STAPLES AT TOP AND MID-SECTION AND SHALL MEET THE FOLLOWING REQUIREMENTS FOR GEOTEXTILE CLASS F:

TENSILE STRENGTH	50 lbs/in (min.)	Test: MSMT 509
TENSILE MODULUS	20 lbs/in (min.)	Test: MSMT 509
FLOW RATE	0.3 gal ft²/minute (max.)	Test: MSMT 322
FILTERING EFFICIENCY	75% (min.)	Test: MSMT 322

3. WHERE ENDS OF GEOTEXTILE FABRIC COME TOGETHER, THEY SHALL BE OVERLAPPED, FOLDED AND STAPLED TO PREVENT SEDIMENT BYPASS.
4. SILT FENCE SHALL BE INSPECTED AFTER EACH RAINFALL EVENT AND MAINTAINED WHEN BULGES OCCUR OR WHEN SEDIMENT ACCUMULATION REACHED 50% OF THE FABRIC HEIGHT.

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SILT FENCE

SILT FENCE DESIGN CRITERIA

SLOPE STEEPNESS	(MAXIMUM) SLOPE LENGTH	(MAXIMUM) SILT FENCE LENGTH
FLATTER THAN 50:1	UNLIMITED	UNLIMITED
50:1 TO 10:1	125 FEET	1,000 FEET
10:1 TO 5:1	100 FEET	750 FEET
5:1 TO 3:1	60 FEET	500 FEET
3:1 TO 2:1	40 FEET	250 FEET
2:1 AND STEEPER	20 FEET	125 FEET

NOTE: IN AREAS OF LESS THAN 2% SLOPE AND SANDY SOILS (USDA GENERAL CLASSIFICATION SYSTEM, SOIL CLASS A) MAXIMUM SLOPE LENGTH AND SILT FENCE LENGTH WILL BE UNLIMITED. IN THESE AREAS A SILT FENCE MAY BE THE ONLY PERIMETER CONTROL REQUIRED.

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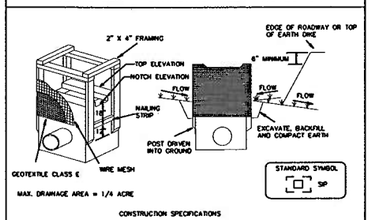
DETAIL 23A – STANDARD INLET PROTECTION



CONSTRUCTION SPECIFICATIONS

1. EXCAVATE COMPLETELY AROUND THE INLET TO A DEPTH OF 18" BELOW THE NOTCH ELEVATION.
2. DRIVE THE 2" X 4" CONSTRUCTION GRADE LUMBER POSTS 1' INTO THE GROUND AT EACH CORNER OF THE INLET. PLACE NAIL STRIPS BETWEEN THE POSTS ON THE ENDS OF THE INLET. ASSEMBLE THE TOP PORTION OF THE 2" X 4" FRAME USING THE OVERLAP JOINT SHOWN ON DETAIL 23A. THE TOP OF THE FRAME (WEIR) MUST BE 6" BELOW ADJACENT ROADWAYS WHERE FLOODING AND SAFETY ISSUES MAY ARISE.
3. STRETCH THE 1/2" X 1/2" WIRE MESH TIGHTLY AROUND THE FRAME AND FASTEN SECURELY. THE ENDS MUST MEET AND OVERLAP AT A POST.
4. STRETCH THE GEOTEXTILE CLASS E TIGHTLY OVER THE WIRE MESH WITH THE GEOTEXTILE EXTENDING FROM THE TOP OF THE FRAME TO 18" BELOW THE INLET NOTCH ELEVATION. FASTEN THE GEOTEXTILE FIRMLY TO THE FRAME. THE ENDS OF THE GEOTEXTILE MUST MEET AT A POST, BE OVERLAPPED AND FOLDED, THEN FASTENED DOWN.
5. BACKFILL AROUND THE INLET IN COMPACTED 8" LAYERS UNTIL THE LAYER OF EARTH IS LEVEL WITH THE NOTCH ELEVATION ON THE ENDS AND TOP ELEVATION ON THE SIDES.
6. IF THE INLET IS NOT IN A SUMP, CONSTRUCT A COMPACTED EARTH DIKE ACROSS THE DITCH LINE DIRECTLY BELOW IT. THE TOP OF THE EARTH DIKE SHOULD BE AT LEAST 6" HIGHER THAN THE TOP OF THE FRAME.
7. THE STRUCTURE MUST BE INSPECTED PERIODICALLY AND AFTER EACH RAIN AND THE GEOTEXTILE REPLACED WHEN IT BECOMES CLOGGED.

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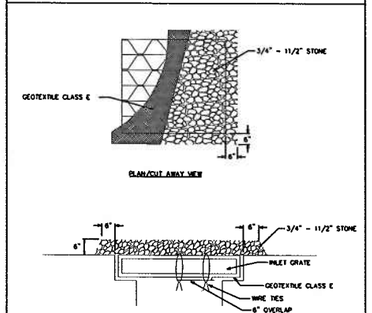
DETAIL 23B – AT GRADE INLET PROTECTION



CONSTRUCTION SPECIFICATIONS

1. LIFT GRATE AND WRAP WITH GEOTEXTILE CLASS E TO COMPLETELY COVER ALL OPENINGS. THEN SET GRATE BACK IN PLACE.
2. PLACE 3/4" TO 1 1/2" STONE, 4"–6" THICK ON THE GRATE TO SECURE THE FABRIC AND PROVIDE ADDITIONAL FILTRATION.

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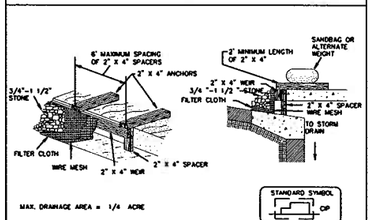
DETAIL 23C – CURB INLET PROTECTION (COG OR COS INLETS)



CONSTRUCTION SPECIFICATIONS

1. ATTACH A CONTINUOUS PIECE OF WIRE MESH (30" MINIMUM WIDTH BY THROAT LENGTH PLUS 4') TO THE 2" X 4" WEIR (MEASURING THROAT LENGTH PLUS 2') AS SHOWN ON THE STANDARD DRAWING.
2. PLACE A CONTINUOUS PIECE OF GEOTEXTILE CLASS E THE SAME DIMENSIONS AS THE WIRE MESH OVER THE WIRE MESH AND SECURELY ATTACH IT TO THE 2" X 4" WEIR.
3. SECURELY NAIL THE 2" X 4" WEIR TO A 6' LONG VERTICAL SPACER TO BE LOCATED BETWEEN THE WEIR AND THE INLET FACE (MAX. 6' APART).
4. PLACE THE ASSEMBLY AGAINST THE INLET THROAT AND NAIL (MINIMUM 2" LENGTHS OF 2" X 4" TO THE TOP OF THE WEIR AT SPACER LOCATIONS). THESE 2" X 4" ANCHORS SHALL EXTEND ACROSS THE INLET TOP AND BE HELD IN PLACE BY SANDBAGS OR ALTERNATE WEIGHT.
5. THE ASSEMBLY SHALL BE PLACED SO THAT THE END SPACERS ARE A MINIMUM 1' BEYOND BOTH ENDS OF THE THROAT OPENING.
6. FORM THE 1/2" X 1/2" WIRE MESH AND THE GEOTEXTILE FABRIC TO THE CONCRETE GUTTER AND AGAINST THE FACE OF THE CURB ON BOTH SIDES OF THE INLET. PLACE CLEAN 3/4" X 1 1/2" STONE OVER THE WIRE MESH AND GEOTEXTILE IN SUCH A MANNER TO PREVENT WATER FROM ENTERING THE INLET UNDER OR AROUND THE GEOTEXTILE.
7. THIS TYPE OF PROTECTION MUST BE INSPECTED FREQUENTLY AND THE FILTER CLOTH AND STONE REPLACED WHEN CLOGGED WITH SEDIMENT.
8. ASSURE THAT STORM FLOW DOES NOT BYPASS THE INLET BY INSTALLING A TEMPORARY EARTH OR ASPHALT DIKE TO DIRECT THE FLOW TO THE INLET.

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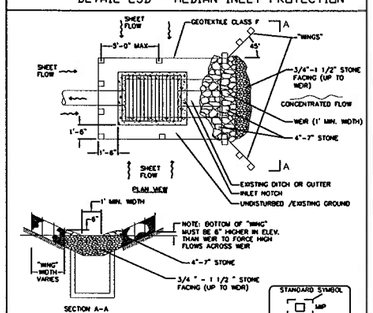
DETAIL 23D – MEDIAN INLET PROTECTION



CONSTRUCTION SPECIFICATIONS

1. FENCE POSTS SHALL BE 36" (MIN.) LONG, DRIVEN 16" INTO THE GROUND AND SPACED 5' (MAX.) APART. WOOD POSTS SHALL BE 1 1/2" X 1 1/2" (MIN.) SQUARE CUT OR 1 3/4" (MIN.) DIAMETER ROUND AND SHALL BE OF SOUND QUALITY HARDWOOD. STEEL POSTS SHALL BE STANDARD T OR U SECTION WEIGHING NOT LESS THAN 1.0 #/LINEAR FOOT.
2. GEOTEXTILE CLASS F SHALL BE FASTENED SECURELY TO EACH POST WITH WIRE TIES OR STAPLES AT TOP AND MID-SECTION.
3. WHERE ENDS OF GEOTEXTILE FABRIC COME TOGETHER THEY SHALL BE OVERLAPPED, FOLDED AND STAPLED.
4. MEDIAN INLET PROTECTION SHALL BE INSPECTED AFTER EACH RAIN AND MAINTAINED WHEN BULGES OCCUR IN THE FABRIC OR WHEN THE STONE GETS CLOGGED.
5. STONE USED TO CONSTRUCT THE WEIR SHALL BE 4" – 7" WITH A 1' THICK LAYER OF 3/4"–1 1/2" STONE ON THE UPSTREAM FACE.

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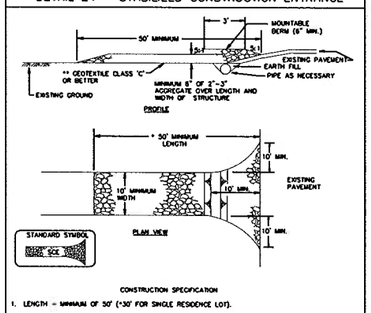
DETAIL 24 – STABILIZED CONSTRUCTION ENTRANCE



CONSTRUCTION SPECIFICATION

1. LENGTH – MINIMUM OF 50' (*30' FOR SINGLE RESIDENCE LOT).
2. WIDTH – 10' MINIMUM, SHOULD BE FLARED AT THE EXISTING ROAD TO PROVIDE A TURNING RADIUS.
3. GEOTEXTILE FABRIC (FILTER CLOTH) SHALL BE PLACED OVER THE EXISTING GROUND PRIOR TO PLACING STONE. **THE PLAN APPROVAL AUTHORITY MAY NOT REQUIRE SINGLE FAMILY RESIDENCES TO USE GEOTEXTILE.
4. STONE – CRUSHED AGGREGATE (2" TO 3") OR RECLAIMED OR RECYCLED CONCRETE EQUIVALENT SHALL BE PLACED AT LEAST 6" DEEP OVER THE LENGTH AND WIDTH OF THE ENTRANCE.
5. SURFACE WATER – ALL SURFACE WATER FLOWING TO OR DIVERTED TOWARD CONSTRUCTION ENTRANCES SHALL BE PIPED THROUGH THE ENTRANCE, MAINTAINING POSITIVE DRAINAGE. PIPE INSTALLED THROUGH THE STABILIZED CONSTRUCTION ENTRANCE SHALL BE PROTECTED WITH A MOUNTABLE BERM WITH 5:1 SLOPES AND A MINIMUM OF 6" OF STONE OVER THE PIPE. PIPE HAS TO BE SIZED ACCORDING TO THE DRAINAGE. WHEN THE SCE IS LOCATED AT A HIGH SPOT AND HAS NO DRAINAGE TO CONVEY A PIPE WILL NOT BE NECESSARY. PIPE SHOULD BE SIZED ACCORDING TO THE AMOUNT OF RUNOFF TO BE CONVEYED. A 6" MINIMUM WILL BE REQUIRED.
6. LOCATION – A STABILIZED CONSTRUCTION ENTRANCE SHALL BE LOCATED AT EVERY POINT WHERE CONSTRUCTION TRAFFIC ENTERS OR LEAVES A CONSTRUCTION SITE. VEHICLES LEAVING THE SITE MUST TRAVEL OVER THE ENTIRE LENGTH OF THE STABILIZED CONSTRUCTION ENTRANCE.

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MDE NO. XX-SF-XXXX
NOTE TO CONTRACTOR:
SEDIMENT CONTROL WILL BE STRICTLY ENFORCED

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COMPANY NAME

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DESIGNED: ---
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REVISION NO.	REVISION DATE	DESCRIPTIONS

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MARYLAND DEPARTMENT OF TRANSPORTATION
MARYLAND AVIATION ADMINISTRATION

OFFICE OF ENGINEERING AND CONSTRUCTION MANAGEMENT
DIVISION OF FACILITIES DESIGN

PROJECT TITLE:

SHEET TITLE: EROSION AND SEDIMENT CONTROL DETAILS III

SCALE:

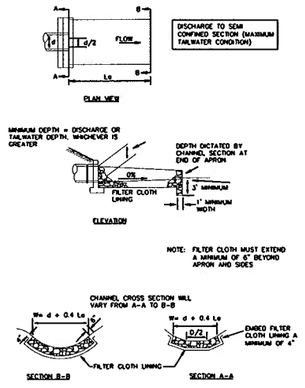
DATE: DATE

CONTRACT NO.:

SHEET NO.:

PATH/FILENAME

DETAIL 25 – ROCK OUTLET PROTECTION I



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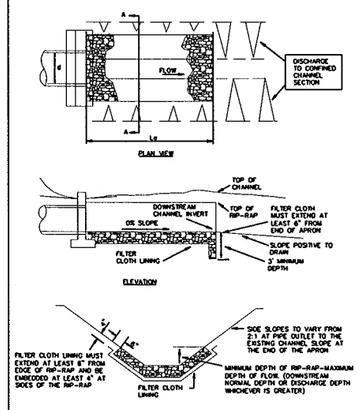
DETAIL 26 – ROCK OUTLET PROTECTION II



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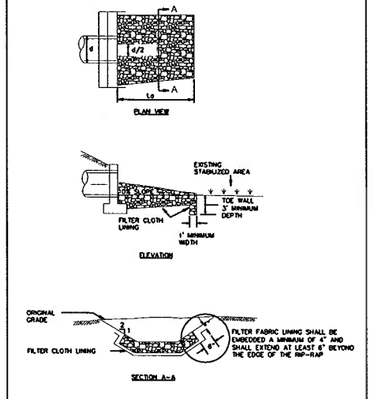
DETAIL 27 – ROCK OUTLET PROTECTION III



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ROCK OUTLET PROTECTION

CONSTRUCTION SPECIFICATIONS

1. THE SUBGRADE FOR THE FILTER, RIP-RAP, OR GABION SHALL BE PREPARED TO THE REQUIRED LINES AND GRADES. ANY FILL REQUIRED IN THE SUBGRADE SHALL BE COMPACTED TO A DENSITY OF APPROXIMATELY THAT OF THE SURROUNDING UNDISTURBED MATERIAL.
2. THE ROCK OR GRAVEL SHALL CONFORM TO THE SPECIFIED GRADING LIMITS WHEN INSTALLED RESPECTIVELY IN THE RIP-RAP OR FILTER.
3. GEOTEXTILE SHALL BE PROTECTED FROM PUNCHING, CUTTING, OR TEARING. ANY DAMAGE OTHER THAN AN OCCASIONAL SMALL HOLE SHALL BE REPAIRED BY PLACING ANOTHER PIECE OF GEOTEXTILE OVER THE DAMAGED PART OR BY COMPLETELY REPLACING THE GEOTEXTILE. ALL OVERLAPS WHETHER FOR REPAIRS OR FOR JOINING TWO PIECES OF GEOTEXTILE SHALL BE A MINIMUM OF ONE FOOT.
4. STONE FOR THE RIP-RAP OR GABION OUTLETS MAY BE PLACED BY EQUIPMENT. THEY SHALL BE CONSTRUCTED TO THE FULL COURSE THICKNESS IN ONE OPERATION AND IN SUCH A MANNER AS TO AVOID DISPLACEMENT OF UNDERLYING MATERIALS. THE STONE FOR RIP-RAP OR GABION OUTLETS SHALL BE DELIVERED AND PLACED IN A MANNER THAT WILL ENSURE THAT IT IS REASONABLY HOMOGENEOUS WITH THE SMALLER STONES AND SPALLS FILLING THE VOIDS BETWEEN THE LARGER STONES. RIP-RAP SHALL BE PLACED IN A MANNER TO PREVENT DAMAGE TO THE FILTER BLANKET OR GEOTEXTILE. HAND PLACEMENT WILL BE REQUIRED TO THE EXTENT NECESSARY TO PREVENT DAMAGE TO THE PERMANENT WORKS.
5. THE STONE SHALL BE PLACED SO THAT IT BLENDS IN WITH THE EXISTING GROUND. IF THE STONE IS PLACED TOO HIGH THEN THE FLOW WILL BE FORCED OUT OF THE CHANNEL AND SCOUR ADJACENT TO THE STONE WILL OCCUR.

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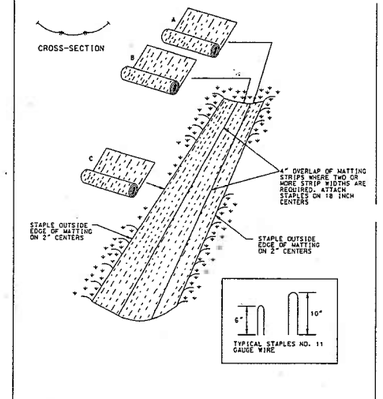
DETAIL 30 EROSION CONTROL MATTING



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EROSION CONTROL MATTING

CONSTRUCTION SPECIFICATIONS

1. KEY-IN THE MATTING BY PLACING THE TOP ENDS OF THE MATTING IN A NARROW TRENCH, 6" IN DEPTH. BACKFILL THE TRENCH AND TAMP FIRMLY TO CONFORM TO THE CHANNEL CROSS-SECTION. SECURE WITH A ROW OF STAPLES ABOUT 4" DOWN SLOPE FROM THE TRENCH. SPACING BETWEEN STAPLES IS 6".
2. STAPLE THE 6" OVERLAP IN THE CHANNEL CENTER USING AN 18" SPACING BETWEEN STAPLES.
3. BEFORE STAPLING THE OUTER EDGES OF THE MATTING, MAKE SURE THE MATTING IS SMOOTH AND IN FIRM CONTACT WITH THE SOIL.
4. STAPLES SHALL BE PLACED 2' APART WITH 4 ROWS FOR EACH STRIP, 2 OUTER ROWS, AND 2 ALTERNATING ROWS DOWN THE CENTER.
5. WHERE ONE ROLL OF MATTING ENDS AND ANOTHER BEGINS, THE END OF THE TOP STRIP SHALL OVERLAP THE UPPER END OF THE LOWER STRIP BY 4", SHINGLE FASHION. REINFORCE THE OVERLAP WITH A DOUBLE ROW OF STAPLES SPACED 6" APART IN A STAGGERED PATTERN ON EITHER SIDE.
6. THE DISCHARGE END OF THE MATTING LINER SHOULD BE SIMILARLY SECURED WITH 2 DOUBLE ROWS OF STAPLES.

NOTE: IF FLOW WILL ENTER FROM THE EDGE OF THE MATTING THEN THE AREA EFFECTED BY THE FLOW MUST BE KEYED-IN.

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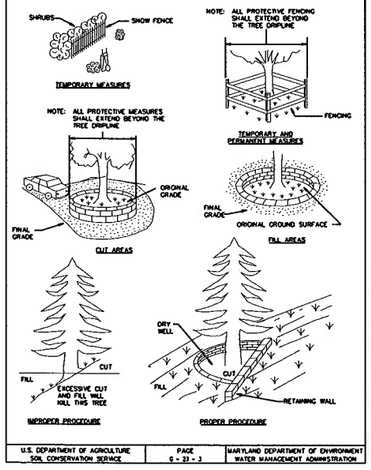
DETAIL 31 – TREE PROTECTION



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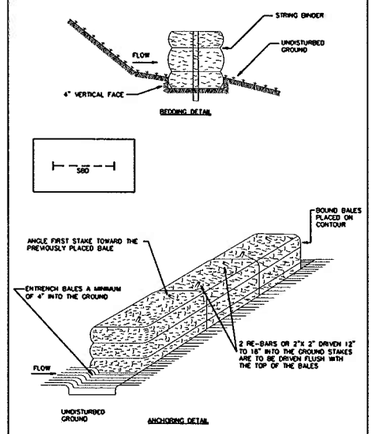
DETAIL 32 – STRAW BALE DIKE



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STRAW BALE DIKE

CONSTRUCTION SPECIFICATIONS

1. BALES SHALL BE PLACED AT THE TOE OF A SLOPE, ON THE CONTOUR, AND IN A ROW WITH THE ENDS OF EACH BALE TIGHTLY ABUTTING THE ADJACENT BALES.
2. EACH BALE SHALL BE ENTRENCHED IN THE SOIL A MINIMUM OF 4" AND PLACED SO THE BINDINGS ARE HORIZONTAL.
3. BALES SHALL BE SECURELY ANCHORED IN PLACE BY EITHER TWO STAKES OR RE-BARS DRIVEN THROUGH THE BALE 12" TO 18" INTO THE GROUND. THE FIRST STAKE IN EACH BALE SHALL BE DRIVEN TOWARD THE PREVIOUSLY LAID BALE AT AN ANGLE TO FORCE THE BALES TOGETHER. STAKES SHALL BE DRIVEN FLUSH WITH THE TOP OF THE BALE.
4. STRAW BALE DIKES SHALL BE INSPECTED FREQUENTLY AND AFTER EACH RAIN EVENT AND MAINTENANCE PERFORMED AS NECESSARY.
5. ALL BALES SHALL BE REMOVED WHEN THE SITE HAS BEEN STABILIZED. THE TRENCH WHERE THE BALES WERE LOCATED SHALL BE GRADED FLUSH AND STABILIZED.

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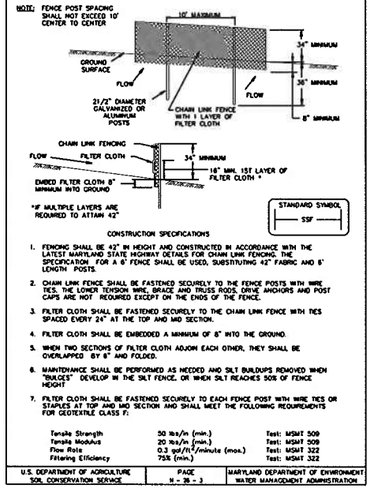
DETAIL 33 – SUPER SILT FENCE



CONSTRUCTION SPECIFICATIONS

1. FENCING SHALL BE 42" IN HEIGHT AND CONSTRUCTED IN ACCORDANCE WITH THE LATEST MARYLAND STATE HIGHWAY DETAILS FOR CHAIN LINK FENCING. THE SPECIFICATION FOR A 6' FENCE SHALL BE USED, SUBSTITUTING 42" FABRIC AND 8' LENGTH POSTS.
2. CHAIN LINK FENCE SHALL BE FASTENED SECURELY TO THE FENCE POSTS WITH WIRE TIES. THE LOWER TENSION WIRE, BRACE AND TRUSS RODS, DRIVE ANCHORS AND POST CAPS ARE NOT REQUIRED EXCEPT ON THE ENDS OF THE FENCE.
3. FILTER CLOTH SHALL BE FASTENED SECURELY TO THE CHAIN LINK FENCE WITH TIES SPACED EVERY 24" AT THE TOP AND MID SECTION.
4. FILTER CLOTH SHALL BE EMBEDDED A MINIMUM OF 8" INTO THE GROUND.
5. WHEN TWO SECTIONS OF FILTER CLOTH ADJOIN EACH OTHER, THEY SHALL BE OVERLAPPED BY 6" AND FOLDED.
6. MAINTENANCE SHALL BE PERFORMED AS NEEDED AND SILT BUILDUPS REMOVED WHEN "BULGES" DEVELOP IN THE SILT FENCE, OR WHEN SILT REACHES 50% OF FENCE HEIGHT
7. FILTER CLOTH SHALL BE FASTENED SECURELY TO EACH FENCE POST WITH WIRE TIES OR STAPLES AT TOP AND MID SECTION AND SHALL MEET THE FOLLOWING REQUIREMENTS FOR GEOTEXTILE CLASS 'F'

Tensile Strength	50 lbs/in (min.)	Test: MSMT 509
Tensile Modulus	20 lbs/in (min.)	Test: MSMT 509
Flow Rate	0.3 gal/ft²/minute (max.)	Test: MSMT 322
Filtering Efficiency	75% (min.)	Test: MSMT 322

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MDE NO. XX-SF-XXXX
NOTE TO CONTRACTOR:
SEDIMENT CONTROL WILL BE STRICTLY ENFORCED

FOR EROSION AND SEDIMENT CONTROL ONLY.

COMPANY NAME

COMPANY NAME
COMPANY ADDRESS
CITY, STATE ZIP CODE
COMPANY PHONE NO. COMPANY FAX NO.

DESIGNED: ---
DRAWN: ---
CHECKED: ---
APPROVED: ---

REVISION NO.	REVISION DATE	DESCRIPTIONS

BWI THURGOOD MARSHALL OR MARTIN STATE LOGO

MARYLAND DEPARTMENT OF TRANSPORTATION
MARYLAND AVIATION ADMINISTRATION

OFFICE OF ENGINEERING AND CONSTRUCTION MANAGEMENT
DIVISION OF FACILITIES DESIGN

PROJECT TITLE:

SHEET TITLE: EROSION AND SEDIMENT CONTROL DETAILS IV

SCALE:

DATE: DATE

CONTRACT NO.:

SHEET NO.:

PATH/FILENAME

SUPER SILT FENCE

DESIGN CRITERIA

SLOPE	SLOPE STEEPNESS	SLOPE LENGTH (MAXIMUM)	SILT FENCE LENGTH (MAXIMUM)
0 - 10%	0 - 10:1	UNLIMITED	UNLIMITED
10 - 20%	10:1 - 5:1	200 FEET	1,500 FEET
20 - 33%	5:1 - 3:1	100 FEET	1,000 FEET
33 - 50%	3:1 - 2:1	100 FEET	500 FEET
50% +	2:1 +	50 FEET	250 FEET

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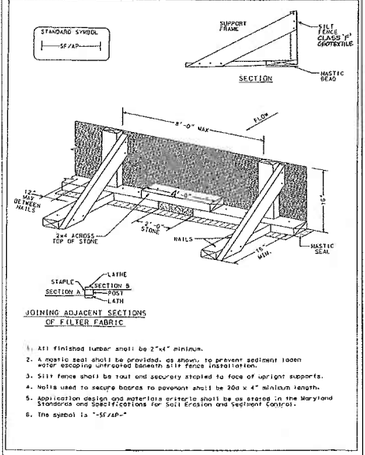
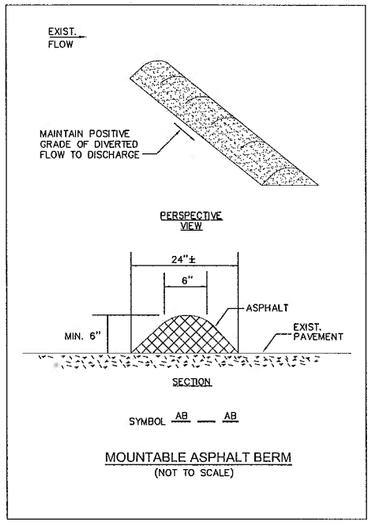
SILT FENCE ON ASPHALT PAVING



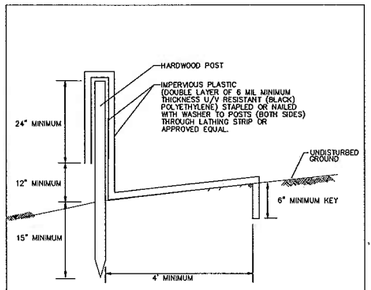
JOINING ADJACENT SECTIONS OF FILTER FABRIC

1. All finished lumber shall be 2"x4" minimum.
2. A mastic seal shall be provided, as shown, to prevent sediment laden water escaping untreated beneath silt fence installation.
3. Silt fence shall be taut and securely stapled to face of upright supports.
4. Nails used to secure boards to pavement shall be 30d x 4" minimum length.
5. Application design and materials criteria shall be as stated in the Maryland Standards and Specifications for Soil Erosion and Sediment Control.
6. The symbol is "-SF/AP-"



SYMBOL AB ___ AB

MOUNTABLE ASPHALT BERM
(NOT TO SCALE)

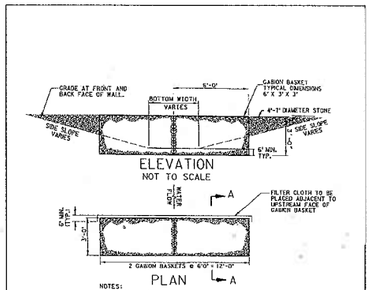


TYPICAL DETAIL
CLEAR WATER DIVERSION FENCE (NTS)

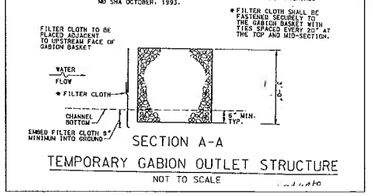
NOTES:
1. 5' MAXIMUM POST SPACING
2. MAINTAIN POSITIVE GRADE
3. TOTAL WIDTH OF POLYETHYLENE IS 10' MINIMUM PER LAYER (A FOLDED 20' WIDTH IS ACCEPTABLE)

PLAN SYMBOL

—— CWD ——CWD——CWD-



NOTES:
1. SEE "1994 MARYLAND STANDARDS AND SPECIFICATIONS FOR SOIL EROSION AND SEDIMENT CONTROL" FOR SUPER SILT FENCE CONSTRUCTION SPECIFICATIONS.
2. GABIONS TO BE CONSTRUCTED UNDER SECTION 312 "STANDARD SPECIFICATIONS FOR CONSTRUCTION AND MATERIALS" MD SHA OCTOBER, 1993.



TEMPORARY GABION OUTLET STRUCTURE
NOT TO SCALE

MDE NO. XX-SF-XXXX
NOTE TO CONTRACTOR:
SEDIMENT CONTROL WILL BE STRICTLY ENFORCED

FOR EROSION AND SEDIMENT CONTROL ONLY.

COMPANY NAME

COMPANY NAME
COMPANY ADDRESS
CITY, STATE ZIP CODE
COMPANY PHONE NO. COMPANY FAX NO.

DESIGNED: ___
DRAWN: ___
CHECKED: ___
APPROVED: ___

REVISION NO.	REVISION DATE	DESCRIPTIONS

BWI THURGOOD MARSHALL OR MARTIN STATE LOGO

MARYLAND DEPARTMENT OF TRANSPORTATION
MARYLAND AVIATION ADMINISTRATION

OFFICE OF ENGINEERING AND CONSTRUCTION MANAGEMENT
DIVISION OF FACILITIES DESIGN

PROJECT TITLE:

SHEET TITLE: EROSION AND SEDIMENT CONTROL DETAILS V

SCALE:

DATE: DATE

CONTRACT NO.:

SHEET NO.:

PATH/FILENAME

APPENDIX D

STANDARD SPECIFICATIONS

MARTIN STATE AIRPORT

BWI BALTIMORE/WASHINGTON INTERNATIONAL Thurgood Marshall AIRPORT

STANDARD SPECIFICATIONS

MAA LANDSCAPE SPECIFICATIONS

- ITEM 900 – LANDSCAPING
- ITEM 901 – TOPSOIL
- ITEM 902 – PLANT INSTALLATION
- ITEM 903 – SEEDING
- ITEM 904 – SODDING
- ITEM 905 – MULCHING
- APPROVED SPECIES LIST
- APPROVED INSTALLATION METHODS

SOLE SOURCE SYSTEMS AND EQUIPMENT

- SECTION 02553 – NATURAL GAS DISTRIBUTION
- SECTION 08711 – DOOR HARDWARE
- SECTION 13851 – FIRE ALARM SYSTEM
- SECTION 13975 - BUILDING AUTOMATION SYSTEMS (BAS)
- SECTION 16430 – POWER MONITORS FOR LOW VOLTAGE SWITCHGEAR
- SECTION 16442 – PANELBOARDS
- SECTION 16714 – FLEXIBLE RESPONSE SYSTEM
- SECTION 16724 – CONTROLLED ACCESS SECURITY SYSTEM
- SECTION 16740 – PUBLIC ADDRESS SYSTEM
- SECTION 16782 – CLOSED-CIRCUIT TELEVISION (CCTV) SYSTEM
- SECTION L-109 – MODIFICATIONS AND ADDITIONS TO AIRFIELD LIGHTING CONTROL SYSTEM

PASSENGER BOARDING BRIDGE SPECIFICATIONS

- ITEM PBB-100 APRON DRIVE PASSENGER BOARDING BRIDGES

COMMUNICATIONS SYSTEMS AND INFRASTRUCTURE

- SECTION 270000-TC – COMMON WORK
- SECTION 270526-TC – GROUNDING AND BONDING
- SECTION 270528-TC – HANGERS AND SUPPORTS
- SECTION 270553-TC – IDENTIFICATION
- SECTION 271116-TC – CABINETS, RACKS, FRAMES AND ENCLOSURES
- SECTION 271119-TC – TERMINATION BLOCKS AND PATCH PANELS
- SECTION 271313-TC – CABLE SPLICING AND TERMINATION
- SECTION 271323-TC – OPTICAL FIBER SPLICING AND TERMINATIONS
- SECTION 271343-TC – COMMUNICATIONS SERVICES CABLING
- SECTION 271519-TC – HORIZONTAL CABLING
- SECTION 271543-TC – FACEPLATES AND CONNECTORS FOR SYSTEMS
- SECTION 275116-TC – PA AND EMERGENCY TENANT PAGING

SENSITIVE SECURITY INFORMATION

- ITEM X-2 – SENSITIVE SECURITY INFORMATION (SSI) SYSTEM REQUIREMENTS DURING CONSTRUCTION

BUILDING AUTOMATION SYSTEMS

- SECTION 230519 (PARTIAL) – AIR FLOW MEASURING SYSTEM
- SECTION 230519 (PARTIAL) – FLOW METERS
- SECTION 230900 – BUILDING AUTOMATION SYSTEMS
- SECTION 262923 – VARIABLE-FREQUENCY MOTOR CONTROLLER

MAA
LANDSCAPE SPECIFICATIONS

MARTIN STATE AIRPORT

BALTIMORE/WASHINGTON INTERNATIONAL Thurgood Marshall AIRPORT

ITEM 900 LANDSCAPING

INTRODUCTION: The Maryland Aviation Administration (MAA) faces many challenges with respect to local, State and Federal regulations regarding construction and construction-related activities at MAA owned and operated airport properties, including the Baltimore/Washington International (BWI) Airport. Maryland is the only state with a Forest Conservation Act (FCA) that regulates impacts to forested areas and that has enforceable planting requirements. The Federal Aviation Administration (FAA) mandates height restrictions for all objects that have the potential to penetrate imaginary air surfaces utilized by pilots during takeoff and landings, and it provides enforceable guidelines for activities that have the potential to attract hazardous wildlife. MAA considers the requirements set forth by both FAA and the State of Maryland when undertaking construction projects.

To comply with these regulations, MAA has completed a Forest Stand Delineation, Reforestation Master Plan, and Forest Management Plan (Draft) that comply with the multi-agency regulations and restrictions. The Reforestation Master Plan specifies areas set aside for forest conservation and retention. Long-term management of forested resources on BWI Airport property is addressed by the Forest Management Plan. As a responsible landowner, MAA insists that all construction and construction-related activities regarding temporary, short-term, or long-term landscaping activities comply with applicable State and Federal regulations. These regulations include:

- The State of Maryland Forest Conservation Act;
- The State of Maryland Forest Conservation Technical Manual;
- COMAR (Agricultural Article Sections 8-101 through 8-501; 8-801 through 8-806; 9-101 through 9-110; and 9-201 through 9-214.); and
- Federal Aviation Administration Advisory Circular 150/5370-10A, Items T-901 through T-908.

In addition, MAA requires all construction and construction-related activities be in accordance with the Reforestation Master Plan for BWI Airport and the Forest Conservation Plan for the specific project. The following documents are available upon request to assist contractors with adherence to these regulations:

- Reforestation Master Plan for Baltimore/Washington International Airport;
- Forest Conservation Plan for appropriate project;
- Maryland Forest Conservation Act;
- FAA Advisory Circular 150/5200-33, "Hazardous Wildlife Attractants On or Near Airports;"
- FAA Advisory Circular 150/5370 - 2 Items P-151 through 156 (as amended by MAA); and
- FAA Advisory Circular 150/5370-10A Items T-901 through T-908 (as amended by MAA).

Each construction project has its own Forest Conservation Plan that is prepared by the design consultant. ***A copy of the Forest Conservation Plan for the specific project shall be kept on site during all hours of operation.***

PURPOSE: These specifications are provided to Contractors performing landscaping and landscape-related work for MAA to ensure adequacy, consistency, and conformance with applicable state and federal regulations. In certain cases, such as planting, seeding, and sodding, specifications were intentionally designed to reduce the attractiveness of certain areas to wildlife, and thus reduce the risk of wildlife strikes by aircraft. Contractors performing activities related to landscaping for MAA shall adhere to these specifications.

SEQUENCING OF TASKS: Tasks performed by the Contractor shall occur in a logical and efficient sequence. The Contractor shall provide sufficient time for testing and analysis to be completed without compromising the sequencing of tasks. Coordination with the designated MAA Engineer is critical for efficient completion of tasks. MAA will not reimburse the Contractor for time or materials lost as a result of failure to comply with these standards, MAA plan reviews, or the State of Maryland Forest Conservation Act.

Limits of Disturbance and Forest Retention Areas shall be identified as follows:

- **Limits of Disturbance:** The limits of disturbance of the project area shall be clearly identified with "Forest Retention Area" signs attached to stakes placed at 50-foot intervals. Diversion dikes and silt fences shall be in place prior to any disturbance.

- **Forest Retention Area Boundaries:** For all projects conducted within 75 feet of a forest retention area, the Contractor will identify the boundary of the forest retention area with ½-inch blaze orange flagging at 100-foot intervals on perimeter trees. The contractor will install blaze orange plastic mesh fence (see Appendix B) along the entire forest retention area offset 45 feet from the forest retention area boundary. If necessary, "specimen tree signs" (see Appendix B) will be installed on specimen trees and appropriate protection measures will be followed as specified in the State Forest Conservation Technical Manual.

- **Pre-construction Site Inspection**: After the forest retention limits of disturbance (LOD) and boundaries have been delineated, the contractor will notify the Office of Facilities Planning and the Department of Natural Resources (DNR) Forest Service, to schedule a walk through inspection of the site. The DNR representative will inspect the forest retention boundary marking, discuss the proposed construction timetable, and discuss additional requirements that may be necessary. MAA and DNR shall approve all plans prior to the initiation of work.

Planting Plans: The following design standard should be used to determine appropriate plant material for use in landscaping and site stabilization in accordance with the FAA advisory circular 150/5200-33, "Hazardous Wildlife Attractants on or Near Airports":

- Use native plants whenever possible;
- Use plants with a minimal wildlife attractiveness value. See Draft List of Recommended species for Construction Plantings;
- Use sterile plants or plants that exhibit minimal seed production;
- Reduce mowing requirements in long narrow areas or areas less than 1,000 square feet by planting low growing shrubs or other alternative ground covers;
- Plant in clusters and group species in communities in large contiguous areas;
- Create distinct breaks between vegetation strata;
- Avoid planting low-growing trees, shrubs, brambles, and vines at the edges of a forest where the forest meets the turf or scrub/shrub areas to reduce the edge effect; and
- All plant material used by the contractor for temporary, short- term landscaping or long-term landscaping shall be from the MAA approved plant materials list (see Draft List of Recommended Species for Construction Plantings).

Deviations from these standards require specific justification and approval by the MAA Office of Facilities Planning.

Specifications: Landscape activities shall be conducted according to the document *Specifications for Performing Landscaping Activities on Baltimore/Washington International and Martin State Airport Properties.*

Compliance: MAA acknowledges that these specifications vary slightly from the Natural Resources Conservation Service Standards for Critical Area Planting (MD 342). However, this specification was approved by the Maryland Department of the Environment, Water Management Administration, the United States Department of Agriculture's Wildlife Services Division, and the Natural Resources Conservation Service in May 2001, and satisfies compliance for MD 378 projects.

Post Construction: Once construction activities (including reestablishment of vegetation) have ceased, the contractor is required to remove all flagging and protective measures (with the exception of forest retention signage) from both the forest retention area and the construction site. MAA has the right to retain final payment until aforementioned actions have been performed.

ITEM 901 TOPSOIL

DESCRIPTION

901-1 GENERAL. This item provides specifications for topsoil and for topsoil-related activities such as preparation of ground surfaces, removal of topsoil from designated areas, placement and spreading of topsoil, and soil stabilization methods. All activities shall conform with the standards described in this specification and occur at locations clearly indicated on site plans or as directed by the MAA Engineer.

MATERIALS

901-2.1 TOPSOIL. Topsoil is a component of soil, composed of the surface layer of soil containing organic matter and free from any admixture of refuse or other materials toxic to plant growth. Topsoil shall be reasonably free from subsoils as well as all stumps, roots, brush, stones (1 inch or more in diameter), clay lumps, or similar objects. Brush and other vegetation that will not be incorporated with the topsoil during handling operations shall be removed. Topsoil shall be free from any parts of Johnson grass (*Sorgum halepense*), Canada thistle (*Circium arvense*) or phragmites (*Phragmites australis*) in addition to the following state designated noxious weeds: annual bluegrass (*Poa annua*), Bermuda grass (*Cynodon dactylon*), bindweed (*Calystegia* spp.), cocklebur (*Xanthium* spp.), corn cockle (*Agrostemma githago*), dodder (*Cuscuta* spp.), giant foxtail (*Setaria magna*), horse nettle (*Solanum carolinense*), spurred anoda (*Anoda* spp.), wild garlic (*Allium vineale*), and wild onion (*Allium canadense*).

Topsoil shall conform to the standards required by the Maryland State Highway Administration as summarized below. Topsoil, unless otherwise specified or approved, shall have a pH range of approximately 6.0 to 7.5, as determined by laboratory testing. The organic content may not be less than 3% nor more than 20% as determined by the wet-combustion method (chromic acid reduction). Topsoil shall conform to the following size and texture specifications:

SIEVE SIZE	MINIMUM PERCENT SOIL PASSING BY WEIGHT
50.00 mm (2 in.)	100
4.75 mm (No. 4)	90
2.00 mm (No. 10)	80

SOIL PARTICLE SIZES AND TEXTURES	PERCENT PASSING BY WEIGHT
Sand (2.0-0.050 mm)	20-75
Silt (0.050-0.002 mm)	10-60
Clay (less than 0.002 mm)	5-30

901-2.2 INSPECTION AND TESTING. Within 10 days following acceptance of the bid, the Contractor shall notify the MAA Engineer of the proposed source of topsoil to be furnished for the project. The topsoil shall be inspected to determine whether the soil is appropriate for use and conforms to MAA standards. During the inspection, the Contractor may be required to collect representative soil samples from several locations within the area under consideration and to the proposed stripping depths for content analysis as described in Paragraph 2.1 of this Item. Samples shall be tested for pH, content of organic matter, particle size, and texture (percentage of sand, silt, and clay).

901-2.3 SOILS FOR REPAIR. Soils to be used for areas in need of repair shall be of equal quality or greater than those that exist in adjacent areas and shall meet the specifications described in Paragraph 901-2.1.

CONSTRUCTION METHODS

901-3.1 GENERAL. Areas receiving topsoil shall be clearly shown on the site plan. If topsoil is available on site, locations of stockpiles or areas to be stripped of topsoil and the associated stripping depths also shall be shown on site plans. Suitable equipment necessary for proper preparation and treatment of the ground surface, stripping of topsoil, and handling and placing of all required materials shall be on site, in good condition, and approved by the MAA Engineer before topsoil operations begin.

901-3.2 PREPARATION OF GROUND SURFACES. Prior to depositing and spreading topsoil on a given area, the surface shall be loosened by discs, spike-tooth harrows, or other means approved by the MAA Engineer, to a minimum depth of 2 inches to facilitate bonding of the topsoil with the soil. The surface of the area receiving topsoil shall be clear of all stones greater than 1 inch in diameter as well as any litter or other materials that may be detrimental to proper bonding, the rise of capillary moisture, or the proper growth of the desired plants. Areas that may be too compact to respond to these operations shall receive special scarification prior to application of any soil.

Grades on the area to receive topsoil, previously established by the Contractor or others, and shown on site plans, shall be maintained in a true and even condition. Where grades have not been established, the areas shall be smooth-graded and the surface left at a prescribed grade in an even and properly compacted condition to prevent, insofar as practical, the formation of low areas or pockets where water may stand. Damages caused by erosion or other forces that occur after the completion of grading shall be repaired prior to the application of topsoil. The Contractor will repair such damages, which may include filling gullies, smoothing irregularities, and repairing other incidental damages prior to the application of topsoil.

901-3.3 OBTAINING TOPSOIL. Prior to stripping of the topsoil from designated areas, all vegetation, briers, stumps and large roots, rubbish, and stones that might interfere with subsequent operations shall be removed using methods approved by the Engineer. Heavy sods or other cover shall be removed.

901-3.3.1 SALVAGED TOPSOIL (TOPSOIL OBTAINED ON SITE). When suitable topsoil is available on site, the Contractor shall salvage this material from the areas as indicated on site plans and to the depth directed by the MAA Engineer. The salvaged topsoil shall either be spread on areas that have already been tilled and smooth-graded or stockpiled in areas previously approved by the MAA Engineer and indicated by site plans. Any topsoil stockpiled by the Contractor shall be removed from the site and properly stored at an MAA-designated location for future use. Any topsoil that has been stockpiled on the site by others and is no longer required for topsoiling purposes shall be removed from the site and properly disposed of by the Contractor. All stockpile sites and adjacent areas that have been disturbed by the Contractor shall be graded and put into a condition acceptable for seeding or other landscaping activities.

901-3.3.2 FURNISHED TOPSOIL (TOPSOIL OBTAINED OFF SITE). When topsoil is secured off site, the Contractor shall locate and obtain the supply with the approval of the MAA Engineer. The Contractor shall notify the MAA Engineer sufficiently in advance of operations so that necessary measurements and tests can be performed. The Contractor shall only remove the topsoil from approved areas and to the depth as directed. The topsoil shall be hauled to the site of work and either placed for spreading by others or spread by the Contractor as specified by site plans. Any topsoil hauled to the site of work and stockpiled shall be removed from the site following completion of the task and properly stored at an MAA-designated location for future use.

901-3.4 SPREADING TOPSOIL. Topsoil shall be evenly spread to a minimum uniform depth of 4 inches after compaction on all areas, with the exception of those areas with a finished grade of 4:1 or steeper. In these sloped areas topsoil should be spread to a minimum depth of 4 inches. Spreading shall not occur when the ground or topsoil is frozen, excessively wet, or otherwise in a condition detrimental to the work. Spreading shall be conducted so that turfing operations can proceed with minimal soil preparation.

After spreading the topsoil the Contractor shall collect and dispose of rocks (1 inch or more in diameter), roots, litter, or any other foreign material occurring on the surface of the topsoil. Large stiff clods and hard lumps of soil shall be pulverized. After removal of such objects has been completed, the topsoil shall be graded. Any topsoil or other dirt falling upon pavements as a result of hauling or handling of topsoil shall be promptly removed and disposed of by the Contractor.

901-3.5 SOIL STABILIZATION MATTING. The need for soil stabilization matting will be approved by the MAA Engineer on a project-by-project basis. Soil stabilization matting shall consist of machine-produced mats of wood fibers, wood excelsior, or biodegradable man-made fibers and shall be 40 to 96 inches wide. Matting shall have a uniform thickness and distribution of fibers. All soil stabilization matting shall be smolder resistant. If chemicals are required during application of matting, the chemicals shall be non-leaching, nontoxic to vegetation (including the germination of seed), and non-injurious to the skin.

If excelsior matting is utilized, the top and bottom shall be covered by a biodegradable extruded plastic netting with a maximum mesh size of 2 square inches (50 by 50 mm) or be covered (on the topside) by netting machine sewn on 2-inch (50 mm) centers along the longitudinal axis of the material. The average breaking strength of any two strands of netting shall be at least 5 pounds. Netting shall be entwined with matting fibers in a manner that will provide adequate reinforcement against damage during handling and placement and shall resist degradation for a minimum of six months and a maximum of one year.

901-3.6 STAPLES. Staples shall be either U- or T-shaped steel wire with minimum gauges of No. 11 (3.061 mm) and No. 8 (4.115 mm) respectively. The U-shaped staples shall be at least 6 inches (150 mm) long and average between 1 and 1.5 inches (25 to 40 mm) wide. The T-shaped staples shall have a primary leg 8-inches (200-mm) long, a secondary leg 1-inch (25 mm) long, and a 4-inch (100-mm) head.

METHOD OF MEASUREMENT

Topsoil will be measured by volume in cubic yards computed by the method of end areas. The quantity of topsoil to be paid for will be measured by the number of square yards measured in place and will account for depth.

901-4.1 Salvaged topsoil (topsoil obtained on site) will be measured by the number of square yards of topsoil measured in its original position, and again after it has been stripped or excavated. Topsoil stockpiled by others and removed for topsoiling by the Contractor will be measured by the number of square yards of topsoil measured to a specific depth in the stockpile. Salvaged topsoil will be measured by volume in either cubic yards computed by the method of end areas or square yards at 1-, 2-, or 4-inch depths.

901-4.2 Furnished topsoil (topsoil obtained off site) will be measured by the number of square yards of topsoil measured in its original position, and again after it has been stripped or excavated. Furnished topsoil will be measured by volume in either cubic yards computed by the method of end areas or square yards at 1-, 2-, or 4-inch depths.

BASIS OF PAYMENT

901-5 Payment will be made at the contract unit price per cubic yard for topsoiling. This price will provide full compensation for furnishing all materials and for all preparations, placing, and spreading of materials, and for all labor, equipment, tolls, and incidentals necessary for the completion of the task.

Payment will be made under:

Item 901-5.1	Topsoil --per cubic yard
Item 901-5.2	Salvaged Topsoil – per square yard at 1-inch depth
Item 901-5.3	Furnished Topsoil – per square yard at 1-inch depth
Item 901-5.4	Salvaged Topsoil – per square yard at 2-inch depth
Item 901-5.5	Furnished Topsoil – per square yard at 2-inch depth
Item 901-5.6	Salvaged Topsoil – per square yard at 4-inch depth
Item 901-5.7	Furnished Topsoil – per square yard at 4-inch depth

END OF ITEM 901

ITEM 902 PLANT INSTALLATION

DESCRIPTION

902-1 GENERAL. This item provides specifications for plant materials to be used for landscaping activities. All activities shall conform to the standards described in this specification and occur at locations clearly indicated by site plans or as directed by the MAA Engineer.

MATERIALS

902-2.1 PLANTS.

902-2.1.1 SPECIES. Preferred species that appear in Appendix A "Approved Landscape Plant Material" shall be used unless otherwise approved by the MAA Engineer. The authority for all plant names shall be the current printing of *Hortus Third*[1]. Representative samples of every shipment of plant materials shall be labeled as to genus, species, and specified size.

902-2.1.2 HEALTH. All plants, unless otherwise specifically permitted, shall conform to the standards of the current edition of *American Standard for Nursery Stock*[2] as approved by the American Standards Institute, Inc. All plants, unless otherwise specifically permitted, shall be nursery grown and shall have been grown within plant hardiness zones 5, 6, 7, or the Virginia portion of zone 8A as recorded in the current edition of *USDA Plant Hardiness Zone Map*[3], prepared by the U.S. National Arboretum, Agricultural Research Service, U.S. Department of Agriculture. All plant materials shall have normal, well developed branches and a vigorous root system. They shall be healthy plants free from physical defects, plant diseases, and insect pests. Plant materials grown in fields or blocks that show evidence of containing any parts of Johnson grass (*Sorgum halepense*), Canada thistle (*Cirsium arvense*), or Phragmites (*Phragmites australis*) will not be accepted. Shade and flowering trees shall be symmetrically balanced. Major branches shall not have V-shaped crotches capable of causing structural weakness. Trunks shall be free of unhealed branch removal wounds greater than 1 inch (25 mm) in diameter. Shade trees shall have a single main trunk. Trunks shall be free of branches below the following heights:

- 1-1/2 to 2-1/2 inch (40- to 65-mm) caliper trees = 5 feet (1.5 meter) height
- 3-inch (75 mm)-caliper and greater trees = 6 feet (1.8 meter) height.

902-2.1.3 INSPECTION AND TESTING. The initial inspection for conformance with these specifications will be made at the nursery, holding area, or job site. The condition of all plant material will be subject to reinspection for the life of the Contract. Inspection and tagging of plant material with a MAA seal prior to digging will occur at the discretion of the MAA

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[1] Staff of the L.H. Bailey Hortorium, Cornell University, 1976. *Hortus Third; A Concise Dictionary of Plants Cultivated in the United States and Canada.* Barnes and Noble, Inc. New York, New York.
[2] American Nursery and Landscape Association, 1990. *American Standard for Nursery Stock.*
[3] US National Arboretum, Agricultural Research Service, US Department of Agriculture, 1990. *USDA Plant Hardiness Zone Map.*

Engineer. Material arriving with broken seals (if tagging is required), broken or loose root balls, mechanical damage, insufficient protection and/or shriveled or undeveloped roots will not be accepted. All container grown plants shall be well rooted, vigorous, and established in the size pot specified, shall have well balanced tops for the pot size, and shall not be root bound. All plant materials shall be declared and certified free from disease and insects of any kind as required by law for the necessary interstate or interdistrict transportation.

902-2.1.4 SUBSTITUTION OF PLANT MATERIALS. No substitutions shall be made without the permission of the MAA Office of Facilities Planning. In cases where plant materials are not available at the time of planting, the Contractor shall submit, in writing, evidence that the plants are unavailable. If necessary, MAA will determine suitable substitutions.

902-2.2 FERTILIZER. Fertilizer, if necessary, shall be standard commercial fertilizer and shall meet the requirements of applicable state and federal laws as well as standards set forth by the Association of Official Agricultural Chemists.

902-2.3 SOIL AMENDMENTS. Soil amendments shall be commercial grade and shall meet the requirements of applicable state and federal laws as well as standards set forth by the Association of Official Agricultural Chemists.

902-2.4 WATER. All water used shall be obtained from fresh water sources and shall be free from injurious chemicals and other toxic substances harmful to plant life. Brackish water shall not be used at any time. The Contractor shall identify all sources of water to the Engineer at least two weeks prior to use. The Engineer may take samples of the water at the source or from the tank at any time and submit the samples to a laboratory to identify chemical and saline content. The Contractor shall not use any water from any source that is disapproved by the Engineer following such tests.

CONSTRUCTION METHODS

902-3.1 GENERAL. This section provides approved methods for installation of plant material and includes specifications for soil preparation, fertilization, installation, and post-installation care. Prior to beginning any planting activities, a planting design prepared by a landscape architect or a qualified official shall be submitted to and approved by the MAA Office of Facilities Planning on behalf of the MAA Engineer. The planting design shall be to scale and clearly show the species to be planted, locations of individual plants, size of individual plants, and spacing requirements. The MAA Office of Facilities Planning shall approve deviations from an approved design. The approved planting design shall be kept on site during all working hours.

902-3.2 PREPARATION OF GROUND SURFACES. Areas designated for planting shall be properly prepared before plant installation occurs. The soil of a properly prepared planting bed shall be loose and friable to a minimum depth of 1 foot (30.5 cm), laboratory tested, and properly amended based on laboratory recommendations. The soil of a properly prepared planting bed shall be free of any stones larger than 1 inch in diameter, sticks, stumps, and/or other debris that may interfere with plant installation, growth of plant material, and subsequent maintenance of

planted areas. The soil of a properly prepared planting bed shall be properly graded to conform with the required lines, grades, and cross sections as shown on the planting design plan.

902-3.2.1 TOPSOIL. Topsoil, if necessary, shall conform to the standards and be incorporated with existing soils according to procedures described in Item 901 - "TOPSOILING" prior to laboratory analysis of soil and subsequent addition of any necessary soil amendments.

902-3.2.2 FERTILIZER. Fertilizer, if necessary, shall be applied at concentrations and rates suggested by the soil testing laboratory based on results of soil analysis. Fertilizer, unless otherwise specified, shall be added by hand on a plant-by-plant basis. Unless specifically required, lime shall not be added to areas to be planted.

902-3.2.3 SOIL AMENDMENTS. Soil amendments shall be added according to recommendations made by the laboratory based on analytical results. These recommendations shall be provided to and approved by the MAA Engineer prior to amendment of any soil.

902-3.3 OBTAINING PLANT MATERIAL. Plant material shall be free from all pests and diseases and conform to the standards described in Section 902-2 "MATERIALS."

902-3.3.1 NURSERY STOCK PLANTS. Nursery stock plants shall be obtained from a nursery certified by the Associated Landscape Contractors of America.

902-3.3.2 TRANSPLANTED PLANTS. Plants approved for transplanting shall be vigorous and free from all pest infestations and/or diseases. Potential plant materials for transplanting shall be inspected by a Licensed Arborist and subsequently approved by the MAA Engineer. Plants approved for transplanting shall be dug up, cared for, and transported according to the standards of the Associated Landscape Contractors of America.

902-3.4 PLACEMENT OF PLANT MATERIALS. Prior to installation of plant material, the site design shall be reviewed, and individual plants shall be placed at locations on the prepared bed as indicated by the site design. Once the design layout has been marked on the prepared bed, the Contractor shall determine if the proposed sizes and spacing of plants are reasonable. Alterations to the landscape design shall be performed by a qualified Landscape Architect and approved by the MAA Office of Facilities Planning on behalf of the MAA Engineer. The planted bed shall be graded to the specifications indicated by the site design.

902-3.5 INSTALLATION OF PLANT MATERIAL. All plant material shall be installed in satisfactorily prepared beds according to the methods detailed in *Landscape Specification Guidelines* published by the Associated Landscape Contractors of America. Portions of these guidelines relevant to digging, backfilling, and securing of plant materials are included as Appendix B.

If circumstances exist that delay installation of plant material, the Contractor shall provide adequate care required to maintain the plants in a healthy condition until installation can be performed. Such care may include watering, protection from excessive sun and wind exposure,

and protection from damage by wildlife. Plants must be stored in a location that does not cause an increased risk of wildlife strike hazards and is approved by the MAA Engineer (plant material must not be stored near aircraft operation areas or approach/departure paths). Materials that deteriorate beyond the potential for recovery shall not be installed. It will be the Contractor's responsibility to replace these items at no additional cost to MAA.

902-3.5 POST INSTALLATION. After installation of all plant materials to a bed, subsequent activities such as seeding, sodding, or mulching shall be conducted as indicated by the site design. Methods for completion of these activities shall conform to the standards set forth in Items 903 "Seeding," 904 "Sodding," and 905 "Mulching."

902-3.6 MAINTENANCE. Maintenance of installed plant material includes watering, weed and pest control, health inspections, and replacements as needed.

METHOD OF MEASUREMENT

902-4 This item will be measured on a per plant basis.

BASIS OF PAYMENT

902-5 This item will be paid for on a per plant basis.

Payment will be made under Item 902-5 Planting.

END OF ITEM 902

ITEM 903 SEEDING

DESCRIPTION

903-1.1 GENERAL. This item provides specifications for seeding of areas as designated on plans or as directed by the MAA Engineer. The species, mixtures, and methods of application provided in this item have been designed to reduce the attractiveness of airport grounds to wildlife. Only MAA-approved species, mixtures, and rates of application provided in this item may be used to establish vegetation. All activities associated with seeding including soil preparation, seed application, fertilization, and maintenance shall also conform to these approved standards.

MATERIALS

903-2.1 SEED. All seed shall comply with the Maryland Seed Law (Agricultural Article of the Annotated Code of Maryland). Only MAA-approved species, mixtures, and rates of application provided in this item may be used to establish vegetation. Seed will be sampled and tested by an inspector from the Turf and Seed Section, Maryland Department of Agriculture (MDA), Annapolis, Maryland. All lawn and turf seed and mixtures shall be free from the following state-listed restricted noxious weeds:

corn cockle (*Agrostemma githago*),
bentgrass (*Agrostis* spp.)[4],
redtop (*Agrostis gigantea*) [1]
wild onion (*Allium canadense*),
wild garlic (*Allium vineale*),
bindweed (*Calstegia* spp.),
dodder (*Cuscuta* spp.),
Bermuda grass (*Cynodon dactylon*),
orchardgrass (*Dactylis glomerata*),
tall fescue (*Festuca arundinacea*) [1]
meadow fescue (*Festuca pratensis*) [1],
velvetgrass (*Holcus lanatus*),
annual bluegrass (*Poa annua*),
rough bluegrass (*Poa trivialis*)[1],
timothy (*Phleum pratense*), and
Johnson grass (*Sorgum halepense*).

Restricted noxious-weed seed may not exceed 0.5 percent by weight of any seed mixture. In addition, all seeds sold in Maryland shall be free from the following listed prohibited noxious weeds: balloonvine (*Cardiospermum halicacabum*), quackgrass (*Elytrigia repens*), sicklepod (*Senna obtusifolia*), sorghum (*Sorghum* spp.), Canada thistle (*Cirsium arvense*), plumeless thistle

[4] These species may be included as a labeled component of a mixture when each is present in excess of five percent of the mixture by weight.

(*Carduus* spp.-includes musk thistle and curled thistle), and serrated tussock (*Nassella trichotoma*).

903-2.1.1 APPROVED SPECIES. The following table contains species that are approved by MAA for use in seed mixtures. Purity requirements and germination requirements are also provided.

APPROVED PLANT SPECIES
MAA SEED MIXTURES

	Purity[a] Not Less than %	Minimum % Germination[b]	Pure Live Seed Factor
Certified Turf-Type Tall Fescue (*Festuca arundinacea*)	98	90	1.13
Certified Kentucky Bluegrass (*Poa pratensis*)	90	80	1.39
Fowl Bluegrass (*Poa palustris*)	90	80	1.39
Hard Fescue (*Festuca longifolia*)	98	90	1.13
Chewings Red Fescue (*Festuca rubra commutata*)	98	90	1.13
Annual Ryegrass (*Lolium multiflorum*)	95	85	1.24
Perennial Ryegrass (*Lolium perenne*)	90	80	1.39
Creeping Bentgrass (*Agrostis stolonifera*)	90	80	1.39
Switchgrass (*Panicum virgatum*)	90	80	1.39
Little Bluestem (*Andropogon scoparius*)	62	94	1.71

[a] The percentage weight of pure seed present shall be free of any agriculture seeds, inert matter, and other seeds distinguishable by their appearance.
[b] The percentage of germination shall be actual sprouts and shall not include hard seeds unless specifically permitted by the MAA Engineer.

903-2.1.2 PURITY. All seed shall be free of all state-designated noxious weeds listed in Paragraph 2.1.1 and conform to MAA specifications. To ensure compliance, MAA requires sampling and testing of seed by the Turf and Seed Section, Maryland Department of Agriculture (MDA). The Contractor shall furnish the MAA Engineer with duplicate signed copies of a statement by the Turf and Seed Section certifying that each lot of seed has been laboratory tested within six months of date of delivery. This statement shall include the following information:

- name and address of laboratory,
- date of test,
- lot number,
- the results of tests as to name, percentages of purity and of germination,

- percentage of weed content for the seed furnished,
- and, in the case of a mixture, the proportions of each kind of seed.

Seed shall be furnished in standard containers with the seed name, lot number, net weight, percentages of purity, germination rate and hard seed, and percentage of maximum weed seed content clearly marked. All seed containers shall be tagged with a MDA supervised mix program seed tag.

903-2.1.3 MIXTURES AND APPLICATION RATES. Only seed mixtures and application rates described in this item may be used unless otherwise approved by the MAA Engineer. Seed mixtures shall meet criteria detailed in Paragraph 903-2.1.2. Seed mixtures have been formulated to minimize the attractiveness of areas to wildlife of common landscape scenarios. The appropriate seed mixture for application will be designated based on environmental conditions and may vary from site to site. All planting rates listed are in pounds of Pure Live Seed (PLS) per acre.

Seed mixtures, application scenarios, and rates *for permanent cool-season grasses* are as follows:

a. Seed Mixture No. 1 - relatively flat areas (grade less than 4:1) subject to normal conditions and regular mowing (Application rate = 234 lbs PLS/acre);
b. Seed Mixture No. 2 - sloped areas (grade greater than 4:1) not subject to regular mowing (Application rate = 115 lbs PLS/acre); and
c. Seed Mixture No. 3 - wetlands and their associated buffer zones (Application rate = 131 lbs PLS/acre).

Seed Mixture No. 1: Relatively flat areas regularly mowed and exposed to normal conditions (Application rate = 234 lbs PLS/acre)

Seed	Rate of Application (lbs of PLS/acre)
85% Certified Turf-Type Tall Fescue	192
10% Certified Kentucky Bluegrass	28
5% Perennial Ryegrass	14
Supplemental Seed	
Annual Ryegrass	25

Seed Mixture No. 2: Sloped areas not subject to regular mowing (Application rate = 115 lbs PLS/acre)

Seed	Rate of Application (lbs of PLS/acre)
75% Hard Fescue	85
20% Chewings Fescue	23
5% Kentucky Bluegrass	7
Supplemental Seed	
Redtop	3

Seed Mixture No. 3 - Wetland areas and their associated buffer zones (Application rate = 131 lbs PLS/acre)

Seed	Rate of Application (lbs of PLS/acre)
60% Creeping Bent Grass	83
30% Fowl Bluegrass	34
10% Switchgrass	14
Supplemental Seed	
Redtop	3

903-2.1.4 SEEDING SEASONS. Application of seed and seed mixtures shall occur within a specified seeding season unless otherwise approved by the MAA Engineer. No seed or seed mixtures are to be applied on frozen ground or when the temperature is at or below 35 degrees Farenheit (7.2 degrees Centigrade). Under these conditions, a layer of mulch should be applied in accordance with Item 905, Mulching, to stabilize the site, and permanent seeding should occur in the subsequent seeding season. Seed application may occur during the seeding season dates listed below. Seeding performed after October 20 should be a temporary cover of annual ryegrass and followed by overseeding of the appropriate seed mixture during the spring seeding season.

SEEDING SEASONS	
Permanent Cool-Season Grasses	March 1 to April 20 and August 1 to October 20, inclusive
Temporary Cover of Annual Rye/Redtop	March 1 to April 30 and August 1 to November 30, inclusive
Temporary Cover of Warm-Season Grasses *(Little Bluestem only)*	May 1 to July 31, inclusive. Rate of application should be 13.6 lbs. PLS per acre.

Seeding seasons are based on typical years and can be subject to variation, which may be modified by the MAA Engineer based on seasonal trends.

If the time required to complete any of the operations necessary under this item, within the specified planting season or any authorized extensions thereof, extends beyond the Contract period, then such time will be charged against the Contract time, and liquidated damages will be enforced with respect to this portion of work.

903-2.2 LIME. Lime shall consist of ground limestone and contain at least 85 percent total carbonates. Lime shall be ground to a fineness so that at least 90 percent will pass through a No. 20 mesh sieve and 50 percent will pass through a No. 100 mesh sieve. Dolomitic lime or a high magnesium lime shall contain at least 10 percent magnesium oxide. Lime shall be applied by approved methods detailed in Section 903-3.3 of this item. The rate of application will be based on results of soil tests.

903-2.3 FERTILIZER. Fertilizer shall be standard commercial fertilizer (supplied separately or in mixtures) and meet the requirements of applicable state and federal laws (O-F-241) as well as standards of the Association of Official Agricultural Chemists. Nitrogen-Phosphorus-Potassium (N-P-K) concentrations shall be determined from analysis of soil samples. Methods of fertilizer application shall conform to standards described in Section 903-3.3 of this item. Fertilizer shall be furnished in standard containers that are clearly labeled with name, weight, and guaranteed analysis of the contents (percentage of total nitrogen, available phosphoric acid, and water-soluble potash). Mixed fertilizers shall not contain any hydrated lime or cyanamide compounds. Fertilizers failing to meet the specified analysis may be approved by the MAA Engineer, providing sufficient materials are applied to conform with the specified nutrients per unit of measure without additional cost to MAA.

The fertilizers may be supplied in the following forms:

a. A dry, free-flowing fertilizer suitable for application by a common fertilizer spreader;

b. A finely ground fertilizer soluble in water, suitable for application by power sprayers; or

c. A granular or pellet form suitable for application by blower equipment.

The rate of application will be based on results of soil tests performed by the University of Maryland Soil Testing Laboratory. By law, persons applying fertilizer to State-owned land shall follow the recommendations of the University of Maryland as set forth in the "Plant Nutrient Recommendations Based on Soil Tests for Turf Maintenance" and the "Plant Nutrient Recommendations Based on Soil Tests for Sod Production" (see Appendix B). Application of the fertilizer shall be in a manner that is consistent with the recommendations of the University of Maryland Cooperative Extension.

CONSTRUCTION METHODS AND EQUIPMENT

903-3.1 GENERAL. This section provides approved methods for the application of and includes standards for seedbed preparation, methods of application, and equipment to be used during the process. Lime and fertilizer shall be applied to seeded areas before the seed is spread. The mixture of seed will be determined for sites based on environmental conditions as described in Paragraph 903-2.1.3.

903-3.2 ADVANCE PREPARATION. Areas designated for seeding shall be properly prepared in advance of seed application. The area shall be tilled and graded prior to application of lime and fertilizer, and the surface area shall be cleared of any stones larger than 1 inch in diameter, sticks, stumps, and other debris that might interfere with sowing of seed, growth of grasses, or subsequent maintenance of grass-covered areas. Damage caused by erosion or other forces that occur after the completion of grading shall be repaired prior to the application of fertilizer and lime. The Contractor will repair such damage, which may include filling gullies, smoothing irregularities, and repairing other incidental damage before beginning the application of fertilizer and ground limestone.

If an area to be seeded is sparsely sodded, weedy, barren and unworked, or packed and hard, all grass and weeds shall first be cut or otherwise satisfactorily disposed of, and the soil then scarified or otherwise loosened to a depth not less than 5 inches (125 mm). Clods shall be broken and the top 3 inches (75 mm) of soil shall be worked into a satisfactory condition by discing or by use of cultipackers, rollers, drags, harrows, or other appropriate means.

An area to be seeded shall be considered a satisfactory seedbed (without requiring additional treatment) if it has recently been thoroughly loosened and worked to a depth of not less than 5 inches; the top 3 inches of soil is loose, friable, and is reasonably free from large clods, rocks, large roots, or other undesirable matter; appropriate amounts of fertilizer and lime have been added; and, if it has been shaped to the required grade immediately prior to seeding. For slope areas steeper than 3:1 (three horizontal to one vertical), the subsoil shall be loose to a depth of 1 inch.

After completion of tilling and grading, lime and fertilizer shall be applied within 48 hours according to the specified rate (Paragraphs 903-2.2 and 2.3) and methods (Paragraphs 903-3.3.1 and 903-3.3.2) approved by MAA. The seeding mixture shall be applied within 48 hours after application of lime and fertilizer. To firm the seeded areas, cultipacking shall occur immediately after seeding.

903-3.3 METHODS OF APPLICATION. Lime, fertilizer, and seed mixes shall be applied by either the dry or wet application methods that have been approved by MAA and are detailed below.

903-3.3.1 DRY APPLICATION METHOD

a. Liming. If soil test results indicate that lime is needed, the following procedures will be used: following advance preparation of the seedbed, lime shall be applied prior to the application of any fertilizer or seed and only on seedbeds that have been prepared as described in paragraph 903-3.2. The lime shall be uniformly spread and worked into the top 2 inches of soil, after which the seedbed shall be properly graded again.

b. Fertilizing. Following advance preparations (and liming if necessary), fertilizer shall be spread uniformly at the specified rate to provide no less than the minimum quantity stated in Paragraph 903-2.3.

c. Seeding. Seed mixtures shall be sown immediately after fertilization of the seedbed. The fertilizer and seed shall be lightly raked to a depth of 1 inch for newly graded and disturbed areas.

d. Rolling. After the seed has been properly covered, the seedbed shall be immediately compacted using a cultipacker or an approved lawnroller.

903-3.3.2 WET APPLICATION METHOD/HYDROSEEDING

a. General. The Contractor may elect to apply seed and fertilizer as per Paragraphs c and d of this section in the form of an aqueous mixture by spraying over the previously prepared seedbed using methods and equipment approved by MAA. The rates of application shall be as specified in Paragraphs 903-2.1 through 903-2.3.

b. Spraying Equipment. The spraying equipment shall have a container or water tank equipped with a liquid level gauge capable of reading increments of 50 gallons or less over the entire range of the tank capacity. The liquid level gauge shall be mounted so as to be visible to the nozzle operator at all times. The container or tank shall also be equipped with a mechanical power-driven agitator capable of keeping all the solids in the mixture in complete suspension at all times until used.

The spraying equipment shall also include a pressure pump capable of delivering 100 gallons per minute at a pressure of 100 pounds per square inch. The pressure pump assemblage shall be configured to allow the mixture to flow through the tank when not being sprayed from the nozzle. All pump passages and pipelines shall be capable of providing clearance for 5/8-inch solids. The power unit for the pump and agitator shall have controls mounted so as to be accessible to the nozzle operator. A pressure gauge shall be connected to and mounted immediately behind the nozzle.

The nozzle pipe shall be mounted on an elevated supporting stand in such a manner that it can be rotated through 360 degrees horizontally and inclined vertically from at least 20 degrees below to at least 60 degrees above the horizontal. There shall be a quick-acting, three-way control valve connecting the recirculating line to the nozzle pipe and mounted so that the nozzle operator can control and regulate the amount of flow of mixture to be supplied so that mixtures may be properly sprayed over a distance varying from 20 feet to 100 feet. One shall be a close-range ribbon nozzle, one a medium-range ribbon nozzle, and one a long-range jet nozzle. For ease of removal and cleaning, all nozzles shall be connected to the nozzle pipe by means of quick-release couplings. In order to reach areas inaccessible to the regular equipment, an extension hose at least 50 feet in length shall be provided to which the nozzles may be connected.

c. Mixtures. Lime shall be applied separately in the quantity specified, prior to the fertilizing and seeding operations. Lime should be added to and mixed with water at a concentration not to exceed 220 pounds of lime for every 100 gallons of water. After lime has been applied, the tank should be emptied and rinsed with fresh water. Seed and fertilizer shall be mixed together in the relative proportions specified, but the resulting concentration should not exceed 220 pounds of mixture per 100 gallons of water and should be applied within 30 minutes to prevent fertilizer burn of the seeds.

All water used shall be obtained from fresh water sources and shall be free from injurious chemicals and other toxic substances harmful to plant life. Brackish water shall not be used at any time. The Contractor shall identify all sources of water to the MAA Engineer at least two weeks prior to use. The Engineer may take samples of the water at the source or from the tank at any time and have a laboratory test the samples for chemical and saline content. The Contractor shall not use any water from any source that is disapproved by the Engineer following such tests.

All mixtures shall be constantly agitated from the time they are mixed until they are finally applied to the seedbed. All such mixtures shall be used within 30 minutes from the time they were mixed or they shall be wasted and disposed of at a location acceptable to the Engineer.

d. Spraying. Lime shall be sprayed upon previously prepared seedbeds on which the lime, if required, shall have been worked in already. The mixtures shall be applied using a high-pressure spray which shall always be directed upward into the air so that the mixtures will fall to the ground in a uniform spray. Nozzles or sprays shall never be directed toward the ground in such a manner that might produce erosion or runoff. Particular care shall be exercised to ensure that the application is made uniformly, at the prescribed rate, and to guard against misses and overlapped areas. Predetermined quantities of the mixture shall be used in accordance with specifications to cover specified sections of known areas. To checks the rate and uniformity of application, the applicator will observe the degree of wetting of the ground or distribute test sheets of

paper or pans over the area at intervals and observe the quantity of material deposited thereon.

On surfaces that are to be mulched as indicated by the plans or designated by the MAA Engineer, seed and fertilizer applied by the spray method need not be raked into the soil or rolled. However, on surfaces on which mulch is not to be used, the raking and rolling operations will be required after the soil has dried.

903-3.4 MAINTENANCE OF SEEDED AREAS. The contractor shall protect seeded areas against traffic or other use by warning signs or barricades, as approved by the Engineer. Surfaces gullied or otherwise damaged following seeding shall be repaired by regrading and reseeding as directed. The Contractor shall mow, water as directed, and otherwise maintain seeded areas in a satisfactory condition until final inspection and acceptance of the work.

When either the dry or wet application method outlined above is used for work performed out of season, the Contractor will be required to establish a good stand of grass of uniform color and density to the satisfaction of the Engineer. If at the time when the contract has been otherwise completed it is not possible to make an adequate determination of the color, density, and uniformity of such stand of grass, payment for the unaccepted portions of the areas seeded out of season will be withheld until such time as these requirements have been met.

METHOD OF MEASUREMENT

903-4 The quantity of seeding to be paid for shall be the numbers of acres (or square yard) or portions thereof, measured on the ground surface, completed, and accepted. Separate measurements will be made of the areas seeded with the several seed mixtures specified. No distinction will be made between "graded" areas and "undisturbed" areas in arriving at the total acreage (or square yard) for each area seeded with specified seed mixes. No separate measurements will be made of graded and undisturbed areas for purposes of separate payments.

BASIS OF PAYMENT

903-5.1 The quantity, determined as provided above, will be paid for at the contract unit price per acre (or square yard), or fraction thereof, for seeding, which price and payment shall be full compensation for furnishing and placing all material, including fertilizers, and for all labor, equipment, tools, and incidentals necessary to complete the work prescribed in the item.

Payment will be made under:

Item 903-5.1 Seeding Mixture No. 1 -- per acre
Item 903-5.2 Seeding Mixture No. 1 -- per square yard
Item 903-5.3 Seeding Mixture No. 2 -- per acre
Item 903-5.4 Seeding Mixture No. 2 -- per square yard

Item 903-5.5 Seeding Mixture No. 3 -- per acre
Item 903-5.6 Seeding Mixture No. 3 -- per square yard
Item 903-5.7 Amendments – per acre
Item 903-5.8 Amendments – per square yard
Item 903-5.9 Fertilizer – per acre
Item 903-5.10 Fertilizer – per square yard

END OF ITEM 903

ITEM 904 SODDING

DESCRIPTION

904-1 This item provides standards for furnishing, hauling, and placing approved live sod on prepared areas as indicated on site plans. Sod will only be applied to landscape areas and shall be mowed frequently. All sodding activities shall conform to these specifications at the locations shown on site plans or as directed by the MAA Engineer.

MATERIALS

904-2.1 SOD. Sod furnished by the Contractor shall have a good cover of living or growing grass. This includes grass that is seasonally dormant during the cold or dry seasons and capable of renewing growth after the dormant period. All sod shall be obtained from areas in which the soil is reasonably fertile and contains a high percentage of loamy topsoil. Sod shall be cut or stripped from living, thickly matted turf relatively free of weeds or other undesirable foreign plants, large stones, roots, or other materials that might be detrimental to the development of the sod or to future maintenance. Grass sod shall be Maryland-certified or approved and shall comply with the Maryland Sod Law of the Annotated Code of Maryland (Agricultural Article Sections 9-101 through 9-110). Each load of sod shall bear a Maryland State Approved or Certified label at the time of delivery on the job. Sod shall be either: (1) Bluegrass sod containing not less than 80 percent Kentucky bluegrass (*Poa pratensis*) and not more than 20 percent Red Fescue (*Festuca rubra*); or (2) certified turf type-tall fescue (*Festuca arundinacea*) sod containing not less than 80 percent certified turf type-tall fescue (*Festuca arundinacea*) grass and not more than 20 percent Kentucky Bluegrass (*Poa pratensis*) and Red Fescue (*Festuca rubra*). Any vegetation more than 6 inches in height shall be mowed to a height of 3 inches or less before sod is lifted. Sod, including the soil containing the roots and the emergent plant growth, shall be cut uniformly to a thickness not less than that specified in Section 904-3.4.

904-2.2 LIME. Lime shall conform to standards described in Section 903, "Seeding."

904-2.3 FERTILIZER. Fertilizers and application methods shall conform to the standards previously described in Section 903, "Seeding."

904-2.4 WATER. All water shall conform to the standards previously described in Paragraph 902-2.4, "Water."

904-2.5 SOILS FOR REPAIR. All soils for repairs shall conform to the standards previously described in Paragraph 901-2.3, "Soils for Repair."

CONSTRUCTION REQUIREMENTS

904-3.1 GENERAL. Areas to be sodded shall be clearly indicated by site plans. Areas requiring special ground surface preparation, such as tilling, and those areas in a satisfactory condition that are to remain undisturbed shall also be shown on the plans.

Suitable equipment necessary for proper preparation of the ground surface and for the handling and placing of all required materials shall be on hand, in good condition, and shall be approved by the MAA Engineer before sodding operations begin. The Contractor shall demonstrate to the MAA Engineer, before starting the various operations, that the application of required materials, such as fertilizer and limestone, will be made at the specified rates.

904-3.2 ADVANCE PREPARATION. If the area to be sodded is sparsely vegetated, weedy, barren and unworked, or packed and hard, all existing herbaceous vegetation shall be removed. The soil shall then be scarified or otherwise loosened to a depth of at least 5 inches (125 mm). Clods shall be pulverized, and the top 3 inches (75 mm) of soil shall be worked into a satisfactory bed by discing or use of cultipackers, rollers, drags, harrows, or other equipment approved by the MAA Engineer. The area shall then be properly graded as indicated by site plans.

After grading of areas is complete and prior to the application of fertilizer and limestone, areas to be sodded shall be raked or otherwise cleared of stones larger than 1 inch in diameter, sticks, stumps, and other debris which might interfere with sodding, growth of grasses, or subsequent maintenance of grass-covered areas. If any damage by erosion or other causes has occurred after grading of areas and before beginning the application of fertilizer and ground limestone, the Contractor shall repair such damage. This may include filling gullies, smoothing irregularities, and repairing other incidental damage.

An area to be sodded will be considered a satisfactory seedbed without requiring additional treatment if it recently has been thoroughly loosened and worked to a depth of at least 5 inches as a result of grading operations and, if immediately prior to sodding, the top 3 inches of soil is loose, friable, reasonably free from large clods, rocks, large roots, or other undesirable matter, and is shaped to the required grade. For slope areas steeper than 3:1 (three horizontal to one vertical) the subsoil shall be loosened to a depth of 1 inch. Lime and fertilizer shall be applied within 48 hours after tilling as described in 903-3.3 and 3.4. The sod shall be applied immediately after the lime and fertilizer have been worked into the soil.

904-3.3 APPLICATION OF FERTILIZER AND LIME. Following ground surface preparation, fertilizer shall be uniformly spread as described in Section 903-3.3 at a rate that will provide at least the minimum quantity of fertilizer required. If the use of ground limestone is specified, it shall be spread as described in Section 903-3.3, "Methods of Application"; at a rate that will provide at least the minimum quantity of lime required. These materials shall be incorporated into the soil to a depth of at least 2 inches by discing, raking, or other methods

approved by the MAA Engineer. Any stones larger than 1 inch in diameter, large clods, roots, and other litter brought to the surface by this operation shall be removed.

904-3.4 OBTAINING AND DELIVERING SOD. The sod shall be well rooted, grown in the State of Maryland, and field grown for a minimum of 12 months. After inspection and approval of the sod by the MAA Engineer, the sod shall be cut with approved sod cutters to such a thickness that after placement on the prepared bed, but before compaction, it shall have a uniform attached soil thickness of at least 0.75 inch. Sod sections or strips shall be cut in uniform widths of at least 14 inches and in lengths of at least 18 inches, but not to lengths that might inhibit placement without breaking, tearing, or loss of soil. Where strips are required, the sod shall be rolled or folded undamaged, with the grass facing inward. The Contractor may be required to mow high grass before cutting sod.

Sod shall be transplanted within 24 hours from the time of harvest unless circumstances beyond the Contractor's control make storage necessary. In such cases, sod shall be stacked, kept moist, protected from exposure to the air and sun, and shall be kept from freezing. Sod shall only be harvested and moved when soil moisture conditions are such that favorable results can be expected. Where soil is too dry, permission to cut sod may be granted only after it has been sufficiently watered to moisten the soil to the depth at which the sod will be cut.

904-3.5 PLACING SOD. Sodding shall only be performed during seasons when satisfactory results can be expected. Frozen sod shall not be used and sod shall not be placed upon frozen soil. Sod may be transplanted during periods of drought with the approval of the MAA Engineer, provided the sod bed is watered to moisten the soil to a depth of at least 4 inches immediately prior to laying the sod.

The sod shall be moist and shall be placed on a bed, prepared according to Paragraphs 904-3.2 "Advance Preparation", and 904-3.3, "Application of Fertilizer and Lime" by hand. Pitchforks shall not be used to handle sod, and dumping from vehicles shall not be permitted. The sod shall be placed carefully by hand, edge to edge and with staggered joints, in rows at right angles to the slopes, starting at the base of the area to be sodded and working upward. The sod shall immediately be pressed firmly into contact with the sod bed by tamping or rolling with approved equipment to provide a true and even surface, and ensure knitting without displacement of the sod or deformation of the surfaces of sodded areas. Where the sod has been displaced during sodding operations, the workmen replacing it shall work from ladders or treaded planks to prevent further displacement. Where the grades are such that the flow of water will be from paved surfaces across sodded areas, the surface of the soil in the sod after compaction shall be set approximately 1.5 inches below the pavement edge. Where the flow will be over the sodded areas and onto the paved surfaces around manholes and inlets, the surface of the soil in the sod after compaction shall be placed flush with pavement edges.

On slopes steeper than 1:2.5 and in V-shaped or flat-bottom ditches or gutters, the sod shall be secured with wooden pegs at least 18 inches long and a cross-sectional area of at least 0.75-square inch, or by other methods of securing sod approved by the MAA Engineer. The pegs shall be driven flush with the surface of the sod. The pegs shall be of sufficient number and at

adequate spacing to secure sod from displacement. The use of sod staples or other means of securing the sod from displacement may be approved by the MAA Engineer provided satisfactory results are expected.

904-3.6 WATERING. Adequate water and watering equipment shall be on hand before sodding begins, and sod shall be kept moist until it has become established and its continued growth assured. In all cases, watering shall be done in a manner that will avoid erosion from the application of excessive quantities and will avoid damage to the finished surface.

904-3.7 ESTABLISHING TURF.

904-3.7.1 GENERAL. The Contractor shall provide general care for the sodded areas as soon as the sod has been laid and shall continue to provide such care until final inspection and acceptance of the work.

904-3.7.2 PROTECTION. All sodded areas shall be protected against traffic or other use by warning signs and barricades approved by the MAA Engineer.

904-3.7.3 MOWING. The Contractor shall mow the sodded areas with approved mowing equipment, depending upon climatic and growth conditions and the needs for mowing of specific areas. In the event that weeds or other undesirable vegetation establishes to such an extent that, either cut or uncut, they threaten to smother the sodded species, the weeds shall be mowed and the clippings raked and removed from the area. Spot applications of an appropriate herbicide by a licensed applicator shall be approved by the MAA Engineer to remove invasive species. The appropriate herbicide shall be determined on a case-by-case basis, depending on the location and type of weed.

904-3.7.4 REPAIR. When the surface has become gullied or otherwise damaged during the period covered by this contract, the affected areas shall be repaired to re-establish the grade and the condition of the soil and shall then be re-sodded as specified in Paragraph 904-3.5, "Placing Sod", at the Contractor's expense.

METHOD OF MEASUREMENT

904-4 This item will be measured on the basis of the area in square yards of the surface covered with sod and accepted.

BASIS OF PAYMENT

904-5 This item will be paid for on the basis of the contract unit price per square yard for sodding. The price will provide full compensation for all labor, equipment, material, staking, and incidentals necessary to satisfactorily complete the items as specified.

Payment will be made under:

Item 904-5.1 Sodding—per square yard.
Item 904-5.2 Amendments – per square yard
Item 904-5.3 Fertilizer – per square yard

END OF ITEM 904

ITEM 905 MULCHING

DESCRIPTION

905-1.1 GENERAL. This item provides the Contractor with MAA-approved specifications for mulch and the application of mulch including distribution of mulch and securing of mulched areas. Areas to be mulched will be clearly shown on site plans or otherwise designated by the MAA Engineer.

MATERIALS

905-2.1 TYPES OF MULCH. Acceptable mulch shall be composed of the materials listed below or composed of any locally available materials that are similar to those specified and approved by the MAA Engineer. Low-grade, shalely, soiled, partially rotted hay, straw, or other materials unfit for animal consumption will not be acceptable for use as mulch. Straw or other material that is fresh, excessively brittle, or is in such an advanced stage of decomposition as to smother or retard the planted grass, is not acceptable. Clean, weed-free straw may be used. Mulch materials containing matured seed with the potential to establish and be detrimental to the project or the surrounding area is not acceptable.

a. Shredded Hardwood Bark. Shredded hardwood bark shall consist of hardwood tree bark that has been milled and screened to ensure a maximum 4-inch (100-mm) particle size, provide a uniform texture, and be free from sawdust, toxic substances, and other foreign materials.

b. Wood Chips. Wood chips shall be produced by a chipping machine to a size specified by the MAA Engineer. Chips may not have been subjected to any conditions that would shorten their useful life or cause them to lose any of their value as mulch. Wood chips shall be free from bark, leaves, twigs, wood shavings, sawdust, toxic substances, and other foreign material.

c. Wood Cellulose Fiber. Wood cellulose fiber shall consist of a processed wood product with uniform fiber characteristics. The fiber shall be capable of remaining in a uniform suspension under agitation in water and blending with seed, fertilizer, and other additives to form a homogeneous slurry. The fiber shall perform satisfactorily in hydraulic seeding equipment without clogging or damaging the system. The slurry shall contain a green dye to provide easy visual inspection for uniformity of application.

Certification showing that the fiber material conforms to the following specifications shall be provided by the manufacturer:

Wood Cellulose Fiber Requirements	
Particle Length, in. (mm)	Approximately 1/2 (13)
Particle Thickness, in. (mm)	Approximately 1/16 (1.5)
Net dry Weight Content	Minimum as stated on bag
TAPPI* T 509, pH	4.0 to 8.5
Ash Content, TAPPI* Standard T 413, % max	7.0
Water Holding Capacity, % min	90

*Technical Association of Pulp and Paper Industry

The material shall be delivered in packages of uniform net weight of 75 lbs (34 kg) or less and shall be clearly labeled with the name of the manufacturer, net weight, and a supplemental statement of the net weight content.

905-2.2 INSPECTION. Within five days after acceptance of the bid, the Contractor shall provide representative samples of mulch material to be used to the MAA Engineer and identify the source of the material and quantities of mulch materials available. The samples provided may be used as standards with the approval of the MAA Engineer and any materials brought on the site that do not meet these standards may be rejected.

CONSTRUCTION REQUIREMENTS

905-3.1 ADVANCE PREPARATION. Before spreading mulch, all large clods, stumps, stones, brush, roots, and other foreign material shall be removed from the area to be mulched. Mulch shall be applied immediately after seeding unless otherwise specified. The application and spreading of mulch may be by hand methods, blower, or other mechanical methods, provided a uniform covering is obtained.

905-3.2 APPLICATION OF MULCH. The Contractor shall evenly apply mulch materials to areas indicated by site plans or otherwise designated by the MAA Engineer. Cellulose-fiber or wood-pulp mulch shall be applied at the rate of 1,500 pounds (dry weight) per acre. Mulch may be blown on the slopes and use of cutters in the equipment for this purpose will be permitted to the extent that at least 95 percent of the mulch in place on the slope is 6 inches or more in length. When mulch applied by the blowing methods is cut, the loose depth in place shall be 1 to 2 inches. Cellulose fiber or wood-pulp mulch shall be applied as an aqueous mixture by spraying at the rate of 1,500 pounds (dry weight) per acre using spraying equipment approved by the MAA Engineer.

905-3.3 SECURING MULCH. Mulch shall be held in place by light discing, a thin coating of topsoil, pins, stakes, wire mesh, or other methods approved by the MAA Engineer. If the "peg and string" method is used, the mulch shall be secured with stakes or wire pins driven into the ground on 5-foot centers or less. Binder twine shall be strung between adjacent stakes in straight

lines and crossed diagonally over the mulch. The stakes shall be firmly driven nearly flush to the ground to draw the twine down tightly onto the mulch.

905-3.4 MAINTENANCE OF MULCHED AREAS. The Contractor shall care for mulched areas until final acceptance of the project. Care required may consist of providing protection against traffic or other disturbances by placement of warning signs and/or barricades before or immediately after mulching has been completed.

The Contractor may be required to repair or replace any mulching that is defective or becomes damaged before the project is finished and deemed satisfactory by the MAA Engineer. When, in the judgment of the MAA Engineer, defects or damage result from poor workmanship or failure to meet the requirements of the specifications, the cost of the necessary repairs or replacement will be borne by the Contractor. However, once the Contractor has completed the mulching of an area in accordance with the provisions of the specifications and to the satisfaction of the Engineer, no additional work at his expense will be required. Any subsequent repairs and/or replacements deemed necessary by the Engineer may be made by the Contractor and will be paid for as additional or extra work.

METHOD OF MEASUREMENT

905-4 Mulching will be measured in square yards on the basis of the actual surface area acceptably mulched to depths of 1-, 2-, or 4-inch depths.

BASIS OF PAYMENT

905-5 Payment will be made at the contract unit price per square yard for mulching. This price will provide full compensation for furnishing all materials, for placing and anchoring the materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item 905-5.1 Mulching – per square yard at 1-inch depth
Item 905-5.2 Mulching – per square yard at 2-inch depth
Item 905-5.3 Mulching – per square yard at 3-inch depth

END OF ITEM 905

APPENDIX A

APPROVED SPECIES LIST

Perennials, Ground Covers, Annuals & Bulbs

Scientific name	**Common name**
Alchemilla mollis	Lady's Mantle
Astilbe x arendsii	Hybrid Astilbe
Carex grayi	Morningstar Sedge
Carex stricta	Tussock Sedge
Ceratostigma plumbaginoides	Leadwort/Plumbago
Chrysanthemum x superbum	Shasta Daisy
Convallaria majalis	Lily-of-the-Valley
Coreopsis rosea	Rosy Coreopsis
Coreopsis verticillata	Threadleaf Coreopsis
Dryopteris erythrosora	Autumn Fern
Dryopteris marginalis	Leatherleaf Wood Fern
Echinacea purpurea 'Magnus'	Magnus Coneflower
Epigea repens	Trailing Arbutus
Eupatorium coelestinum	Hardy Ageratum
Eupatorium hyssopifolium	Hyssopleaf Thoroughwort
Eupatorium maculatum	Joe-Pye Weed
Eupatorium purpureum	Sweet Joe-Pye Weed
Geranium maculatum	Wild Geranium
Hedera helix	English Ivy
Hemerocallis spp.	Daylily
Hibiscus moscheutos	Rose Mallow
Hosta spp.	Plantain Lily
Hydrangea quercifolia	Oakleaf Hydrangea
Iris sibirica	Siberian Iris
Iris versicolor	Blue Flag Iris
Lantana camara	Yellow Sage
Liatris spicata	Gay-feather
Liriope muscari	Blue Lily-turf
Liriope variegata	Variegated Liriope
Lobelia siphilitica	Blue Cardinal Flower
Lonicera sempervirens	Coral Honeysuckle
Lythrum salicaria	Purple Loosestrife
Narcissus (all species and cultivars)	Daffodil
Nepeta x faassenii	Catmint
Onoclea sensibilis	Sensitive Fern
Osmunda cinnamomea	Cinnamon Fern
Pelargonium x domesticum	Mary Washington Geranium
Perovskia abrotanoides	Caspian/Russian Blue Sage
Phlox stolonifera	Creeping Phlox
Polygonum aubertii	Silver Lace Vine
Polystichum acrostichoides	Christmas Fern
Rudbeckia fulgida	Blackeyed Susan
Salvia nemorosa	May Night Salvia
Schizachyrium scoparium	Little Bluestem
Sedum spectabile	Stonecrop
Solidago rugosa	Goldenrod
Thelypteris noveboracensis	New York Fern
Tiarella cordifolia	Foam Flower
Tulipa spp.	Tulip

Perennials, Ground Covers, Annuals & Bulbs

Scientific name	**Common name**
Verbena canadensis	Rose Verbena
Veronica spp.	Speedwell
Vinca minor	Periwinkle
Yucca filamentosa	Adam's-needle Yucca

Trees (large, medium, small, ornamental & evergreen)

Scientific Name	**Common Name**
Abies concolor	White Fir
Abies nordmanniana	Nordman Fir
Acer campestre	Hedge Maple
Acer rubrum	Red Maple (seedless cultivars such as 'Celzam', 'Karpick', and 'Somerset' only)
Acer x freemanii	Freeman Maple (seedless cultivars such as 'Autumn Blaze', 'Celebration', 'Marmo' and 'Scarlet Sentinel' only)
Betula nigra	River Birch
Carpinus betulus 'Fastigiata'	Upright European Hornbeam
Carpinus caroliniana	American Hornbeam
Cedrus atlantica	Blue Atlas Cedar
Cedrus deodora	Deodor Cedar
Cercidiphyllum japonicum	Katsura tree
Cercis canadensis	Eastern Redbud
Chionanthus virginicus	White Fringetree (male only)
Crytomeria japonica	Japanese Cedar
Cupressocyparis x leylandii	Leyland Cypress
Fraxinus americana	White Ash (seedless cultivars such as 'Autumn Applause', 'Autumn Purple', Champaign County', 'Rosehill' and 'Skyline' only)
Fraxinus pennsylvanica	Green Ash (seedless cultivars such as 'Aerial', 'Bergeson', 'Honeyshade', 'Marshalls Seedless', 'Patmore' and 'Robinhood' only)
Ginkgo biloba	Ginko (male cultivars only)
Gleditsia triacanthos var. inermis	Thornless Common Honeylocust (seedless cultivars such as 'Imperial', 'Shademaster', 'Skyline', and 'Sunburst' only)
Ilex opaca	American Holly (male cultivars such as 'Jersey Knight' only)
Koelreutarea paniculata	Golden Raintree
Lagerstroemia indica	Crape Myrtle
Liriodendron tulipfera	Yellow Poplar
Liquidambar styraciflua	Sweetgum
Magnolia x loebneri	Loebneri Magnolia
Magnolia x soulangiana	Saucer Magnolia
Magnolia stellata	Star Magnolia
Magnolia virginiana	Sweetbay Magnolia
Malus spp.	Flowering Crabapple (non-fruiting cultivars such as 'American Beauty', 'Prince Georges', and 'Spring Snow' only)
Ostrya virginiana	American Hophornbeam
Oxydendrum arboreum	Sourwood
Picea abies	Norway Spruce
Picea glauca	White Spruce
Picea omorika	Serbian Spruce
Picea pungens	Colorado Spruce
Pinus echinata	Shortleaf Pine
Pinus mugo	Mugo Pine

Trees (large, medium, small, ornamental & evergreen)

Scientific Name	**Common Name**
Pinus rigida	Pitch Pine
Pinus strobus	Eastern White Pine
Pinus taeda	Loblolly Pine
Pinus thunbergii	Japanese Black Pine
Pinus virginiana	Virginia Pine
Platanus occidentalis	American Sycamore
Populus deltoides	Eastern Cottonwood
Populus grandidentata	Bigtooth Aspen
Prunus spp.	Flowering Cherry (non-fruiting cultivars only)
Prunus serrulata	Japanese Flowering Cherry (non-fruiting cultivars such as 'Kwanzan' only)
Prunus x yedoensis	Yoshino Cherry (non-fruiting cultivars only)
Salix nigra	Black Willow
Sophora japonica	Japanese Scholartree
Stewartia pseudocamellia	Japanese Stewartia
Styrax japonicus	Japanese Snowbell
Syringa reticulata	Japanese Tree Lilac
Taxodium distichum	Bald Cypress
Thuja occidentalis	American Arborvitae
Tilia americana	American Linden
Tilia cordata	Littleleaf Linden
Tilia tomentosa	Silver Linden
Tsuga canadensis	Canadian Hemlock
Tsuga caroliniana	Carolina Hemlock
Ulmus americana	American Elm
Ulmus parvifolia	Chinese Elm
Ulmus pumila	Siberian Elm
Zelkova serrata	Japanese Zelkova

Shrubs (large, medium, small, ornamental & evergreen)

Scientific name	**Common name**
Abelia "Edward Goucher"	Edward Goucher Abelia
Abelia x grandiflora	Glossy Abelia
Acer campestre	Hedge Maple
Berberis x mentorensis	Mentor Barberry
Buddleia davidii	Butterfly Bush
Calluna vulgaris	Common Heather
Clethra alnifolia	Sweet Pepperbush
Cotoneaster dammeri	Bearberry Cotoneaster
Deutzia gracilis	Slender Deutzia
Euonymus americanus	Strawberry Bush
Euonymus kiautschovicus	Spreading Euonymus
Forsythia x intermedia	Border Forsythia
Forsythia suspensa	Weeping Forsythia
Forsythia viridissima	Greenstem Forsythia
Hamamelis vernalis	Vernal Witchhazel
Hamamelis virginiana	Common Witchhazel
Hydrangea arborescens	Smooth Hydrangea
Hydrangea quercifolia	Oakleaf Hydrangea
Hypericum patulum	Goldencup St. Johnswort
Hypericum frondosum	Golden St. Johnswort
Ilex spp.	Holly species (male cultivars only)
Ilex x attenuata "Fosteri"	Foster's Holly (male cultivars only)
Ilex crenata	Japanese Holly (male cultivars such as 'Glass', 'Green Dragon', 'Green Island', 'Helleri', 'Howard', 'Northern Beauty' and 'Sentinel' only)
Ilex x "Edward J Stevens"	Edward Stevens Holly
Ilex glabra	Inkberry (male cultivars such as 'Chamzin' and 'Shamrock' only)
Ilex x meserveae	Meserve Hybrid Hollies (male cultivars such as 'Blue Boy', 'Blue Prince', 'Blue Stallion', and 'China Boy' only)
Ilex opaca	American Holly (male cultivars such as 'Jersey Knight' only)
Itea virginica	Virginia Sweetspire
Jasminum nudiflorum	Winter Jasmine
Juniperis conferta	Shore Juniper
Juniperis chinensis	Chinese Juniper (male cultivars such as 'Globosa' and 'Pfitzeriana Glauca' only)
Juniperis horizontalis	Creeping Juniper (male cultivars such as 'Fountain', 'Glomerata', 'Jade River', 'Jade Spreader', 'Plumosa' and 'Plumosa Compacta Youngstown' only)
Juniperis procumbens	Japgarden Juniper (male cultivars only)
Juniperis sabina	Savin Juniper (male cultivars only)
Juniperis scopulorum	Rocky Mountain Juniper (male cultivars such as 'Gray Gleam', 'Medora', and 'Silver King' only)
Kalmia latafolia	Mountain Laurel
Lavandula angustifolia	Common Lavender
Leucothoe axillaris	Fetterbush
Ligustrum japanicum	Japanese Privet
Lindera benzoin	Spicebush (use male cultivars such as 'Green Gold' and 'Rubra' only)

Shrubs (large, medium, small, ornamental & evergreen)

Scientific name	**Common name**
Magnolia virginiana	Sweetbay Magnolia
Microbiota decussata	Russian Arborvitae
Mynca pennsylvanica	Northern Bayberry (male cultivars such as 'Myriman' only)
Nandina domestica	Heavenly Bamboo (non-fruiting cultivars such as 'Atropurpurea Nana' only)
Osmanthus heterophyllus	False-holly
Photinia x fraseri	Fraser Photinia
Prunus laurocerasus	Common Cherrylaurel (only cultivars with non-showy fruit such as 'Schipkaensis' only)
Pyracantha koidzumii	Formosa Firethorn
Rhododendron arborescens	Sweet Azalea
Sarcococca hookeriana	Sweetbox
Spiraea spp.	Meadowsweet
Spiraea nipponica 'Snowmound'	Snowmound Spiraea
Syringa vulgaris	Common Lilac
Taxus baccata	English Yew (male cultivars only)
Taxus x media	Anglojap Yew (male cultivars such as 'Amherst', 'Brownii', 'Hatfieldii' and 'Sebian' only)
Viburnum x burkwoodii	Burkwood Viburnum
Viburnum plicatum var. tomentosum	Doublefile Viburnum (use non-fruiting cultivars such as 'Roseum' only)
Viburnum rhytidophyllum	Leatherleaf Viburnum
Weigela florida	Old-fashioned Wegelia

Grasses (Ornamental, Turf, Erosion Control)

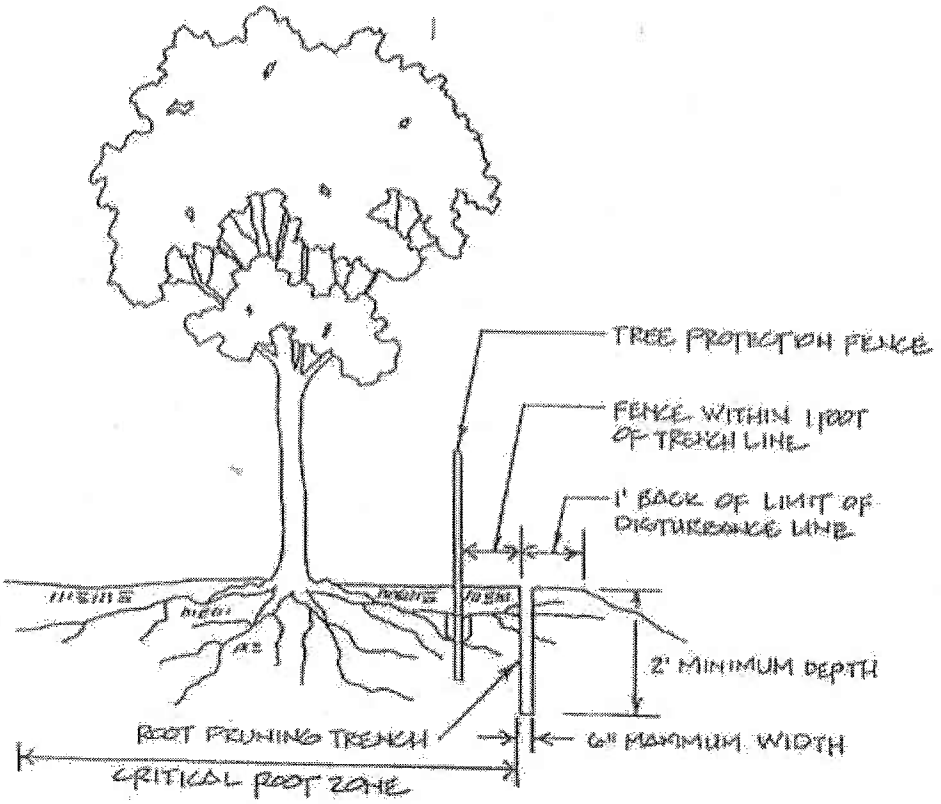
Scientific name	**Common name**
Andropogon scoparius	Little Bluestem
Calamagrostis x acutiflora	Feather Reed Grass
Calamagrostis arundinacea 'Karl Foerster'	Foerster's Feather Reed Grass
Calamagrostis stricta	Slimstem Reed Grass
Festuca arundinacea	Certified turf-type Tall Fescue
Festuca longifolia	Hard Fescue
Festuca rubra var. commutata	Chewings Fescue
Lolium multiflorum	Annual Ryegrass
Lolium perenne	Perennial Ryegrass
Miscanthus sinensis var. gracillimus	Maiden Grass
Panicum virgatum	Switch-grass
Pennisetum alopecuroides	Fountain Grass
Pennisetum alopecuroides 'Hameln'	'Hameln' Fountain Grass
Pennisetum alopecuroides 'Little Bunny'	'Little Bunny' Fountain Grass
Pennisetum villosum	Feathertop
Poa pratensis	Kentucky Bluegrass

APPENDIX B

APPROVED INSTALLATION METHODS

Figure J -1

Root Pruning

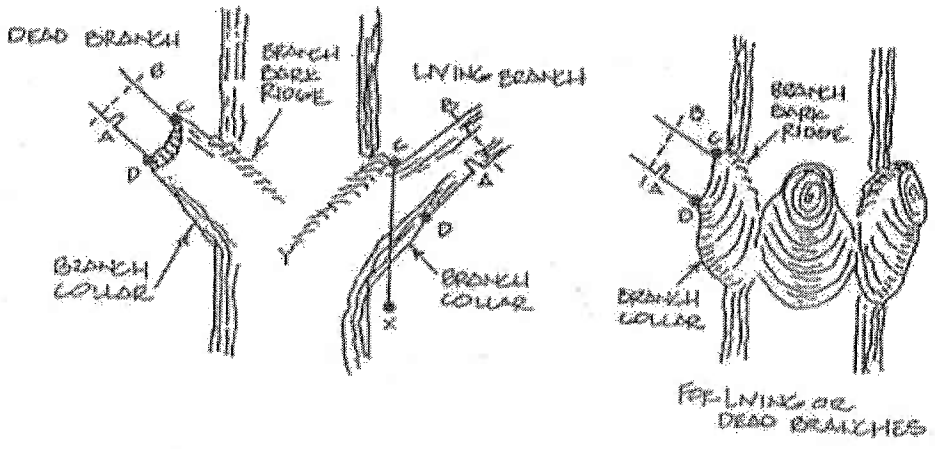


Notes:
1. Retention Areas will be set as part of the review process
2. Boundaries of Retention Areas should be staked flagged prior to trenching
3. Exact location of trench should be identified
4. Trench should be immediately backfilled with soil removed or other high organic soil
5. Roots should be cleanly cut using vibratory knife or other acceptable equipment

Source: City of Gaithersburg, Maryland: City Tree Manual

Figure J-2

Crown Reduction

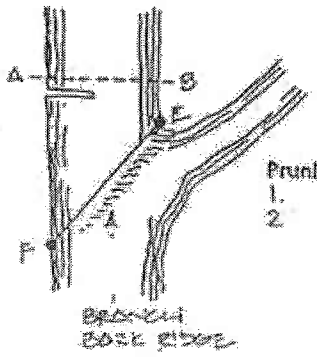


HARDWOODS

CONIFERS

Pruning a Branch

1. Remove branch weight by undercutting at A and remove limb by cutting through at B.
2. Remove stub at CD (line between branch bark ridge and outer edge of branch collar).
3. If D is difficult to find on hardwoods, drop vertical from C (line CX). Angle XCY=XCD.



Pruning a Leader or To Reduce Size

1. Remove top weight by cutting at A&E.
2. Remove stub at EF parallel to the Branch Bark Ridge.

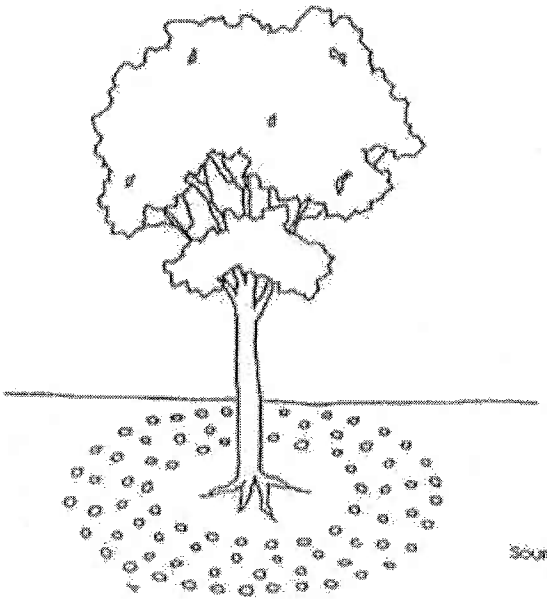
Source: Fairfax County, Virginia
Vegetation Preservation & Planting

Notes:

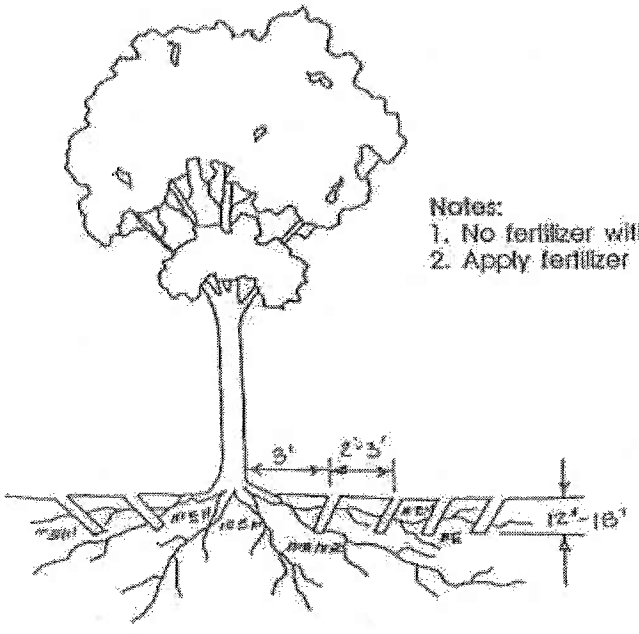
1. Only prune at specified times
2. No more than 30% of crown to be removed at one time.

Figure J-3

Application of Fertilizers by Injection



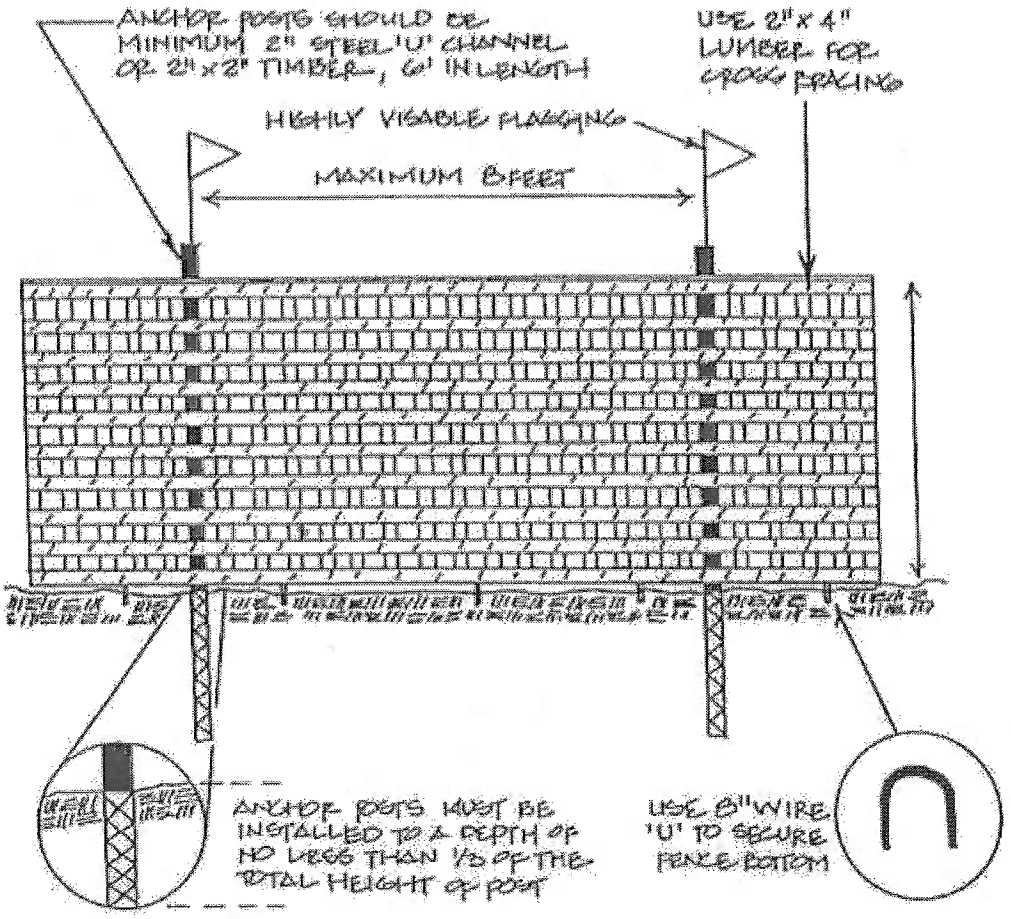
Source: Pirone, 1978



Notes:
1. No fertilizer within 3 feet of trunk
2. Apply fertilizer to entire critical root zone

Figure J-4

Blaze Orange Plastic Mesh



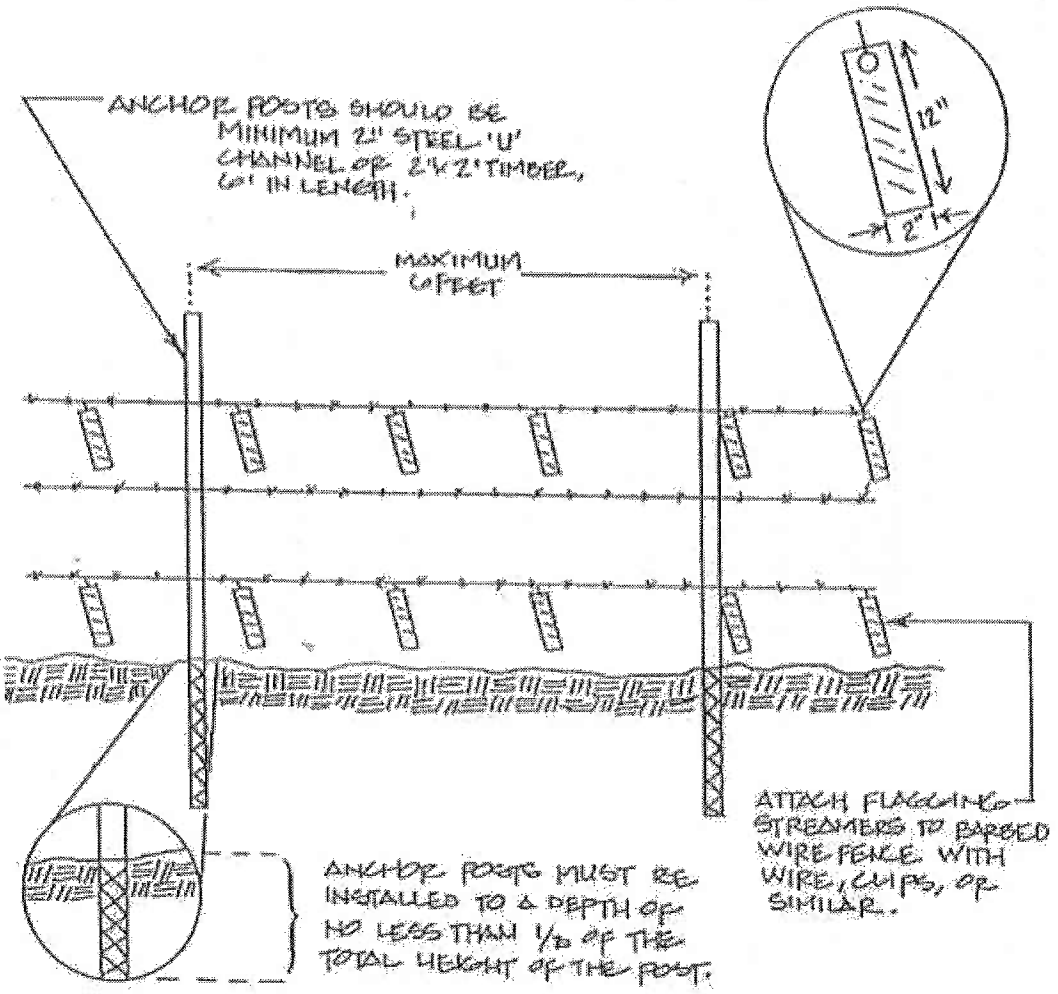
Notes

1. Forest protection device only.
2. Retention Area will be set as part of the review process.
3. Boundaries of Retention Area should be staked and flagged prior to installing device.
4. Root damage should be avoided.
5. Protective signage may also be used.
6. Device should be maintained throughout construction.

Source: Prince George's County, Maryland: Woodland Conservation Manual

Figure J-5

Three Strand Barbed Wire



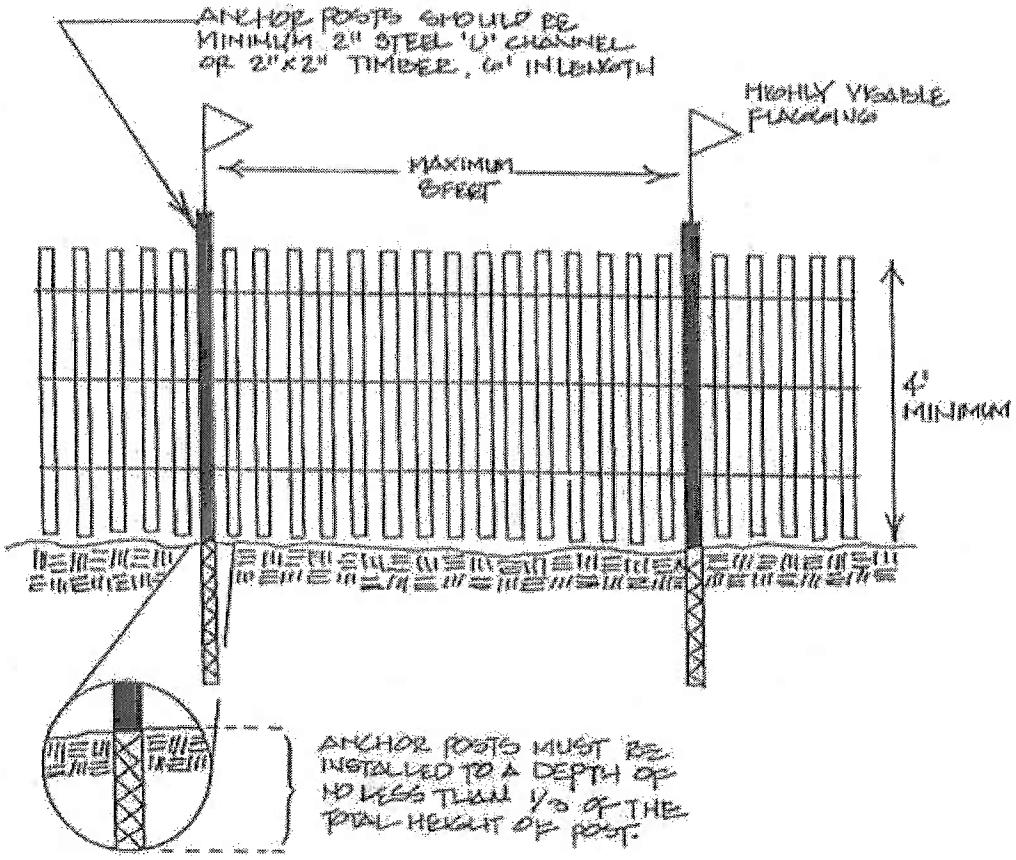
Notes

1. Forest protection device only.
2. Retention Area will be set as part of the review process.
3. Boundaries of Retention Area should be staked and flagged prior to installing device.
4. Avoid root damage when placing anchor posts.
5. Barbed wire should be securely attached to posts.
6. Device should be properly maintained during construction.
7. Protective signage is also recommended.

Source: Prince George's County, Maryland: Woodland Conservation Manual

Figure J-6

Snow Fence



Notes:
1. Forest protection device only
2. Retention area will be set as part of the review process
3. Boundaries of Retention Area should be staked prior to installing protective device
4. Avoid root damage when placing anchor posts
5. Device should be properly maintained during construction
6. Protective signage is also recommended

Source: Prince George's County, Maryland, Woodland Conservation Manual

Figure J-7

Signage

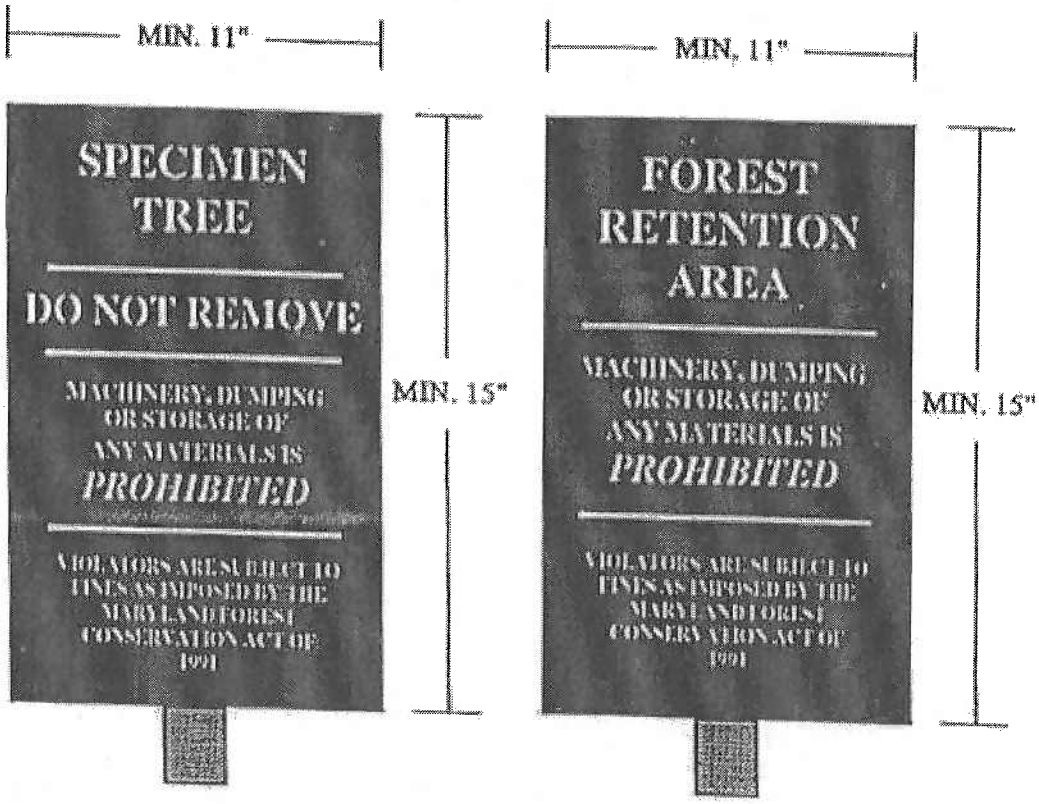
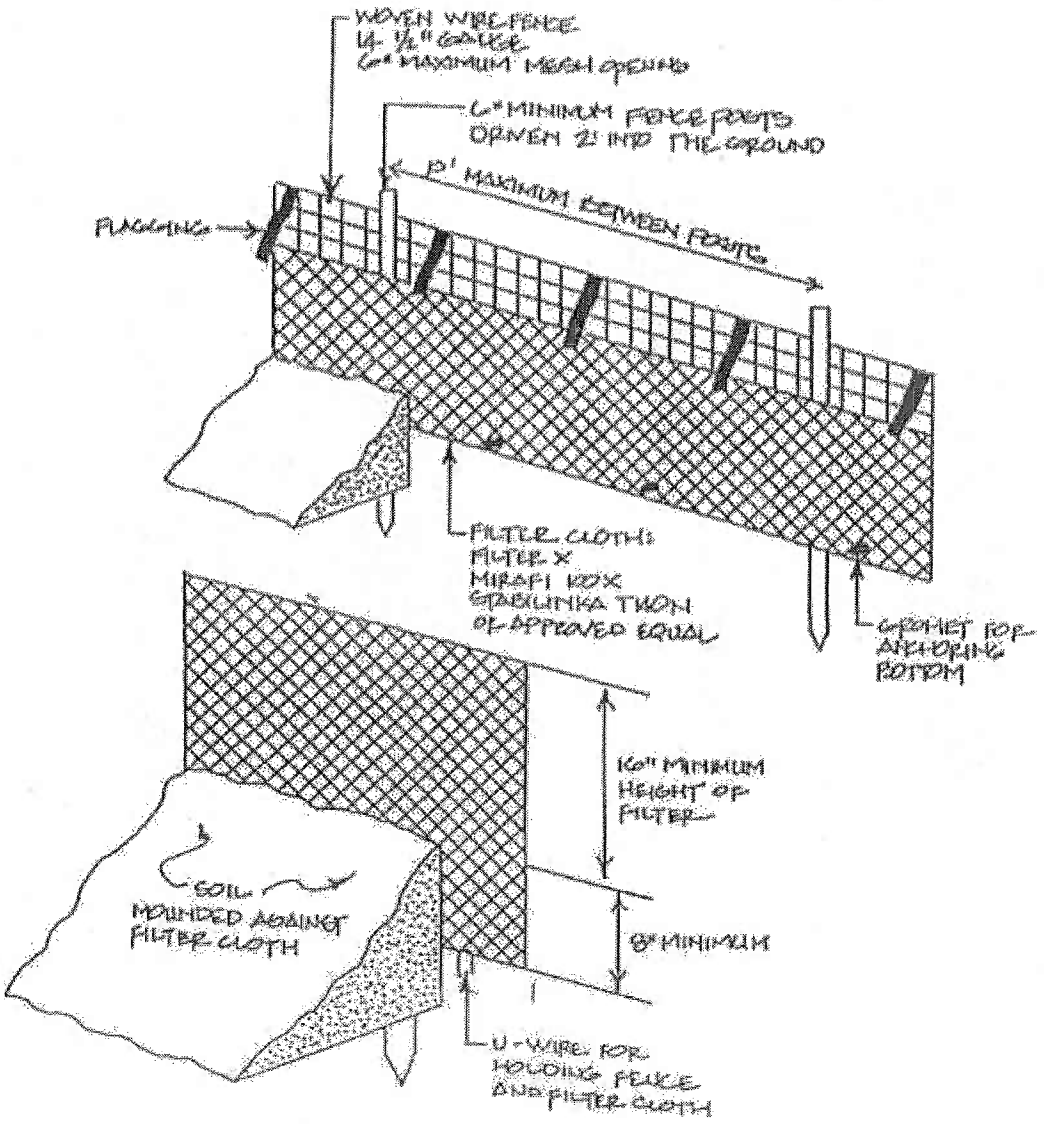


Figure J-8

Filter Cloth on Wire Mesh



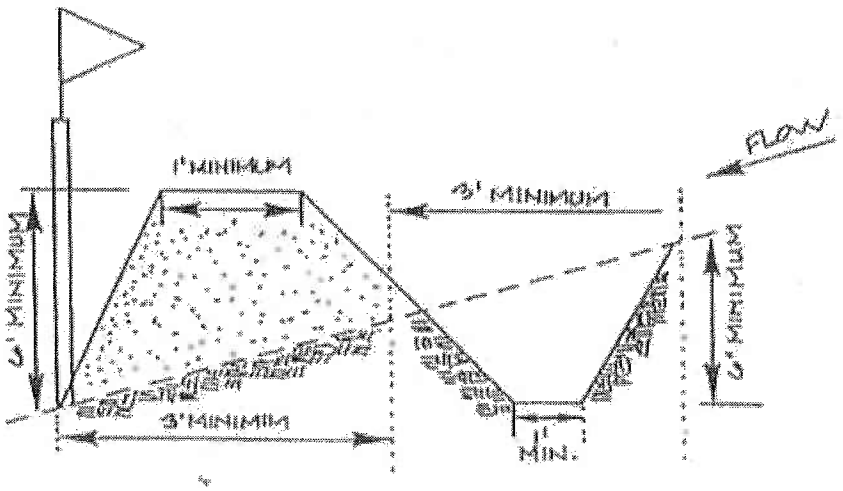
Source: Prince George's County, Maryland: Woodland Conservation Manual

Notes:

1. Combination sediment control and protective device
2. Retention area will be set as part of the review process
3. Boundaries of Retention Area should be staked prior to installing protective device
4. Root damage should be avoided
5. Mound soil only within the limits of disturbance
6. Protective signage is also recommended
7. All standard maintenance for sediment control devices apply to these details

Figure J-10

Earthen Dike and Swale

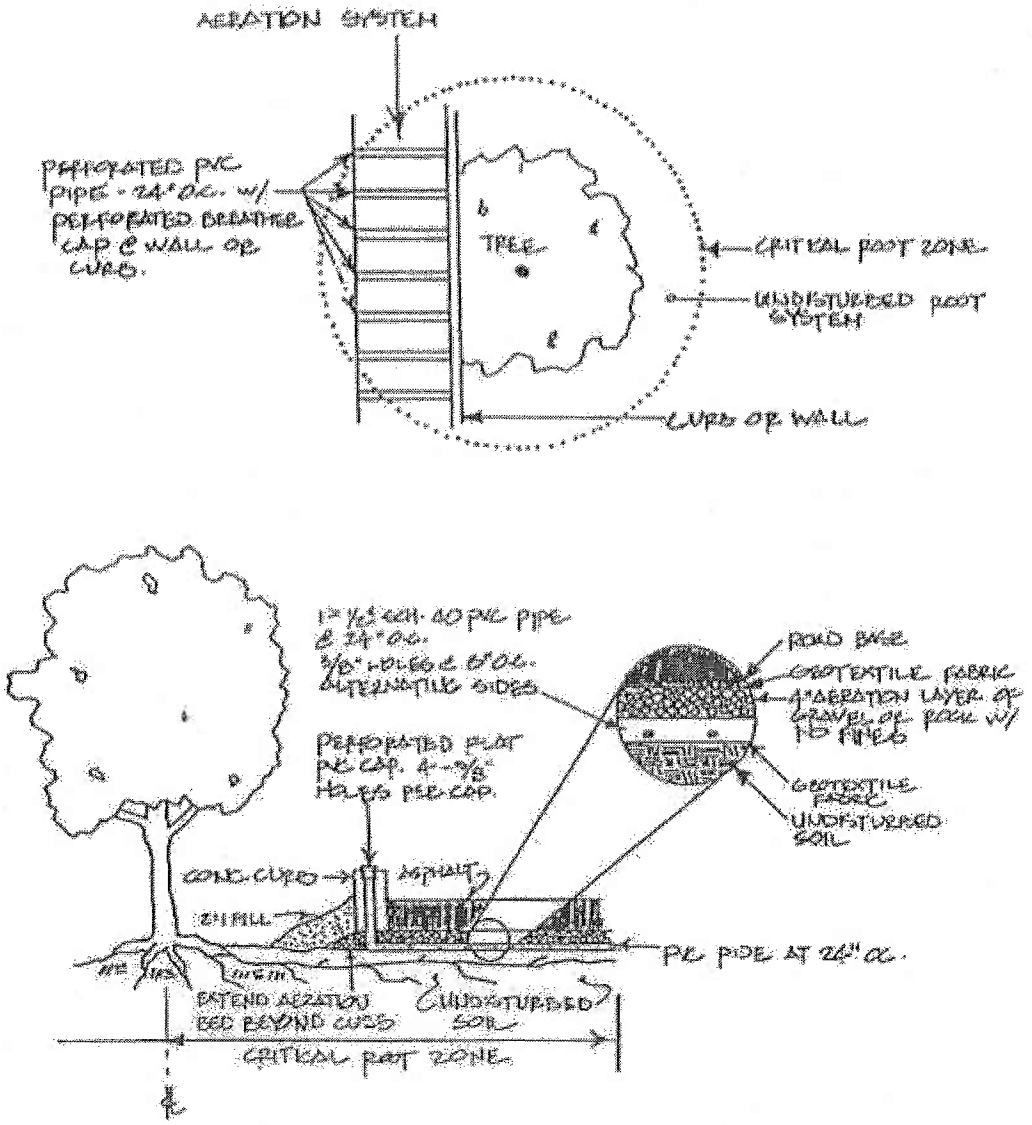


Notes:
1. Combination sediment control and protective device
2. Retention area will be set as part of the review process
3. Boundaries of Retention Area should be staked prior to installing protective device
4. Root damage should be avoided
5. The top or toe of slope should be within the limit of disturbance
6. Equipment is prohibited within critical root zone of retention area; place dike accordingly
7. All standard maintenance for earthen dikes and swales apply to these details
8. All standard reclamation practices for earthen dikes and swales shall apply to these details

Source: Prince George's County, Maryland: Woodland Conservation Manual

Figure J- 11

Aeration System

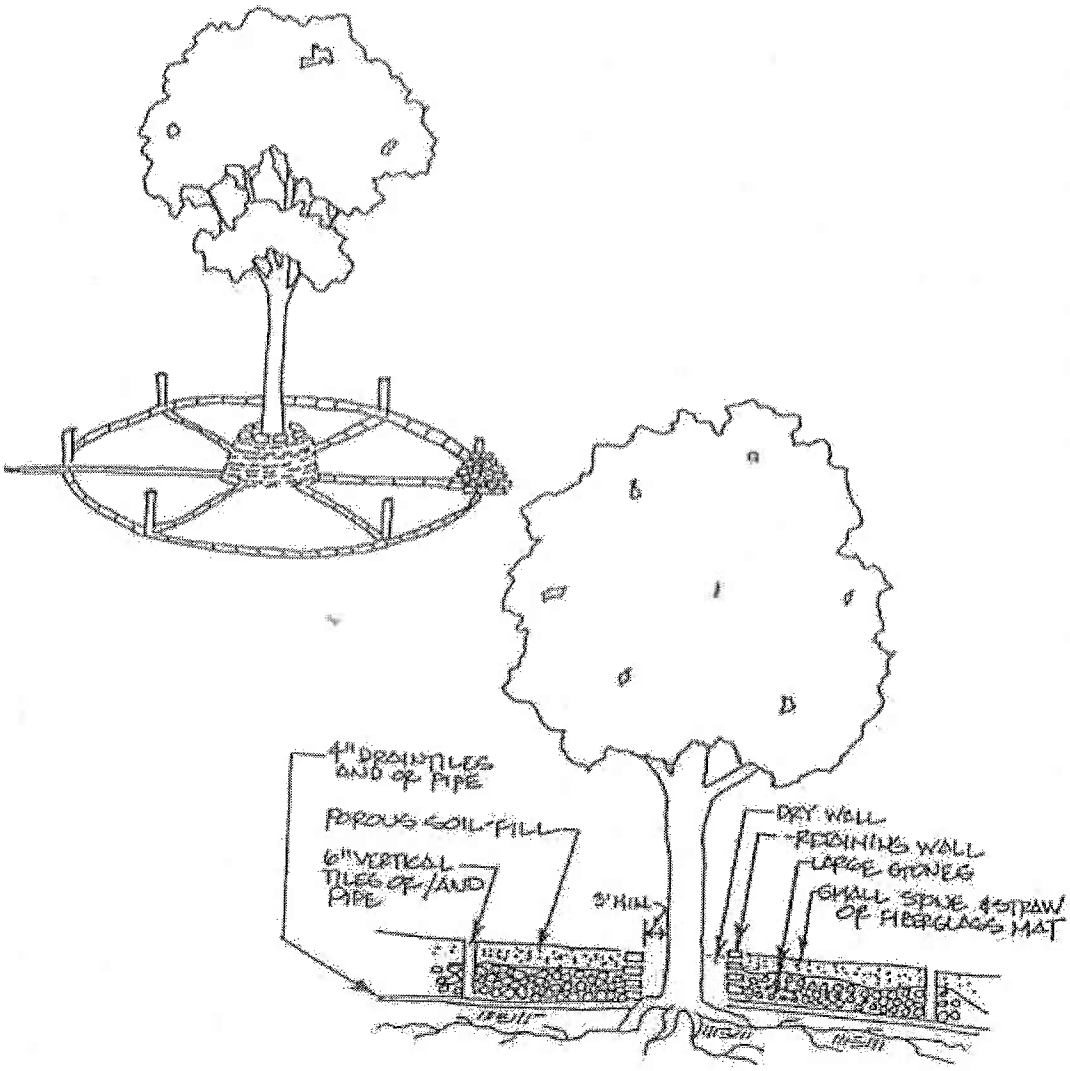


Notes:
1. Bed preparation should not exceed two inches.
2. Vertical pipe should be capped with a perforated cap with 4-3/8 inch holes per cap.
3. Gravel or rock should contain no fines.
4. Can also be used when critical root zone is covered by fill instead of asphalt.

Source: Steve Clark & Associates

Figure J -12

Tree Well

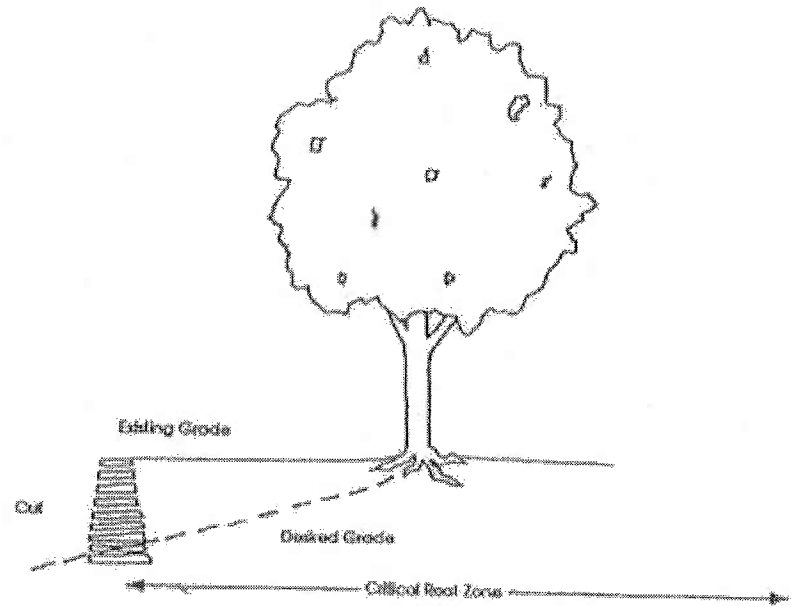


Notes:
1. Well wall should be no closer than 3 feet from tree trunk or more for smaller trees.
2. Drainage pipe layout should extend beyond the critical root zone
3. Vertical pipes shall be capped with a perforated flat cap with 4-3/8 inch holes per cap
4. Radiating spokes should be on 3 foot centers at the well wall

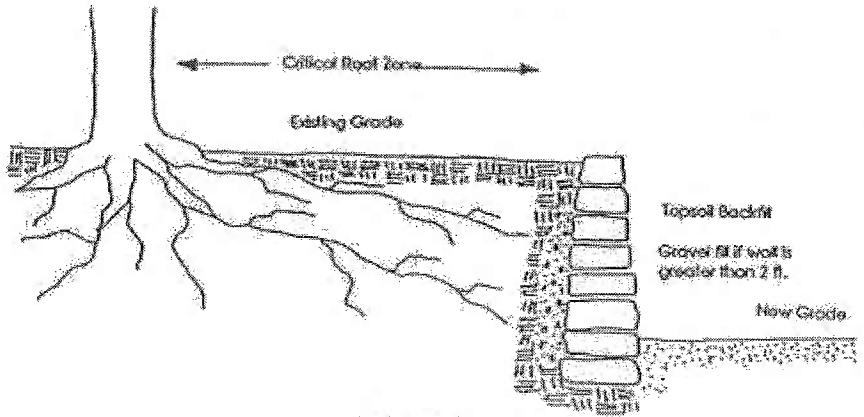
Source: Fairfax County, Virginia: Vegetation Preservation & Planting

Figure J- 13

Retaining Walls



Source: Fulton County, Georgia
Tree Preservation Ordinance

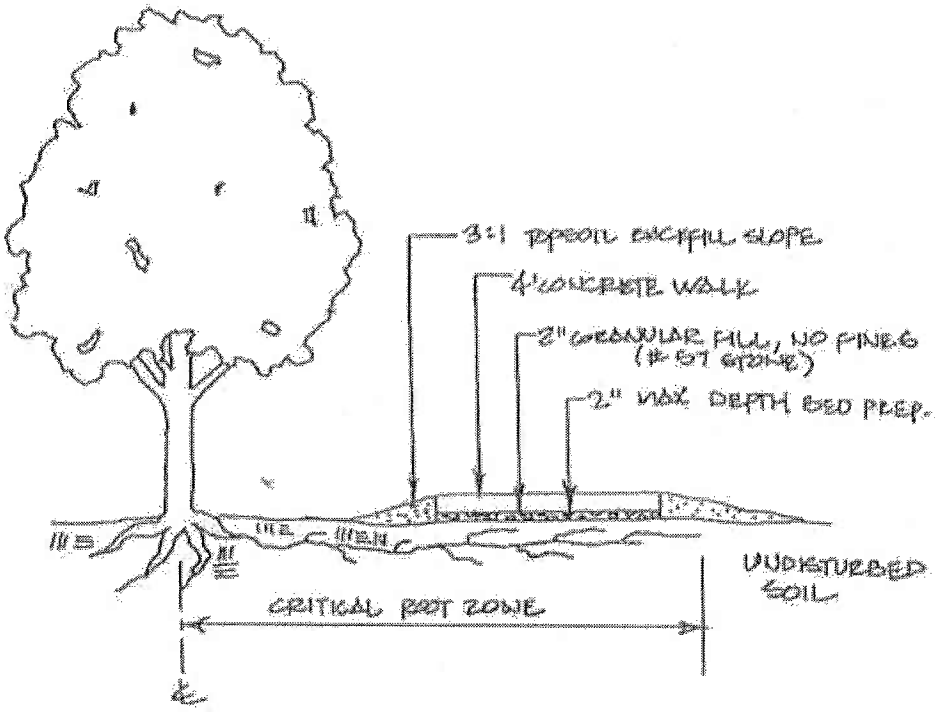


Source: Fairfax County, Virginia - Vegetation Preservation & Planting

Note:
1. Wall should be constructed outside the critical root zone.

Figure J-14

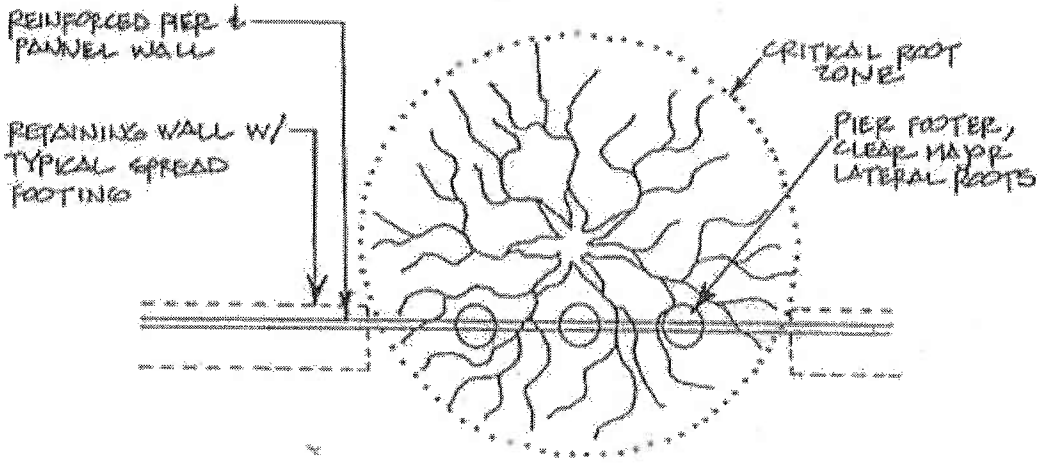
Raised Sidewalk



Notes:
1. Bed preparation should not exceed 2 inches
2. Granular fill should contain no fines
3. Minimize width of sidewalk; should be no wider than 4 feet

Source: City of Gaithersburg, Maryland. City Tree Manual

Figure J-15 **Reinforced Pier and Panel Wall**

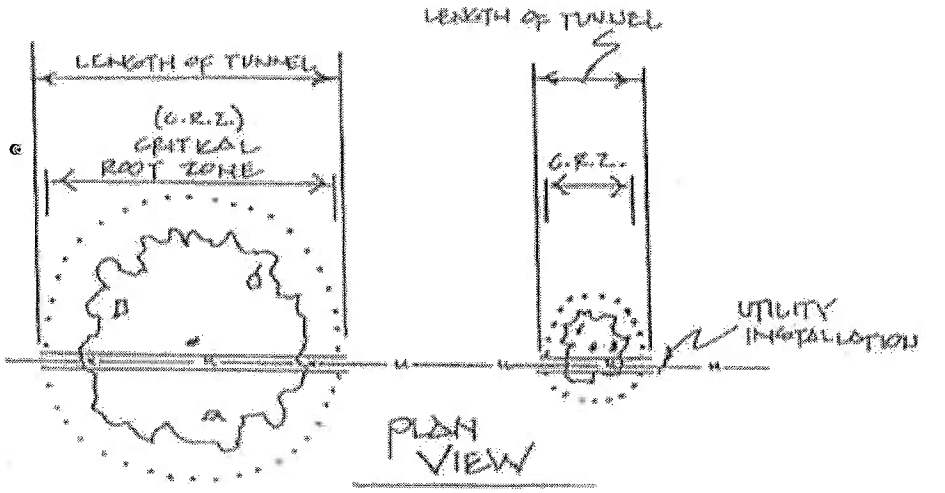


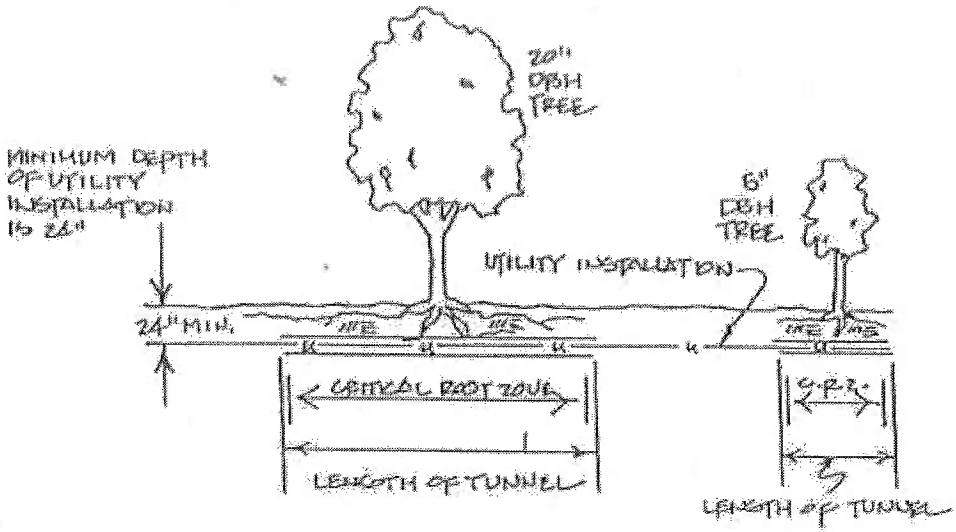
Notes:
1. Area of disturbance should be minimized.
2. Care should be taken to avoid major lateral roots
3. Roots should be cleanly cut using a vibratory knife or other similar equipment

Source: Steve Clark & Associates

Figure J- 16

Tunnelling





Notes:
1. Tunnel under critical root zone
2. Tunnel should be 24 inches deep at a minimum
3. When tunnelling, aim for the trunk of the tree
4. When trenching, tunnel through the critical root zone

Adapted from: Fairfax County, Virginia: Vegetation Preservation & Planting

AIRPORT WIDE STANDARD FOR SOLE SOURCE SYSTEMS AND EQUIPMENT

MARTIN STATE AIRPORT

BWI BALTIMORE/WASHINGTON INTERNATIONAL Thurgood Marshall AIRPORT

SECTION 02553 - NATURAL GAS DISTRIBUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Standard Provisions/Interim Standard Provisions for Construction Contracts - Volume 1, December 1993, and Technical Provisions apply to the Work of this Section.

1.2 SCOPE

A. The work covered by this section includes the furnishing of all materials and equipment and the performing of all labor to complete the Natural Gas Distribution as shown on the Contract Drawings and as herein specified or directed by the Engineer.

B. The Engineer is responsible for contacting the Baltimore Gas and Electric Company (BGE) prior to development of plans to verify availability of natural gas supply for this project. The Engineer shall also provide BGE with estimated gas load calculations and minimum service pressures required.

C. BGE will provide and install new natural gas service main, meter with pressure regulator assembly on site and connection to existing gas main.

D. Contractor shall be responsible for pavement removal and repair, maintenance of traffic and for all coordination between BGE and the Project.

1.3 RELATED SECTIONS

A. The following sections in this document contain requirements that relate to this Section:

1. Section 02310 - "Excavation and Backfill"

1.4 SEQUENCING AND SCHEDULING

A. Coordinate gas main installation on-site and connection to existing gas main with BGE.

B. Coordinate with other utility work.

C. BGE estimates it will take approximately ____ working days to complete the gas main installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Materials for natural gas piping system including pipe, valves, meter, pressure regulators, and specialties will be provided by BGE.

B. Bedding material meeting requirements of AASHTO M6-81 shall be furnished by BGE.

C. Concrete pad for meter station at building will be constructed by the Contractor after verifying dimensions required with BGE.

PART 3 - EXECUTION

3.1 GENERAL

A. The Contractor shall notify BGE three months prior to start of work in area around the proposed building gas service mains. Contact with BGE shall be made through:

Mr. Kevin Kline
Baltimore Gas and Electric Company
(410) 597-6516

B. The Contractor shall coordinate all necessary pavement removal and repairs.

C. The Contractor shall provide a secure area near the construction site for BGE to store materials and equipment.

3.2 INSTALLATION

A. See Division 2 Section 02310 for requirements of excavation, backfill, and pavement repair.

B. The Contractor shall be responsible for pedestrian and traffic control during installation of the new gas main piping by BGE.

C. Drawings indicate general alignment for the gas main. The Contractor is responsible for coordination of the new gas main with other utilities and between different construction phases of the project.

3.3 FIELD QUALITY CONTROL

A. BGE shall verify that entire gas distribution system has been inspected, tested, and purged by BGE according to NFPA 54, Part 4 "Gas Piping Inspection, Testing, and Purging" and local gas utility company requirements.

B. Report test results in writing to the Engineer and the authorities having jurisdiction.

1. Verify that specified piping tests are complete.

C. Refer to Section 01400 - Construction Quality Control Plan.

PART 4 - MEASUREMENT

4.1 METHOD OF MEASUREMENT

A. No direct measurement will be made for Pay Item "BGE Gas Service Cost Allowance" and Pay Item "Contractor Gas Service Support Work Allowance" as payment will be made on actual cost basis. Measurement of gas pipe demolition shall be made on a linear foot basis. Demolition of gas pipe shall include excavation and backfill, and other incidental items shown on the plans.

PART 5 - PAYMENT

5.1 BASIS OF PAYMENT

A. Payment for the Pay Item "BGE Gas Service Cost Allowance" will be made to the Contractor on the basis of actual costs billed (as shown on utility invoices) by BGE plus Contractor's overhead and profit as defined in Article SP-9.04. Partial payments will be made out of the allowance amount as bills are received from the utilities. The Contractor shall furnish proof to the Engineer that utility payments have been made after he receives payment from MAA. The Contractor shall include the figure indicated in the proposal form in his bid for this item. The Contractor will not be entitled to any unspent or non-approved portion of monies from this allowance.

B. Payment for the Pay Item "Contractor Gas Service Support Work Allowance" will be made to the Contractor on the basis of actual costs billed (as shown on invoices submitted by the Contractor and approved by the Engineer) plus Contractor's overhead and profit as defined in Article SP-9.04. Partial payments will be made out of the allowance amount as bills are submitted and approved with each Application for Payment, which shall include all materials and labor for pavement demolition, disposal, and replacement, assisting BGE with pipe installation, coordination, and all incidentals necessary to complete this work. The Contractor shall include the figure indicated in the

proposal form in his bid for this item. The Contractor will not be entitled to any unspent or non-approved portion of monies for this allowance.

C. Payment for the demolition of gas pipe will be made based on the accepted quantities of piping removed at the contract unit price.

D. Payment will be made under:

Item 02553-1	Demolition of Gas Piping--per linear foot
Item 01021-1	BGE Gas Service Cost Allowance
Item 01021-2	Contractor Gas Service Support Work Allowance

END OF SECTION 02553

SECTION 08711 - DOOR HARDWARE

PART 2 - PRODUCTS

2.1 INTERCHANGEABLE DOOR HARDWARE CORES AND KEYING

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Cylinders:

a. Best Lock Corporation (BLC).

B. Standards: Comply with the following:

1. Cylinders: BHMA A156.5.

C. Cylinder Grade: BHMA Grade 1.

D. Cylinders: Manufacturer's standard tumbler type, constructed from brass or bronze, and complying with the following:

1. Number of Pins: Seven.

2. Mortise Type: Threaded cylinders with rings and straight- or clover-type cam.

3. Rim Type: Cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.

4. Bored-Lock Type: Cylinders with tailpieces to suit locks.

a. High-Security Grade: BHMA Grade 1A, listed and labeled as complying with pick- and drill-resistant testing requirements of UL 437 (Suffix A).

E. Permanent Cores: Manufacturer's standard; finish face to match lockset; complying with the following:

1. Interchangeable Cores: Core insert, removable by use of a special key, and usable with other manufacturers' cylinders.

2. All cores must be recombinatable by removing pin segments of one individual barrel without disturbing the seals or pins of the other barrels of the same core.

3. The control key shall have no cuts in common with the grand-master key and shall operate with a shear line completely independent from the shear line of the grand-master, master and change keys.

F. Construction Keying: Comply with the following:

1. Construction Cores: Provide construction cores that are replaceable by permanent cores. Provide 10 construction master keys.

a. Replace construction cores with permanent cores, as directed by MAA.

G. Keying System: Unless otherwise indicated, provide a factory-registered keying system complying with the following requirements:

1. Grand Master Key System: Cylinders are operated by a change key, a master key, and a grand master key.

2. Existing System: Master key or grand master key locks to Owner's existing system.

a. Cylinders shall be master keyed.

H. Keys: Provide nickel-silver keys complying with the following:

1. Stamping: Permanently inscribe each key with a visual key control number and include the following notation:

a. Notation: "DO NOT DUPLICATE." or as directed by MAA.

2. Quantity: In addition to one extra blank key for each lock, provide the following:

a. Cylinder Change Keys: Three.

b. Master Keys: Five.

c. Grand Master Keys: Five.

I. Finishes

1. Standard: Comply with BHMA A156.18.

2. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

3. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations

in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

4. BHMA Designations: Comply with base material and finish requirements indicated by the following:

   a. BHMA 619: Satin nickel plated, clear coated, over brass or bronze base metal.

   b. BHMA 626: Satin chromium plated over nickel, over brass or bronze base metal.

2.2 ACCESS KEY BOXES (KNOX BOX)

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

   1. Access Key Boxes:

      a. Series 3200, Knox Company, Irvine, California.

B. Access Key Boxes:

   1. Surface-Mounted Cabinet: ¼-inch thick steel plate cabinet with ½-inch thick steel door equipped with interior gasket and

   2. Door shall be manufactured to accept Best Removable Core.

   3. Finish: Zinc-phosphate primer with black weather resistant TGIC polyester power-coat finish.

END OF SECTION 08711

SECTION 13851 - FIRE ALARM SYSTEM

PART 2 - PRODUCTS

2.1 MANUFACTURERS

Manufacturers: The existing Fire Alarm System is manufactured and certified by Honeywell; therefore, Fire Alarm panel, initiating, monitoring and controlling devices shall be exclusively by Honeywell only. Substituted Booster Panels and notification devices shall be submitted and approved by Honeywell. There will be "No Exceptions Allowed".

2.2 FIRE ALARM CONTROL PANEL (FACP)

A. General: Comply with UL 864, "Control Units for Fire-Protective Signaling Systems."

B. Cabinet: Lockable steel enclosure. Arrange panel so all operations required for testing or for normal care and maintenance of the system are performed from the front of the enclosure. If more than a single unit is required to form a complete control panel, provide exactly matching modular unit enclosures. Accommodate all components and allow ample gutter space for interconnection of panels as well as field wiring. Identify each enclosure by an engraved, red-laminated, phenolic resin nameplate. Lettering on the enclosure nameplate shall not be less than 1-inch high. Identify individual components and modules within the cabinets with permanent labels.

C. Systems: Alarm and supervisory systems are separate and independent in the FACP. The alarm-initiating addressable interface circuit boards in the FACP consist of plug-in cards. Installation requiring interconnection of field wiring for module replacement is not acceptable.

D. Zones: Provide for all alarm and supervisory zones indicated.

E. The fire alarm panel shall tie into the existing Honeywell Graphic Central P.C.s, such that every addressable initiating device will be displayed on its appropriate color graphic floor plan on the Graphic Central P.C. The device symbol, on the color graphic floor plan, shall display a change of state (color of the symbol shall change) wherever the initiating device is in "normal", "alarm", or "trouble", condition. The fire alarm panel shall tie into the existing Honeywell Graphic Central P.C.s. Furnish the required programming to monitor the fire alarm panel providing trouble and alarm relay contacts and display in the appropriate location on the Honeywell P.C.s.

F. Alphanumeric Display and System Controls: Provide the basic interface between human operator at FACP and addressable system components, including annunciation, supervision, and control. A display with a minimum of 32 characters displays alarm,

supervisory, and component status messages and indicates control commands to be entered into the system for control of smoke detector sensitivity and other parameters. Provide keypad for use in entering and executing control commands.

G. Instructions: Printed or typewritten instruction card mounted behind a lexan plastic or glass cover in a stainless steel or aluminum frame. Install the frame in a location observable from the FACP. Include interpretation and appropriate response for displays and signals, and briefly describe the functional operation of the system under normal, alarm, and trouble conditions.

H. Acceptable Products:
Honeywell FS 90 Plus FACP.
Honeywell 14005680 Series F.O. Interface Board.

2.3 UPGRADING EXISTING FIRE ALARM CONTROL PANEL (FACP)

A. Provide hardware, programming and testing for existing fire alarm panels to interface with new fire alarm panels for fire alarm notification zones for the terminal building.

2.4 DATA GATHERING PANELS (DGP)

Honeywell FS 90 Plus FACP.

2.5 GATEWAYS

A. Provide color graphic PC/gateway at CDC, Aircraft Rescue, and Fire Facility for two communication buses to expand Fire Alarm monitoring system's point capacity at existing Honeywell Graphic Central PC at CDC, Aircraft Rescue and Fire Facility.

Acceptable Products:
Honeywell W 7053 B.

2.6 BOOSTER PANELS

A. Booster panel shall meet UL 864 and ADA requirements. Booster panel shall include 8 Amp, 24 DC volt power supply, battery charger, batteries, synchronizing module, dry contacts for monitoring and interface with Honeywell Fire Alarm Control Panel in red color NEMA 1 enclosure.

Acceptable Products:
Wheel Lock PS–12/24-8 Booster Panel.
Wheel Lock DSM-12/24-R Synchronizing Module.

2.7 INITIATING DEVICES

A. General

1. Each device shall be assigned a unique address via easily understood decade (01 to 99) switch. Address selection via binary switches or by jumpers is not acceptable. Devices which take their address from their position in the circuit are unacceptable because if devices are later added, existing addresses, descriptors and commands must be reprogrammed.

2. Devices shall receive communication signals from the same pair of wires. For fault-tolerant circuits, any separate power wiring shall also be made fault-tolerant.

3. Additional devices shall be capable of being added to the circuit from any point in the circuit and without affecting any existing device address or function.

4. Each device shall contain screw terminals with rising plates for positive termination of up to 12 AWG wire.

B. Manual Pull Stations

1. Fabricated of metal or plastic, and finished in red with molded, raised-letter operating instructions of contrasting color.

2. Single-action mechanism initiates an alarm.

3. Double-action mechanism requires two actions, such as a push and a pull, to initiate an alarm.

4. Station Reset: Key or wrench operated; double pole, double throw; switch rated for the voltage and current at which it operates.

5. Indoor Protective Shield: Factory-fabricated clear plastic enclosure, hinged at the top to permit lifting for access to initiate an alarm. Lifting the cover actuates an integral battery-powered audible horn intended to discourage false alarm operation.

6. Weatherproof Protective Shield: Factory-fabricated clear plastic enclosure, hinged at the top to permit lifting for access to initiate an alarm.

7. Integral Addressable Module: Arranged to communicate manual-station status (normal, alarm, or trouble) to the FACP.

   Acceptable Product:
   Honeywell S 464G1007.

C. Sensors

1. All sensors shall mount on a common base to facilitate the changing of sensor type if building conditions change. The base shall be incompatible with conventional detectors to preclude the mounting on a non-intelligent device.

2. Each sensor shall contain a LED which blinks each time it is scanned by the FACP. If the FACP determines that the sensor is in alarm, the FACP shall command the sensor LED to remain on to indicate alarm.

3. Each sensor shall contain a magnetically-actuated test switch such that it can be tested for alarm from the sensor location.

4. Each sensor shall be capable of being tested for alarm via command from the FACP.

5. Each sensor shall respond to FACP scan for information with its type identification to preclude inadvertent substitution of another sensor type. The FACP shall operate with the installed type but shall initiate a mismatch (trouble) condition until the proper type is installed or the programmed sensor type changed.

6. Each sensor shall respond to FACP scan for information with an analog representation of measured fire-related phenomena (smoke density, particles of combustion, temperature). Systems which only monitor the presence of a conventional detector in an addressable base shall not be acceptable.

7. Photoelectric Smoke Sensors shall contain an optical sensing chamber with nominal sensitivity of 2.3% per foot obscuration.
   Acceptable Product:
   Honeywell TC 806 B.

8. Duct Ionization Smoke Sensors. Shall operate over an air velocity range from 300 to 4,000 fpm. Each shall be equipped with an air inlet sampling tube which completely traverses to duct width.
   Acceptable Product:
   Honeywell TC 807 A.
   Honeywell 14506873, smoke sensor duct housings.

9. Thermal Sensors shall provide temperature measurement when scanned by the FACP for information.
   Acceptable Product:
   TC 808 B Thermal Sensors

10. Flow Switch: Provide monitoring module for each flow switch. Flow switch shall be provided as part of Fire Protection System.

11. Tamper Switch: Provide monitoring module for each tamper switch. Tamper switch shall be provided as part of Fire Protection System.

D. Monitor Modules:

1. The Monitor Module shall provide an addressable input for N.O. or N.C. contact devices such as manual pull stations, duct smoke detectors, water flow switches, sprinkler supervisory devices, door contacts, intrusion detectors, etc.

2. The Monitor Module shall provide a supervised initiating circuit. An open-circuit fault shall be annunciated at the FACP. Subsequent alarms shall be reported. (Style D Operation)

3. The module shall contain an LED which blinks upon being scanned by the FACP. Upon determination of an alarm condition, the LED shall be latched on.

4. The module shall mount in a standard electrical box.
Acceptable Product:
Honeywell TC 809 A.

E. Control Modules:

1. The Control Module shall provide an addressable output for a separately powered alarm indicating circuit or for a control relay.

2. The Control Module shall provide a supervised indicating circuit where indicated on the plans. An open-circuit fault shall be annunciated at the FACP. Subsequent alarm signaling shall occur in spite of the fault condition.

3. The Control Module shall provide a control relay. The relay contacts shall be SPDT (Form "C") rated at 2 amps at 28 V dc.

4. The module shall contain an LED which blinks upon being scanned by the FACP. Upon activation of the module, the LED shall be latched on.

5. The module shall mount in a standard electrical box.
Acceptable Product:
Honeywell TC 810 A.

2.8 FIRE ALARM NOTIFICATION DEVICES

A. Alarm Horn/Strobe Units

1. Alarm horns shall be UL 1971 listed and suitable for indoor, or outdoor, application with the appropriate electrical box. All horns shall be 24 VDC

polarized. The minimum sound level shall be 75-130 dB at 10 feet. Horns shall be semi-flush mounted. Single and dual projectors are to be supplied.

2. The visual signal shall flash on alarm occurrence. The bezel shall extend 1-1/2 inches minimum from the finished wall, and be approximately 3-1/2 x 5 inches engraved "FIRE".

3. All Multi candela strobes shall be field selectable to 15, 30, 75 or 110 candelas. Multi candela Strobe shall be Wheel Lock NS4-24-MCW-FR.

4. All strobes in unisex and public restrooms shall be ADA compliant and shall be 15/75 candela. ADA strobe shall be Wheel Lock NS4-241575W-FR.

B. Visual Alarm Unit

1. Visual Alarm unit shall be UL 1971 listed. Electronic light source shall be sealed in silicone and protected by a Lexan lens. The word "FIRE" shall appear on the lens. The light shall flash at a rate of 1 to 3 flashed per second, maximum. Lamp shall be powered by a supervised 24 VDC polarized source

2. Multi candela strobes shall be field selectable to 15, 30, 75 or 110 candelas. Multi candela Strobe shall be Wheel Lock RSS-24-MCW-FR.

3. Strobes in unisex and public restrooms shall be ADA compliant and shall be 15/75 candela. ADA strobe shall be Wheel Lock RSS-24-241575W-FR.

4. High Intensity Strobes shall be 185 candelas. Strobe shall be Wheel Lock RSS-24-24185W-FR.

2.9 REMOTE INDICATING LIGHTS AND IDENTIFICATION PLATES

A. Description: LED indicating light near each smoke detector that may not be readily visible, and each sprinkler water-flow switch and valve-tamper switch. Light is connected to flash when the associated device is in an alarm or trouble mode. Lamp is flush mounted in a single gang wall plate. A red, laminated, phenolic-resin identification plate at the indicating light identifies, in engraved white letters, device initiating the signal and room where the smoke detector or valve is located. For water-flow switches, the identification plate also designates protected spaces downstream from the water-flow switch.

2.10 MAGNETIC DOOR HOLDERS

A. Description: Units are equipped for wall or floor mounting as indicated and are complete with matching door plate.

1. Electromagnet: Requires no more than 3 W to develop 25-lbf (111-N) holding force.

2. Wall-Mounted Units: Flush mounted, unless otherwise indicated.

3. Rating: 120-V ac.

B. Material and Finish:

1. Match door hardware.

2.11 EMERGENCY POWER SUPPLY

A. General: Components include nickel-cadmium battery, charger, and an automatic transfer switch.

1. Battery Nominal Life Expectancy: 20 years, minimum.

B. Battery Capacity: 24-Hours stand-by and 15-minutes in alarm back-up. Comply with NFPA 72.

C Battery Charger: Solid-state, fully automatic, variable-charging-rate type. Provide capacity for 150 percent of the connected system load while maintaining batteries at full charge. If batteries are fully discharged, the charger recharges them completely within four hours. Charger output is supervised as part of system power supply supervision.

D. Integral Automatic Transfer Switch: Transfers the load to the battery without loss of signals or status indications when normal power fails.

2.12 ADDRESSABLE INTERFACE DEVICE

A. Description: Microelectronic monitor module listed for use in providing a multiplex system address for listed fire and sprinkler alarm-initiating devices with normally open contacts.

B. Integral Relay: Capable of providing a direct signal to the elevator controller to initiate elevator recall or to a circuit-breaker shunt trip for power shutdown.

2.13 GUARDS FOR PHYSICAL PROTECTION

A. Description: Welded wire mesh of size and shape for the manual station, smoke detector, gong, or other device requiring protection.

1. Factory fabricated and furnished by the manufacturer of the device.

2. Finish: Paint of color to match the protected device.

2.14 WIRE

A. Notification Circuits: Shall be in compliance with NFPA 70, Class A, Style Z, Type FPLR-CI, minimum 12 AWG solid copper conductors, shielded twisted pair rated at 600-volts, 90-degrees Celsius with color coded insulation.

B. Initiating Line Circuits: Shall be in compliance with NFPA 70, Class A, Style D, Type FPLR-CI, minimum 14 AWG solid copper conductors, shielded twisted pair rated at 600-volts, 90-degrees Celsius with color coded insulation.

C. Signaling Line Circuits: Shall be in compliance with NFPA 70, Class A, Style 5 Alpha, Type FPLR-CI, minimum 14 AWG solid copper conductors, shielded twisted pair rated at 600-volts, 90-degrees Celsius with color coded insulation.

END OF SECTION 13851

SECTION 13975 – BUILDING AUTOMATION SYSTEMS (BAS)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Maryland Department of Transportation/Maryland Aviation Administration Standard Provisions to the Construction Contract for Projects at Baltimore/Washington International Airport, and other Division 1 Specifications Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes control equipment for HVAC systems and components, including control components for central station air handling units and other HVAC units that are not supplied with factory-wired controls, and programmable lighting control as specified in Section 16215.

B. Related Sections

1. Section 15175 "Variable (Adjustable) Frequency Drives" contains requirements that relate to this Section.

2. Section 15122 "Meters and Gages" for turbine flowmeters.

3. Section 16231 "Packaged Engine Generators."

4. Section 16442 "Panelboards."

5. Section 16443 "Motor Control Centers."

1.3 SYSTEM DESCRIPTION

A. The Contractor, through the use of an Automatic Temperature Control (ATC) System Supplier, shall furnish, install, and place into service the complete heating, ventilating, and air conditioning (HVAC) monitoring and control system, all in accordance with the requirements of the Contract Documents. The HVAC monitoring and control system shall communicate with the existing Baltimore Washington International Airport Facility Management System (FMS)/Building Automation Systems (BAS). Additional controls and monitoring shall be provided for electrical systems as described in Part 3.4 of this Section.

B. The System Supplier shall assume and execute full responsibility to select, furnish, install and connect, test and calibrate, place into operation all specified components,

assemblies, and accessories needed for a complete and functional system of HVAC monitoring and control in full compliance with the requirements of the specification.

C. The existing Baltimore Washington International Airport Facility Management System (FMS) is a Johnson Controls Metasys System.

D. The ATC System shall be one of direct digital control utilizing electric or pneumatic actuation. Provide Network Control Units (NCU) to allow communication to the existing Metasys network. A Metasys "companion" system is unacceptable.

E. Communications: The Building Automation Contractor shall be responsible for full communications to the existing BWI Metasys network. Full communications means, the MAA facility operators will be able from the existing Metasys operator workstations to do the following: fully utilize the Metasys network manager software. The FMS operator will be able to receive alarms, logs, and reports; monitor operating conditions; change control setpoints and operating schedules; and operate equipment as desired at all existing Metasys operator workstation locations.

F. Air Handling Units:

The following is a brief description, but is not limited to:

1. Furnish and install DDC controller, sensors, switches, transmitters, and control actuating devices.

2. Provide damper actuators.

3. Provide hot water and chilled water control valves.

G. Air Curtains:

The following is a brief description, but is not limited to:

1. Furnish and install DDC Controller, sensors, switches, transmitters, and control actuating devices.

2. Provide hot water control valves.

H. Hot/Chilled Water Controls:

The following is a brief description, but is not limited to:

1. Furnish and install DDC controller, sensors, switches, transmitters, and control actuating devices.

2. Provide Onicon Dual Turbine Flow Meter.

3. Provide Hot Water control valves.

I. Roadway Ventilation Zone Control:

The following is a brief description, but is not limited to:

1 Furnish and install DDC controller, sensors, switches, transmitters, and control actuating devices.

2 Provide and install Mine Safety model 3800 carbon monoxide sensors with in line oxides of nitrogen sensors on each ventilation system.

J. Hot Water Unit Heaters: The following is a brief description, but is not limited to: Provide room thermostat to cycle the unit heater fan to maintain zone set point.

K. Stormwater/Sewage Pumps:

1. Furnish and install DDC controllers for monitoring sump level alarms.

L. Heat Tracing:

1. Furnish and install DDC controllers for monitoring heat tracing alarms.

2. Furnish and install DDC controls for controlling start/stop of heat tracing elements.

M. Emergency Generator:

1. Provide controls for monitoring emergency generator points as indicated on the plans.

2. HVAC controls for the emergency generator room shall be furnished and installed as shown on the plans.

N. Oil/Water Separators:

1. Furnish and install DDC controls for monitoring oil/water separator high level alarm sensors.

O. Cabinet Unit Heaters:

1. Furnish and install DDC controls for control of fan and 2-way control valves, as detailed on the plans.

P. VAV Boxes:

1. Furnish and install DDC controllers, sensors, transmitters, and control actuating devices for monitoring and control of all VAV boxes.

Q. Heating and Ventilation Units:

1. Furnish and install DDC controls for monitoring and control of the heating and ventilation units, as detailed on the plans.

R. Computer Room DX Units:

1. Provide DDC controls for monitoring status of units.

2. Provide temperature and humidity sensors for each space for monitoring and alarms.

S. Computer Room Chilled Water Units/Fan Coil Units:

1. Provide DDC controls for monitoring and control of fan coil units, exhaust fan and dampers.

T. Exhaust Fans:

1. Provide DDC controls for monitoring status of fans.

2. Provide DDC controls for interlock of fans with associated AHU's and dampers, etc.

3. Provide DDC control sensors when exhaust fans are controlled by space temperature.

U. Switchgear/Substation:

1. Provide DDC controls for monitoring of electrical devices as scheduled on the plans.

V. Lighting Controllers:

1. Provide DDC control items for monitoring and control of lighting systems as shown on the plans and specified herein.

W. Reheat Coils:

1. Provide new 3-way control valves, actuators and temperature sensors for all designated existing reheat coils. Remove all existing control devices and elements.

X. Pumps:

1. Furnish and install DDC controllers, sensor, and transmitters for operation of all chilled water, heating water, domestic hot water, and secondary heating water pumps.

Y. Miscellaneous Controls:

The following is a brief description, but is not limited to:

1. Provide monitoring of elevator sump pumps.

2. Extension of existing Johnson Controls Metasys Facility Management System for Automatic Temperature Controls.

3. Provide as necessary for other elements, as detailed on the plans.

Z. Network:

The following is a brief description, but is not limited to:

1. Furnish and install new Network Controllers with tie into existing BWI network.

2. Map all new control points and sequences back to existing Metasys Operator Workstation.

3. Create new graphics for project equipment on existing Metasys Operator Workstation.

1.4 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product Data for each type of product specified. Include manufacturer's technical Product Data for each control device furnished, indicating dimensions, capacities, performance characteristics, electrical characteristics, finishes of materials, installation instructions, and startup instructions.

C. Shop Drawings from manufacturer detailing equipment assemblies and indicating dimensions, weights, loadings, required clearances, method of field assembly, components, and location and size of each field connection. Submit damper leakage and flow characteristics, plus size schedule for controlled dampers.

D. Shop Drawings containing the following information for each control system:

1. Schematic flow diagram showing pumps, fans, coils, dampers, valves, air flow measurement devices, and control devices.

2. Each control device labeled with setting or adjustable range of control.

3. Diagrams for all required electrical wiring. Clearly differentiate between factory-installed and field-installed wiring.

4. Details of control panel faces, including controls, instruments, and labeling.

5. Written description of sequence of operation.

6. Trunk cable schematic showing programmable control unit locations and trunk data conductors.

7. Listing of connected data points, including connected control unit and input device.

8. System graphics indicating monitored systems, data (connected and calculated) point addresses, and operator notations.

9. Software description and sequence of operation.

10. System configuration showing peripheral devices, diagrams, and interconnections.

E. Wiring diagrams detailing wiring for power, signal, and control systems and differentiating clearly between manufacturer-installed and field-installed wiring.

F. Maintenance data for control systems equipment to include in the operation and maintenance manual specified in Division 1. Include the following:

1. Maintenance instructions and spare parts lists for each type of control device.

2. Interconnection wiring diagrams with identified and numbered system components and devices.

3. Inspection period, cleaning methods, cleaning materials recommended, and calibration tolerances.

4. Calibration records and list of set points.

G. Field Test Reports: Procedure and certification of pneumatic control piping system.

H. Project Record Documents: Record actual locations of control components, including control units, thermostats, and sensors. Revise Shop Drawings to reflect actual installation and operating sequences.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer specializing in control system installations.

B. Startup Personnel Qualifications: Engage specially trained personnel in direct employ of manufacturer of primary temperature control system.

C. Comply with NFPA 90A.

D. Comply with NFPA 70.

E. Coordinate equipment selection with Division 16 Section "Fire Alarm Systems" to achieve compatibility with equipment that interfaces with that system.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store equipment and materials inside and protected from weather.

B. Factory-Mounted Components: Where control devices specified in this Section are indicated to be factory mounted on equipment, arrange for shipping control devices to unit manufacturer.

1.7 SPARE PARTS

A. Provide the following quantity of spare parts:

1. Temperature Sensors 10 percent of total.

2. Pressure Sensors 10 percent of total.

3. 10% of AHU, exhaust fans, supply fans and UNTs controllers.

B. These items shall be delivered to the facility at the time of the acceptance testing and a copy of the receipt signed by the facility shall be included in the acceptance test. The MAA will not issue its letter of acceptance without receipt of spare parts.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. The System Supplier shall be a single firm, or corporation subcontracted by the Contractor to assume full responsibility to perform all engineering, to select, furnish, and place into operation a complete and functional system of HVAC monitoring and control. Acceptable System Supplier shall be "Factory Branch Office" of the following:

1. Johnson Controls, Inc., Loveton Circle, Sparks, Maryland (telephone: 410-527-2607).

Other bids by wholesalers, contractors, and franchised dealers are not acceptable.

2.2 GENERAL PRODUCT DESCRIPTION

A. The Facility Management System shall be capable of integrating multiple building functions including equipment supervision and control, alarm management, energy management, information management, and historical data collection and archiving.

B. The facility management system shall consist of the following:

1. Standalone DDC panels.

2. Standalone application specific controllers (ASCs).

3. Local Display Devices.

The system shall be modular in nature, and shall permit expansion of both capacity and functionality through the addition of sensors, actuators, standalone DDC panels, and operator devices.

C. System architectural design shall eliminate dependence upon any single device for alarm reporting and control execution. Each DDC panel shall operate independently by performing its own specified control, alarm management, operator I/O, and historical data collection. The failure of any single component or network connection shall not interrupt the execution of control strategies at other operational devices.

D. Standalone DDC panels shall be able to access any data from, or send control commands and alarm reports directly to any other DDC panel or combination of panels on the network without dependence upon a central processing device, including a Central File Server. Standalone DDC panels shall also be able to send alarm reports to multiple operator workstations, terminals, and printers without dependence upon a central processing device or File Server.

2.3 NETWORKING/COMMUNICATIONS

A. The design of the FMS shall network operator workstations and Standalone DDC Panels as shown on the system configuration drawing. Inherent in the system's design shall be the ability to expand or modify the network either via a local area network, or auto-dial telephone line modem connections, or via a combination of the two networking schemes.

B. Local Area Network

1. Workstation/DDC Panel Support: Operator workstations and DDC panels shall directly reside on a local area network such that communications may be executed directly between controllers, directly between workstations, and between controllers and workstations on a peer-to-peer basis.

2. Dynamic Data Access: All operator devices, either network resident or connected via dial-up modems, shall have the ability to access all point status and application report data, or execute control functions for any and all other devices via the local area network. Access to data shall be based upon logical identification of building equipment. Access to system data shall not be restricted by the hardware configuration of the facility management system. The hardware configuration of the FMS network shall be transparent to the user when accessing data or developing control programs.

3. General Network Design: Network design shall include the following provisions:

a. High speed data transfer rates for alarm reporting, quick report generation from multiple controllers, and upload/download efficiency between network devices. The minimum baud rate shall be 1 Megabaud.

b. Support of any combination of controllers and Operator Workstations directly connected to the local area network.

c. Detection and accommodation of single or multiple failures of either workstations, DDC panels or the network media. The network shall include provisions for automatically re-configuring itself to allow all operational equipment to perform their designated functions as effectively as possible in the event of single or multiple failures.

d. Message and alarm buffering to prevent information from being lost.

e. Error detection, correction, and retransmission to guarantee data integrity.

f. Default device definition to prevent loss of alarms or data, and ensure alarms are reported as quickly as possible in the event an operator device does not respond.

g. Commonly available, multiple sourced, networking components shall be used to allow the FMS to coexist with other networking applications. ETHERNET and ARCNET are acceptable technologies.

h. Communications must be of a deterministic nature to assure calculable performance under worst-case network loading. When a collision-based network is proposed, the Contractor shall provide detailed calculations showing worst-case network response times.

i. Automatic synchronization of the real-time clocks in all DDC panels shall be provided.

C. Dial-Up Communications: Auto-dial/auto-answer communications shall be provided to allow standalone DDC panels to communicate with remote operator devices on an intermittent basis via telephone lines.

1. Dial-Up Standalone DDC Panels: Auto-Dial panels shall automatically place calls to workstations to report critical alarms, or to upload trend and historical information for archiving.

a. Standalone DDC Panels shall analyze and prioritize all alarms to minimize the initiation of calls. Non-critical alarms shall be buffered in memory and reported as a group of alarms, or until an operator manually requests an upload of all alarms.

b. The auto-dial program shall include provisions for handling busy signals, "no-answers," and incomplete data transfers. Default devices shall be called when communications cannot be established with primary devices.

2. Dial-Up Workstations: Operators at dial-up workstations shall be able to perform all control functions, all report functions, and all database generation and modification functions as described for workstations connected via the local area network. Routines shall be provided to automatically answer calls, and either file or display information sent from remote DDC panels.

a. An operator shall be able to access remote buildings by selection of any facility by its logical name. The PC Dial-Up program shall maintain a user-definable cross-reference of buildings and associated telephone numbers, so the user shall not be required to remember or manually dial telephone numbers.

b. PC workstation may serve as an operator device on a local area network, as well as a dial-up workstation for multiple auto-dial DDC panels or networks. Alarm and data file transfers handled via dial-up transactions shall not interfere with local area network activity, nor shall local area network activity keep the workstation from handling incoming calls.

3. Modem Characteristics: Dial-up communications shall make use of Hayes compatible 56k baud modem and voice grade telephone lines. Each standalone DDC panel may have its own modem, or a group of Standalone DDC panels may share a modem.

2.4 STANDALONE DDC PANELS

A. General: Standalone DDC panels shall be microprocessor based, multi-tasking, multi-user, real-time digital control processors. Each standalone DDC panel shall consist of modular hardware with plug-in enclosed processors, communication controllers, power supplies, and input/output modules. A sufficient number of controllers shall be supplied to fully meet the requirements of this specification.

B. Memory: Each DDC panel shall have sufficient memory to support its own operating system and databases including:

1. Control processes.
2. Energy Management Applications.
3. Alarm Management.
4. Historical/Trend Data for all points.
5. Maintenance Support Applications.
6. Custom Processes.
7. Operator I/O.
8. Dial-Up Communications.
9. Manual Override Monitoring.

C. Point Types: Each DDC panel shall support the following types of point inputs and outputs:

1. Digital Inputs for status/alarm contacts.
2. Digital Outputs for on/off equipment control.
3. Analog Inputs for temperature, pressure, humidity, flow, and position measurements.
4. Analog Outputs for valve and damper position control, and capacity control of primary equipment.

5. Pulse Inputs for pulsed contact monitoring.

D. Expandability: The system shall be modular in nature, and shall permit easy expansion through the addition of software applications, workstation hardware, field controllers, sensors, and actuators. The system architecture shall support 25% expansion capacity of all types of DDC panels, and all point types included in the initial installation.

E. Serial Communication Ports: Standalone DDC panels shall provide at least two RS-232C serial data communication ports for simultaneous operation of multiple operator I/O devices such as industry standard printers, laptop workstations, PC workstations, and panel mounted or portable DDC panel Operator's Terminals. Standalone DDC panels shall allow temporary use of portable devices without interrupting the normal operation of permanently connected modems, printers, or network terminals.

F. Integrated On-Line Diagnostics: Each DDC panel shall continuously perform self-diagnostics, communication diagnosis and diagnosis of subsidiary equipment.

G. Surge and Transient Protection: Isolation shall be provided at all network termination's, as well as all field point termination's to suppress induced voltage transients consistent with IEEE Standard 587-1980.

H. Powerfail Restart: In the event of the loss of normal power, there shall be an orderly shutdown of all standalone DDC panels to prevent the loss of database or operating system software. Non-Volatile memory shall be incorporated for all critical controller configuration data, and battery back-up shall be provided to support the real-time clock and all volatile memory for a minimum of 72 hours. Upon restoration of normal power, the DDC panel shall automatically resume full operation without manual intervention. Should DDC panel memory be lost for any reason, the panel will automatically receive a download via the local area network, phone lines, or connected computer. In addition, the user shall have the capability of reloading the DDC panel via the local area network, via the local RS-232C port, or via telephone line dial-in.

2.5 SYSTEM SOFTWARE FEATURES

A. General

1. All necessary software to form a complete operating system as described in this specification shall be provided. Provide a color graphic floor plan for all floors to show the on/off status of lighting zones.

2. The software programs specified in this section shall be provided as an integral part of the DDC panel and shall not be dependent upon any higher level computer for execution.

B. Graphics Display: Color graphic floor plan displays and system schematic for each piece of mechanical equipment shown on plans shall be provided. Provide a color graphic floor plan for all floors to show the on/off status of lighting zones.

C. Energy Management Applications: DDC Panels shall have the ability to perform any or all of the following energy management routines:

1. Time of Day Scheduling
2. Calendar Based Scheduling
3. Holiday Scheduling
4. Temporary Schedule Overrides
5. Optimal Start
6. Optimal Stop
7. Night Setback Control
8. Enthalpy Switch Over (Economizer)
9. Peak Demand Limiting
10. Temperature Compensated Load Rolling
11. Heating/Cooling Interlock
12. Hot Water Reset
13. Chilled Water Reset

All programs shall be executed automatically without the need for operator intervention, and shall be flexible enough to allow operator customization.

D. Custom Process Programming Capability: DDC panels shall be able to execute custom, job-specific processes defined by the operator, to automatically perform calculations and special control routines.

1. Process Inputs and Variables: It shall be possible to use any of the following in a custom process:

   a. Any system-measured point data or status.

   b. Any calculated data.

c. Any results from other processes.

d. User-Defined Constants.

e. Arithmetic functions (+, -, *, / square root, exponential, etc.).

f. Boolean logic operators (and, or, exclusive or, etc.).

g. On-delay/Off-delay/One-shot timers.

2. Process Triggers: Custom processes may be triggered based on any combination of the following:

a. Time interval.

b. Time of day.

c. Date.

d. Other processes.

e. Time programming.

f. Events (e.g., point alarms).

3. Dynamic Data Access: A single process shall be able to incorporate measured or calculated data from any and all other DDC panels on the local area network. In addition, a single process shall be able to issue commands to points in any and all other DDC panels on the local area network.

4. Advisory/Message Generation: Processes shall be able to generate operator messages and advisories to operator I/O devices. A process shall be able to directly send a message to a specified device, buffer the information in a follow-up file, or cause the execution of a dial-up connection to a remote device such as a printer.

5. Custom Process Documentation: The custom control programming feature shall be self-documenting. All interrelationships defined by this feature shall be documented via graphical flowcharts and English language descriptors.

E. Alarm Management: Alarm management shall be provided to monitor, buffer, and direct alarm reports to operator devices and memory files. Each DDC panel shall perform distributed, independent alarm analysis and filtering to minimize operator interruptions due to non-critical alarms, minimize network traffic, and prevent alarms from being lost. At no time shall the DDC panel's ability to report alarms be affected by either operator activity at a PC Workstation or local I/O device, or communications with other panels on the network.

1. Point Change Report Description: All alarm or point change reports shall include the point's English language description, and the time and date of occurrence.

2. Prioritization: The user shall be able to define the specific system reaction for each point. Alarms shall be prioritized to minimize nuisance reporting and to speed operator response to critical alarms. A minimum of three priority levels shall be provided. Each DDC panel shall automatically inhibit the reporting of selected alarms during system shutdown and start-up. Users shall have the ability to manually inhibit alarm reporting for each point. The user shall also be able to define under which conditions point changes need to be acknowledged by an operator, and/or sent to follow-up files for retrieval and analysis at a later date.

3. Report Routing: Alarm reports, messages, and files will be directed to a user-defined list of operator devices or PC disk files used for archiving alarm information. Alarms shall also be automatically directed to a default device in the event a primary device is found to be off-line.

4. Alarm Messages: In addition to the point's descriptor and the time and date, the user shall be able to print, display or store a 65-character alarm message to more fully describe the alarm condition or direct operator response. Each standalone DDC panel shall be capable of storing a library of at least 250 Alarm Messages. Each message may be assignable to any number of points in the panel.

5. Auto-Dial Alarm Management: In Dial-up applications, only critical alarms shall initiate a call to a remote operator device. In all other cases, call activity shall be minimized by time-stamping and saving reports until an operator scheduled time, a manual request, or until the buffer space is full. The alarm buffer must store a minimum of 50 alarms.

6. Transaction Logging: Operator commands and system events shall be automatically logged to disk in Personal Computer industry standard database format. Operator commands initiated from Direct-connected workstations, dial-up workstations, and local DDC panel Network Terminal devices shall all be logged to this transaction file. This data shall be available at the Operator Workstation. Facility shall be provided to allow the user to search the transaction file using standard database query techniques, including searching by dates, operator name, data point name, etc. In addition, this transaction file shall be accessible with standard third party database and spreadsheet packages.

F. Historical Data and Trend Analysis: A variety of Historical data collection utilities shall be provided to automatically sample, store, and display system data in all of the following ways:

1. Continuous Point Histories: Standalone DDC panels shall store Point History Files for all analog and binary inputs and outputs. The Point History routine shall continuously and automatically sample the value of all analog inputs at half hour

intervals. Samples for all points shall be stored for the past 24 hours to allow the user to immediately analyze equipment performance and all problem-related events for the past day. Point History Files for binary input or output points and analog output points shall include a continuous record of the last ten status changes or commands for each point.

2. Control Loop Performance Trends: Standalone DDC panels shall also provide high resolution sampling capability in one-second increments for verification of control loop performance.

3. Extended Sample Period Trends: Measured and calculated analog and binary data shall also be assignable to user-definable trends for the purpose of collecting operator-specified performance data over extended periods of time. Sample intervals of 1 minute to 2 hours shall be provided. Each standalone DDC panel shall have a dedicated buffer for trend data, and shall be capable of storing a minimum of 5000 data samples.

4. Data Storage and Archiving: Trend data shall be stored at the Standalone DDC panels, and uploaded to hard disk storage when archival is desired. Uploads shall occur based upon either user-defined interval, manual command, or when the trend buffers become full. All trend data shall be available in disk file format compatible with Third Party personal computer applications.

G. Runtime Totalization: Standalone DDC panels shall automatically accumulate and store runtime hours for binary input and output points as specified in the Execution portion of this specification.

1. The Totalization routine shall have a sampling resolution of one minute or less.

2. The user shall have the ability to define a warning limit for Runtime Totalization. Unique, user-specified messages shall be generated when the limit is reached.

H. Analog/Pulse Totalization: Standalone DDC panels shall automatically sample, calculate and store consumption totals on a daily, weekly, or monthly basis for user-selected analog and binary pulse input-type points.

1. Totalization shall provide calculation and storage of accumulations of up to 99,999.9 units (e.g., KWH, gallons, KBTU, tons. etc.).

2. The Totalization routine shall have a sampling resolution of one minute or less.

3. The user shall have the ability to define a warning limit. Unique, user-specified messages shall be generated when the limit is reached.

I. Event Totalization: Standalone DDC panels shall have the ability to count events such as the number of times a pump or fan system is cycled on and off. Event totalization shall be performed on a daily, weekly, or monthly basis.

1. The Event Totalization feature shall be able to store the records associated with a minimum of 9,999,999 events before reset.

2. The user shall have the ability to define a warning limit. Unique, user-specified messages shall be generated when the limit is reached.

J. Lighting Control Software Description: Provide lighting control software/programming at Metasys and at each lighting control panel. Prior to start of programming work, request a lighting control schedule from the MAA. This schedule will dictate default on and off control of lights on a per day basis. Do not proceed until the approved schedule is obtained from the MAA. Provide a menu driven selection screen that will allow the following:

1. Monitoring of the corridor and holdroom lighting zone on/off status.

2. Individual control of each lighting zone.

K. Ventilation Control Software Description

1. Ventilation Control Application

a. ASHRAE Standard 62-1989, Ventilation for Acceptable Indoor Air Quality, provides a procedure to determine outdoor air flow rates for buildings: The "Ventilation Rate Procedure."

b. The "Ventilation Rate Procedure" specifies the outdoor air flow rate as a function of occupancy and building use. The specified outdoor air flow rates are "derived from physiological considerations, subjective evaluations and professional judgments." The ventilation (outdoor) air must have acceptable quality, as specified in the Standard. The contaminant concentrations in the indoor air are not directly measured under this procedure, but are expected to be at typical levels for the given types of occupied space. The prescribed outdoor air flow rates are then expected to dilute the indoor air contaminant concentrations to acceptable levels.

2. Software Features: The following software features shall be part of the ventilation control application.

a. CO_2 Multiplexer--Controls the sampling sequence and storing of the three measured CO_2 concentrations.

b. CO_2 Sensor Autozero function--Causes the controller to read outdoor air CO_2 concentrations for one hour each day for the auto zeroing algorithm in the CO_2 sensor.

c. Outdoor Air Flow Calculator--Uses the CO_2 concentration data to calculate the outdoor air flow rate.

d. Outdoor Air Flow Controller--Uses the outdoor air flow rate as a controlled variable input for closed loop PI control of outdoor air flow. The primary setpoint is determined by the Outdoor Air Flow Controller's Setpoint Selector.

e. Outdoor Air Flow Controller Backup--Takes over control when the ODA Flow Calculator output is not dependable for any reason. This is a redundancy that is not required for outdoor air flow control but is provided for space pressurization considerations.

f. Outdoor Air Flow Setpoint Selector (with CO_2 High Limit Control)--The Setpoint Selector determines the setpoint of the Outdoor Air Flow Controller based on the highest of three signals: Scheduled setpoint based on estimated occupancy, space pressurization (i.e., volume matching) setpoint, and the CO_2 high limit control setpoint. The CO_2 high limit control function supplements the scheduled outdoor air flow function, addressing any higher than expected occupancy periods.

g. Return Air CO_2 Alarm capability--Alerts building operators to conditions of high CO_2 levels, indicating loss of ventilation control, or conditions of low CO_2 levels indicating a CO_2 sensor fault.

h. Controller Manager--Selects between the Outdoor Air Flow Controller and the conventional discharge air temperature controller/economizer for control of the mixed air dampers.

i. CO_2 Concentration Values Check--Warns the operator if the CO_2 concentration values are not in the proper relationship; supply air CO_2 concentration should be higher than that of the outdoor air and lower than that of the return air.

j. Lead Ventilation--Provides ventilation prior to occupancy, diluting building source contaminants to acceptable levels.

k. Trend Tool--This Excel work, in conjunction with an OWS and Metalink™, provides expanded graphic presentation of trend data.

l. Outdoor Air Actuator Ramp Generator--Diagnostic software process compound ramps outdoor air damper through 0%, 50% and 100% positions for precommissioning tests and ventilation control verification.

m. Trend Automator--Starts and stops trending of object attributes when the air handling unit is started and stopped. This avoids wasted disk space which occurs if trending continues during equipment off periods.

n. Reliability Checker--Replaces unreliable trend data with zero.

o. Outdoor Air Flow Calculator - Energy Balance Method--Uses mixed, return and outdoor air temperature data to calculate the outdoor air flow rate for comparison purposes (not for control).

3. Measurement of Outdoor Air Flow Rate

a. ASHRAE Standard 62-1989 states: "When mechanical ventilation is used, provision for air flow measurement should be included" and "sufficient ventilation shall be demonstrable." This is being interpreted to mean that for VAV systems, measurement of the outdoor air flow is required to meet the Standard. An additional benefit of outdoor air flow measurement is to improve the operation of space pressurization and mixed air controls.

b. Outdoor air flow is measured indirectly, using the "CO_2 Concentration Balance" measurement method. In the "CO_2 Concentration Balance" method, the outdoor air flow is calculated from supply air flow (measured directly via airflow measuring station), and from three CO_2 concentrations. Outdoor, supply, and return air CO_2 concentrations are used to compute the fraction of outdoor air in the supply air stream. This provides a calculated outdoor air flow value as a controlled variable input for the Outdoor Air Flow Controller.

c. The volumetric concentration balance for the outdoor and return air streams being mixed can be calculated for any "tracer gas" injected into the air streams. Since human respiration generates significant amounts of CO_2 in the return air stream and CO_2 sensors are available, CO_2 is a good tracer gas for this method.

4. Implementation of Outdoor Air Flow Software Control Strategies

a. The multiplexed method of CO_2 measurement that is used to provide accurate CO_2 concentration values for the Outdoor Air Flow Calculator has additional capabilities in that it can compensate for exhaust air bypass and mixing plenum air leaks. It is the only method that can distinguish between outdoor and re-entrained return or exhaust air.

b. The method is derived from equations describing the mixing of the outdoor and return air streams in a common air handling unit. Each of these air streams contains some concentration of the tracer gas, CO_2

c. The outdoor air flow rate can then be determined as

$$'FM_{OA} = \frac{CO_{2,RA}-CO_{2,SA}}{CO_{2,RA}-CO_{2,0A}} \text{ CDOTCFM}$$

using the supply air volumetric flow rate in CFM (or m^3/sec) and the CO_2 concentrations in ppm (parts per million).

$$\frac{CO_{2,RA}-CO_{2,SA}}{}$$

d. The expression $CO_{2,RA}-CO_{2,OA}$ can be viewed as a "flow coefficient" that determines the "outdoor air fraction" in the supply air. The typical return air CO_2 concentration in an occupied building is in the range of 500 to 1000 ppm while the outdoor air CO_2 concentration is in the range of 350 to 450 ppm. The mixing of the outdoor and return air streams will always cause the supply air CO_2 concentration to be higher than that of the outdoor air and lower than that of the return air. When the outdoor and exhaust air dampers are fully closed and all the return air is being recirculated, the supply air CO_2 concentration is equal to that of the return air and the flow coefficient will have a value of zero, correctly indicating that no outdoor air is being introduced into the space. When the outdoor and exhaust air dampers are fully open, the supply air CO_2 concentration is equal to that of the outdoor air and the flow coefficient will have value of one, indicating that the air handling unit is using 100% outdoor air.

e. Single CO_2 sensor with a sampling air pump and appropriate software is used to measure and store, in sequence, CO_2 concentrations of the three air streams. Two solenoid air valves are used to connect the appropriate sampling line to the air sampling pump and to the sensor. Adequate time is provided for purging each sampling line and for the time response of the CO_2 sensor.

f. With the use of a single CO_2 sensor, the relative differences between CO_2 concentrations can be measured with an error of less than 5 ppm. The effect of sensing errors such as drift, temperature effect and short term output variations will be identical for all three CO_2 measurements. Because the flow coefficient requires only calculation of the ratio of the CO_2 differentials, the identical errors in the individual measurements will cancel out. Only infrequent field calibration of the CO_2 sensor is required because only the differentials are used, rather than absolute values.

g. The return air CO_2 concentration, one of the three CO_2 concentrations read and stored during the multiplexing cycle, can be utilized in some cases for purposes other than indirect outdoor air flow calculation. For example, it can be used for CO_2 high limit control and for Return Air CO_2 Alarms. For these applications, when an absolute CO_2 measurement is needed, accurate CO_2 sensor calibration is required. The CDS-2000 CO_2 sensor provides its own internal auto zeroing algorithm that has proved to be quite effective and limits the need for recalibration. For absolute measurements, CDS-2000 CO_2 sensors require periodic (annually) calibration with a calibration gas that contains a specific concentration of CO_2.

5. CO_2 Sensing Point Location

a. Selection of the CO_2 sensing locations should be as follows. The sampling tube (typically a 1/4 inch diameter plastic tube) is inserted into the duct in any convenient and easily accessible section of the ductwork. Note that, contrary to temperature sensing, the CO_2 concentration in mixed air is identical to the CO_2 concentration in the supply air. Therefore, there is never any need to sense CO_2 in the mixed air plenum where an averaging sensing probe would be required. Because the CO_2 concentration of an air stream is not affected by heating coils, cooling coils or humidifiers, the sensing point for the supply can be located downstream of the supply fan to ensure that the outdoor and return air streams are well mixed and have minimum stratification. The return air sensing point can be located in the return air duct, upstream or downstream of the return fan, using a tube of up to 100 feet in length.

b. The supply air sensing point is subject to the fastest changes in CO_2 concentration, as the linked dampers change position. When presented with choices regarding equipment location, mount the controller in a location that will minimize the length of the supply air sensing tube, using a tube of up to 30 feet, in length.

c. The outdoor air sensing point should be located in free air outside the building or, alternatively, in the outdoor air intake. If the outdoor air CO_2 sample is obtained from a location that is isolated from the building exhausts, the CO_2 Concentration Balance method will automatically compensate for air which short-cycles from the exhaust louvers to the outdoor air intake. Either location compensates for air which short-cycles from the fan room into the mixing plenum. By placing the outdoor air CO_2 sensing point in a location that is isolated from the building exhausts, this method allows calculation of the true fresh air portion of the outdoor air flow intake from the three CO_2 measurements and the supply air flow. The outdoor CO_2 sensing point, if placed in the outdoor air intake duct for

convenience reasons, should be placed far enough on the upstream side of the outdoor air damper so that its reading is not affected by a possible "backwash" of the mixed air at larger outdoor air damper openings. A good practical test is to check the outdoor air CO_2 sensing point reading while positioning the outdoor air damper from its fully closed to its fully open position and verify that the sensor reading does not change.

2.6 APPLICATION SPECIFIC CONTROLLERS - HVAC APPLICATIONS

A. Each Standalone DDC Controller shall be able to extend its performance and capacity through the use of remote Application Specific Controllers (ASCs).

B. Each ASC shall operate as a standalone controller capable of performing its specified control responsibilities independently of other controllers in the network. Each ASC shall be a microprocessor-based, multi-tasking, real-time digital control processor.

C. Each ASC shall have sufficient memory to support its own operating system and data bases including:

1. Control Processes
2. Energy Management Applications
3. Operator I/O (Portable Service Terminal)

D. The operator interface to any ASC point data or programs shall be through any network-resident PC workstation, or any PC or portable operator's terminal connected to any DDC panel in the network.

E. Application Specific Controllers shall directly support the temporary use of a portable service terminal. The capabilities of the portable service terminal shall include, but not be limited to, the following:

1. Display temperatures.
2. Display status.
3. Display setpoints.
4. Display control parameters.
5. Override binary output control.
6. Override analog setpoints.
7. Modification of gain and offset constants.

F. Powerfail Protection: All system setpoints, proportional bands, control algorithms, and any other programmable parameters shall be stored such that a power failure of any duration does not necessitate reprogramming the controller.

G. Surge and Transient Protection: Isolation shall be provided at all network terminations, as well as all field point terminations to suppress induced voltage transients consistent with IEEE Standard 587-1980. Isolation levels shall be sufficiently high as to allow all signal wiring to be run in the same conduit as high voltage wiring where acceptable by electrical code.

H. Powerfail Restart: In the event of the loss of normal power, there shall be an orderly shutdown of all standalone DDC panels to prevent the loss of database or operating system software. Non-volatile memory shall be incorporated for all critical controller configuration data, and battery back-up shall be provided to support the real-time clock and all volatile memory for a minimum of 72 hours.

1. Upon restoration of normal power, the DDC panel shall automatically resume full operation without manual intervention.

2. Should DDC panel memory be lost for any reason, the user shall have the capability of reloading the DDC panel via the local area network, via the local RS-2320 port, or via telephone line dial-in.

2.7 AHU CONTROLLERS

A. AHU controllers shall support all the necessary point inputs and outputs to perform the specified control sequences in a totally stand alone fashion.

B. AHU controllers shall have a library of control routines and program logic to perform the sequence of operation as shown on the plans.

C. Occupancy-Based Standby/Comfort Mode Control: Each AHU controller shall have a provision for occupancy sensing overrides. Based upon the contact status of either a manual wall switch or an occupancy sensing device, the AHU controller shall automatically select either standby or comfort mode to minimize the heating and cooling requirements while satisfying comfort conditions.

D. Continuous Zone Temperature Histories: Each AHU controller shall have the capability to automatically and continuously maintain a history of the associated zone temperature to allow users to quickly analyze space comfort and equipment performance for the past 24 hours. A minimum of two samples per hour shall be stored.

2.8 SEQUENCE OF OPERATION

A. See Mechanical plans.

2.9 SENSORS

A. Electronic Sensors: Vibration and corrosion resistant, for wall, immersion, or duct mounting as required.

1. Resistance Temperature Detectors: Platinum.

a. Accuracy: Plus or minus 0.2 percent at calibration point.

b. Wire: Twisted, shielded-pair cable.

c. Insertion Elements in Ducts: Use where not affected by temperature stratification or where ducts are smaller than 9 sq. ft.

d. Averaging Elements in Ducts: Use where ducts are larger than 9 sq. ft. or where prone to stratification, length as required.

e. Insertion Elements for Liquids: Brass socket with minimum insertion length of 2-1/2 inches.

f. Room Sensors: Discrete sensor.

g. Outside Air Sensors: Watertight inlet fitting, shielded from direct sunlight.

h. Duct and Outside Air Sensors: With element guard and mounting plate, range of 0 to 100 percent relative humidity.

B. Equipment Operation Sensors: As follows:

1. Status Input for Pumps: Differential-pressure switch piped across pump with adjustable pressure-differential range of 8 to 60 psi.

2. Status Inputs for Fans: Differential-pressure switch with adjustable range of 0 to 5 inches wg.

3. Status Inputs for Electric Motors: Current-sensing relay with current transformers, adjustable and set to 175 percent of rated motor current.

C. Humidity Sensors: Bulk polymer sensor element.

a. Accuracy: 5 percent full range with linear output.

b. Room Sensors: With locking cover matching room thermostats, span of 25 to 90 percent relative humidity.

c. Duct and Outside-Air Sensors: With element guard and mounting plate, range of 0 to 100 percent relative humidity.

D. Static-Pressure Transmitter: Nondirectional sensor with suitable range for expected input, and temperature compensated.

1. Accuracy: 2 percent of full scale with repeatability of 0.5 percent.

2. Output: 4 to 20 mA.

3. Building Static-Pressure Range: 0 to 0.25 inch wg (0 to 62 Pa).

4. Duct Static-Pressure Range: 0 to 5 inches wg (0 to 1243 Pa).

E. Pressure Transmitters: Direct acting for gas, liquid, or steam service; range suitable for system; proportional output 4 to 20 mA.

F. Digital-to-Pneumatic Transducers: Convert plus or minus 12-V dc pulse-width-modulation outputs, or continuous proportional current or voltage to 0 to 20 psig (0 to 138 kPa).

G. Pneumatic Valve/Damper Position Indication: Potentiometer mounted in enclosure with adjustable crank-arm assembly connected to damper to transmit 0 to 100 percent valve/damper travel.

H. Electronic Valve/Damper Position Indication: Visual scale indicating percent of travel and 2- to 10-V dc, feedback signal.

I. Water-Flow Switches: Pressure-flow switches of bellows-actuated mercury or snap-acting type, with appropriate scale range and differential adjustment, with stainless-steel or bronze paddle. For chilled-water applications, provide vaporproof type.

J. Occupancy Sensor: Passive infrared, with time delay, daylight sensor lockout, sensitivity control, and 180 degree field of view with vertical sensing adjustment, for flush mounting.

2.10 THERMOSTATS

A. Combination Thermostat and Fan Switches: Line-voltage thermostat with two-, three-, or four-position, push-button or lever-operated fan switch.

1. Label switches "FAN ON-OFF," "FAN HIGH-LOW-OFF," "FAN HIGH-MED-LOW-OFF." Provide unit for mounting on two-gang switch box.

B. Low-Voltage, On-Off Thermostats: NEMA DC 3, 24-V, bimetal-operated, mercury-switch type, with adjustable or fixed anticipation heater.

C. Line-Voltage, On-Off Thermostats: Bimetal-actuated, open contact or bellows-actuated, enclosed, snap-switch type, or equivalent solid-state type, with heat anticipator, integral manual on-off-auto selector switch.

1. Equip thermostats, which control electric heating loads directly, with off position on dial wired to break ungrounded conductors.

2. Dead Band: Maximum 2 deg F (1 deg C).

D. Remote-Bulb Thermostats: On-off or modulating type, liquid filled to compensate for changes in ambient temperature, with copper capillary and bulb, unless otherwise indicated.

1. Bulbs in water lines with separate wells of same material as bulb.

2. Bulbs in air ducts with flanges and shields.

3. Averaging Elements: Copper tubing with either single- or multiple-unit elements, extended to cover full width of duct or unit, adequately supported.

4. Scale settings and differential settings are clearly visible and adjustable from front of instrument.

5. On-Off Thermostat: With precision snap switches, with electrical ratings required by application.

6. Modulating Thermostats: Construct so complete potentiometer coil and wiper assembly is removable for inspection or replacement without disturbing calibration of instrument.

E. Room thermostat accessories include the following:

1. Insulating Bases: For thermostats located on exterior walls.

2. Thermostat Guards: Locking; heavy-duty, transparent plastic; mounted on separate base.

3. Adjusting Key: As required for calibration and cover screws.

4. Aspirating Boxes: For flush-mounted aspirating thermostats.

5. Set-Point Adjustment: 1/2-inch- (13-mm-) diameter, adjustment knob.

F. Immersion Thermostat: Remote-bulb or bimetal rod-and-tube type, proportioning action with adjustable throttling range and adjustable set point.

G. Airstream Thermostats: Two-pipe, fully proportional, single-temperature type, with adjustable set point in middle of range and adjustable throttling range, plug-in test fitting or permanent pressure gage, remote bulb, bimetal rod and tube, or averaging element.

H. Electric Low-Limit Duct Thermostat: Snap-acting, single-pole, single-throw, manual- or automatic-reset switch that trips if temperature sensed across any 12 inches (300 mm) of bulb length is equal to or below set point.

1. Bulb Length: Minimum 20 feet (6 m).

2. Quantity: One thermostat for every 20 sq. ft. (2 sq. m) of coil surface.

I. Electric High-Limit Duct Thermostat: Snap-acting, single-pole, single-throw, manual- or automatic-reset switch that trips if temperature sensed across any 12 inches (300 mm) of bulb length is equal to or above set point.

1. Bulb Length: Minimum 20 feet (6 m).

2. Quantity: One thermostat for every 20 sq. ft. (2 sq. m) of coil surface.

J. Heating/Cooling Valve-Top Thermostats: Proportional acting for proportional flow, molded-rubber diaphragm, remote-bulb liquid-filled element, direct and reverse acting at minimum shutoff pressure of 25 psig (172 kPa), and cast housing with position indicator and adjusting knob.

2.11 HUMIDISTATS

A. Duct-Mounted Humidistats: Electric insertion, 2-position type with adjustable 2 percent throttling range, 20 to 80 percent operating range, single- or double-pole contacts.

2.12 ACTUATORS

A. Electric Motors: Size to operate with sufficient reserve power to provide smooth modulating action or two-position action.

1. Permanent Split-Capacitor or Shaded Pole Type: Gear trains completely oil immersed and sealed. Equip spring-return motors with integral spiral-spring mechanism in housings designed for easy removal for service or adjustment of limit switches, auxiliary switches, or feedback potentiometer.

2. Nonspring-Return Motors for Valves Larger Than 2-1/2 Inches: Size for running torque of 150 inch-pounds and breakaway torque of 300 inch-pounds.

3. Spring-Return Motors for Valves Larger Than 2-1/2 Inches: Size for running and breakaway torque of 150 inch-pounds.

B. Pneumatic Valve Operators: Rolling-diaphragm, spring-loaded, piston type with spring range as required. Select operator for full shutoff at maximum pump differential pressure.

C. Pneumatic Damper Operators: Rolling-diaphragm, piston type with adjustable stops and spring return, sized to operate with sufficient reserve power to provide smooth modulating action or two-position action. Where actuators operate in sequence, provide pilot positioners.

1. Pilot Positioners: Starting point adjustable from 2 to 12 psi and operating span adjustable from 5 to 13 psi.

2.13 CONTROL VALVES

A. Control Valves: Factory fabricated, of type, body material, and pressure class indicated. Where type or body material is not indicated, make selection as determined by manufacturer for installation requirements and pressure class, based on maximum pressure and temperature rating of piping system.

B. Globe Valves: As follows:

1. Globe Valves NPS 2 Inches (DN50) and Smaller: Bronze body, bronze trim, rising stem, renewable composition disc, screwed ends with backseating capacity repackable under pressure.

2. Globe Valves NPS 2-1/2 Inches (DN65) and Larger: Iron body, bronze trim, rising stem, plug-type disc, flanged ends, renewable seat and disc.

3. Hydronic Systems: As follows:

a. Chilled Water Rating: Service at 125 psi WSP and 250 degrees F.

b. Hot Water: Service at 150 PSI WSP and 400 degrees F.

c. High Temperature Hot Water (HTHW): Carbon Steel, Class 600.

d. Internal Construction: Replaceable plugs and seats of stainless steel or brass.

1) Single-Seated Valves: Cage trim provides seating and guiding surfaces for plug on top and bottom of guided plugs.

2) Double-Seated Valves: Balanced plug; cage trim provides seating and guiding surfaces for plugs on top and bottom of guided plugs.

e. Sizing: 3 psi (cooling) 5 psi (heating) maximum pressure drop at design flow rate.

f. Flow Characteristics: 3-way valves have linear characteristics. Select operators to close valves against pump shutoff head.

g. High Temperature Hot Water: Class 600 or 800.0

C. Butterfly Pattern: Iron body, ductile iron (Nylon II coated) disc; resilient, EPDM seat for service to 250 degrees F lug ends; extended neck, 416 stainless steel stem.

1. Rating: Service at 125 psi WSP and 250 degrees F.

2. Sizing: 1 psi maximum pressure drop at design flow rate.

D. Terminal Unit Control Valves: Bronze body, bronze trim, two- or three-port as indicated, replaceable plugs and seats, union and threaded ends.

1. Rating: Class 125 for service at 125 psig (862 kPa) and 250 deg F (121 deg C) operating conditions.

2. Sizing: 3-psig (21-kPa) maximum pressure drop at design flow rate, to close against pump shutoff head.

3. Flow Characteristics: Two-way valves shall have equal percentage characteristics; three-way valves shall have linear characteristics.

E. Pressure Reducing Valve (PRV): 250-psig minimum rating. Pressure reducing valve shall automatically reduce a higher inlet pressure inlet pressure to a steady lower downstream pressure regardless of changing flow rate and/or varying inlet pressure. The pressure reducing valve shall be an accurate, pilot-operated regulator capable of holding downstream pressure to a pre-determined limit. The cover on the pilot control shall be sealed to prevent tampering. Pressure reducing valve shall be pre-set at factory.

1. Pressure Reducing Valve Material:

a. Body and Cover: Ductile iron, internally epoxy coated.

b. Disc Retainer and Diaphragm Washer: Cast iron.

c. Trim (Disc Guide, Seat and Cover Bearing): Stainless steel.

d. Disc: Buna-N rubber.

e. Stem, Nut and Spring: Stainless steel.

f. Diaphragm: Nylon reinforced Buna-N rubber.

2. Pilot System Material:

a. Pilot Control: Bronze ASTM B 62.

b. Trim: Stainless steel Type 303.

c. Rubber: Buna-N synthetic rubber.

3. Adjustment Range: 2 to 30 psi.

4. Accessories: Strainer, isolation valve.

5. Manufacturer and Model: Pressure reducing valves shall be manufactured by Cla-Val, Model 90-01 or equal."

2.14 DAMPERS

A. Dampers: AMCA-rated, parallel or opposed blade design; form frames from not less than 0.1084-inch galvanized steel with mounting holes for duct mounting; damper blades not less than 0.0635-inch galvanized steel, with maximum blade width of 8 inches.

1. Blades secured to 1/2-inch diameter, zinc-plated axles using zinc-plated hardware, with nylon blade bearings, blade-linkage hardware of zinc-plated steel and brass. Ends sealed against spring-stainless-steel blade bearings. Thrust bearings at each end of every blade.

2. Operating Temperature Range: From -40 to 200 degrees F.

3. For standard applications as indicated, (as selected by manufacturer's sizing techniques) with optional closed-cell neoprene edging.

2.15 AIR SUPPLY

A. Control and Instrumentation Tubing: Type K, seamless copper tubing complying with ASTM B 88 (ASTM B 88M) or Type ACR, copper tubing complying with ASTM B 280.

1. Fittings: Cast-bronze solder fittings complying with ASME B16.18; or wrought-copper solder fittings complying with ASME B16.22, except forged-brass compression-type fittings at connections to equipment.

2. Joining Method: Soldered or brazed.

B. Control and Instrumentation Tubing: Virgin-polyethylene, flame-retardant, nonmetallic tubing complying with ASTM D 2737 with flame-retardant harness for multiple tubing.

1. Fittings: Compression or push-on polyethylene fittings.

C. Tank: ASME storage tank with drain test cock, automatic moisture removal trap, tank relief valve, and rubber-cork vibration isolation mounting pads.

D. Duplex Air Compressor: Capacity to supply compressed air to temperature-control system. Minimum two (2) duplex air compressors, with air dryer and accessories shall be provided.

1. Adjustable electric contacts pressure control, set to start and stop both compressors at different pressures.

2. Electrical alternation set with motor starters and disconnect to operate compressors alternately or on time schedule.

E. Compressor Type: Reciprocating.

F. Size compressor and tank to operate compressor not more than 20 minutes during a 60-minute period.

G. Compressor Accessories: Low-resistance intake-air filter, and belt guards.

H. System Accessories: Air filter rated for 97 percent efficiency at rated airflow, and combination filter/pressure-reducing station or separate filter and pressure-reducing station.

I. Refrigerated Air Dryer: Self-contained, refrigerated air dryer complete with heat exchangers, moisture separator, internal wiring and piping, and with manual bypass valve.

1. Heat Exchangers: Air-to-refrigerant coils with centrifugal-type moisture separator and automatic trap assembly.
2. Refrigeration Unit: Hermetically sealed, operating to maintain dew point of 13 deg F (minus 11 deg C) at 20 psig (138 kPa), housed in steel cabinet with access door and panel.

3. Accessories: Air-inlet temperature gage, air-inlet pressure gage, on-off switch, high-temperature light, power-on light, refrigerant gage on back, air-outlet

temperature gage, air-outlet pressure gage, and with contacts for remote indication of power status and high-temperature alarm.

J. Pressure Gages: Black letters on white background, 2-1/2-inch (64-mm) diameter, flush or surface mounted, with front calibration screw to match sensor, in appropriate units.

K. Instrument Pressure Gages: Black letters on white background, 1-1/2-inch (38-mm) diameter, stem mounted, with suitable dial range.

L. Diaphragm Control and Instrument Valves: 1/4-inch (6-mm) forged-brass body with reinforced polytetrafluoroethylene diaphragm, stainless-steel spring, and color-coded phenolic handle.

M. Gage Cocks: Tee or level handle, bronze, rated for 125 psig (862 kPa).

N. Relays: For summing, reversing, amplifying, highest or lowest pressure selection, with adjustable input/output ratio.

O. Switches: With indicating plates, accessible adjustment, calibrated and marked.

P. Pressure Regulators: Zinc or aluminum castings with elastomeric diaphragm, balanced construction to automatically prevent pressure build-up, and producing flat reduced-pressure curve.

Q. Particle Filters: Zinc or aluminum castings with 97 percent filtration efficiency at rated airflow, quick-disconnect service devices, and aluminum or plastic bowl with metal guard and manual drain cock.

R. Combination Filter/Regulators: Zinc or aluminum castings with elastomeric diaphragm, balanced construction to automatically prevent pressure build-up, and producing flat reduced-pressure curve; with threaded pipe connections, quick-disconnect service devices, and aluminum or plastic bowl with metal guard and manual drain cock.

S. Airborne Oil Filter: Filtration efficiency of 99.9 percent for particles of 0.025 micrometer or larger particles of airborne lubricating oil.

T. Pressure Relief Valves: ASME rated and labeled.

1. High Pressure: Size for installed capacity.

2. Low Pressure: Size for installed capacity of pressure regulators and set at 20 percent above low pressure.

U. Pressure-Reducing Stations: Two parallel pressure regulators.

2.16 CONTROL CABLE

A. Electronic Cable for Control Wiring: Refer to Division 16 Section "Control/Signal Transmission Media."

2.17 AIR HANDLING UNIT CONTROL PANEL

A. Air Handling Units: Control panel for each air handling unit shall be furnished by the FMS supplier and field installed adjacent to air handling unit equipment.

2.18 DDC AIR FLOW MEASUREMENT EQUIPMENT

A. DDC Air Flow Measuring System

1. Provide Dybec Model D-91 DDC or equal, air flow measuring systems including microprocessor panels and air flow measuring sensor struts as specified.

2. Pitot tube arrays and differential pressure arrays are not acceptable.

3. DDC Air Flow Measuring System shall have velocity range from 45 ft/min to 6400 ft/min with duct measurement accuracy (including repeatability, zero offset, and temperature compensation) of plus or minus 2.5 percent.

B. DDC Processor Panel

1. Processor shall calculate duct air flow by independently measuring the flow over each thermistor/sensor and calculating the velocity of the air for each thermistor/sensor. Equipment which averages multiple thermistors is not acceptable.

2. DDC Air Flow Measuring Systems shall require no field calibration and shall allow field replacement of thermistors without calibration. Equipment which requires shipment to factory for recalibration is not acceptable.

3. In the event of a thermistor failure, the processor shall ignore the failed thermistor and continue to operate with the remaining thermistors. The microprocessor shall have diagnostics which can identify the failed thermistor.

4. Display: Processor panels measuring one or two ducts shall have two line display and panels measuring three or four ducts shall have four line display. Display shall be 16 characters/line LCD type and shall display all air flows and temperatures. Processor must also be able to display user-defined custom values such as measured delta cfm and delta cfm set point as specified at time of purchase.

5. Printer Port: Processor shall have serial printer port for hard copy system commissioning and for tenant confirmation of outdoor ventilation rates.

6. Communications Port: Processor panel shall have RS232 serial interface port for local computer or phone remote diagnostics.

7. Ambient Operating Conditions: 50 degrees F to 105 degrees F and less than 95 percent relative humidity.

8. Enclosure and Power: NEMA 1 24 VAC 5 amp fused input power.

9. Signal Outputs: 0-5 VDC.

C. Thermistor Sensor Struts

1. Manufacturer must provide documentation certifying that the thermistor meets military specifications for drift rates which do not exceed 0.1 degree F in five years at 140 degrees F.

2. Sensor Operating Range: -50 degrees to 120 degrees F.

3. Each sensor on the strut shall have integral flow straighteners both upstream and downstream of thermistors.

1. At least one strut in each duct shall have a solid state temperature sensor.

2. Sensor Struts: Sensor struts shall be mounted in duct by sheet metal contractor and wired by the temperature control contractor.

3. Manufacturer shall provide tagged struts with prewired cables (one cable/strut) for screw-in connections to respective processor panel.

D. Submittals: Submittals shall include all relevant data (all service bulletins) regarding setup for flow measuring system. Submittal shall include factory approved startup service. Submittal must include signed statement from manufacturer stating equipment recalibration is not necessary and if for any reason is required, manufacturer shall pay for all costs (material, labor, shipment) associate with the recalibration of equipment. Submittal must include detailed procedure for replacement of thermistor

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify that conditioned power supply is available to control units and operator workstation. Verify that field end devices, wiring, and pneumatic tubing are installed before proceeding with installation.

3.2 INSTALLATION

A. Install equipment as indicated to comply with manufacturer's written instructions.

B. Connect and configure equipment and software to achieve the sequence of operation specified on the plans.

C. Verify location of thermostats, and other exposed control sensors with plans and room details before installation. Locate 60 inches above floor.

1. Install averaging elements in ducts and plenums in crossing or zigzag pattern.

D. Install damper actuators on outside of duct in warm areas, not where exposed to outdoor temperatures.

E. Install labels and nameplates to identify control components according to Division 15 Sections specifying mechanical identification.

F. Install hydronic instrument wells, valves, and other accessories according to Division 15 Section "Hydronic Piping."

3.3 ELECTRICAL WIRING AND CONNECTIONS

A. Install raceways, boxes, and cabinets according to Division 16 Section "Raceways, Boxes, and Cabinets."

B. Install building wire and cable according to Division 16 Section "Wires and Cables."

C. Install automatic temperature control/direct digital control wiring as follows:

1. Install automatic temperature control/direct digital wiring in raceways, boxes, and cabinets according to Division 16, Section 16130, "Raceways, Boxes, and Cabinets."

2. Fasten flexible conductors, bridging cabinets and doors, neatly along hinge side; protect against abrasion. Tie and support conductors neatly.

3. Number-code or color-code conductors, except local individual room controls, for future identification and servicing of control system.

D. Connect electrical components to wiring systems and to ground as indicated and instructed by manufacturer. Tighten connectors and terminals, including screws and bolts, according to equipment manufacturer's published torque-tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals according to tightening requirements specified in UL 486A.

E. Connect manual reset limit controls independent of manual control switch positions. Automatic duct heater resets may be connected in interlock circuit of power controllers.

F. Motor Controllers: Monitor on/off status. Communication shall be as a feature of motor protection relay.

G. Lighting Control: Provide lighting control by panelboards powerlink modules wiring with Metasys Network. For details refer to Division 16, Section 16442, Paragraph 2.4, subparagraph C.

3.4 CONTROLS FOR ELECTRICAL SYSTEMS

All power monitoring/control modules are specified to be compatible with Johnson Controls N2 protocol for remote display and controls. The following electrical components shall be monitored and/or controlled by Metasystem Network provided by Johnson Controls.

A. 480V Switchgears: Provide monitoring of overcurrent, ground-fault conditions, and main circuit breaker trip status for Fire Cycle III pre-action at the substations. Use main circuit breaker dry contacts to wire for communication to Metasystem.

B. Standby Generator: Monitor on/off status of generator and generator circuit breaker.

C. Transfer Switches: Monitor on/off status of all the autotransfer switches.

D. Motor Controllers: Monitor on/off status. Communication shall be as a feature of motor protection relay. Comply with the requirements of this Section paragraph 2.6 and 2.7.

E. Lighting Control: Provide lighting control by panelboards powerlink modules wiring with Metasys Network.

F. UPS Status: Monitor on/off status of UPS units.

G. Fire Cycle III pre-action cabinets shall be monitored in substation, elevator machinery and all communications rooms.

3.5 COMMISSIONING

A. Manufacturer's Field Services: Provide the services of a factory-authorized service representative to start control systems.

B. Test and adjust controls and safeties.

C. Replace damaged or malfunctioning controls and equipment.

D. Start, test, and adjust control systems.

E. Demonstrate compliance with requirements.

F. Adjust, calibrate, and fine tune circuits and equipment to achieve sequence of operation specified herein and as shown on the plans.

3.6 FIELD QUALITY CONTROL

A. Pressure test control air piping at 30 psi or 1.5 times the operating pressure for 24 hours, with maximum 5 psi loss.

3.7 HVAC SYSTEM EVALUATION AND PRECOMMISSIONING VERIFICATION

A. Ensure that air handling units are operating properly before the application of outdoor air flow controls. If a retrofit application is involved, the equipment and controls must be evaluated to bring the system up to the intended operating level before applying this control strategy.

B. Perform a walk through inspection: Look for and correct unstable control loops by checking transducer and pilot positioner calibration as well as controller tuning.

C. Instability of any of the following existing control loops would degrade the operation of the Outdoor Air Flow Controller: Discharge air temperature/economizer control loop, supply fan static pressure control loop (which may in turn be affected by individual VAV box control loop instability) and space pressurization (volume matching) control loop.

D. Confirm that the mixed air damper actuators, linkages and controls are operable and capable of achieving the specified flow rates. Confirm that the outdoor air, return air and exhaust air dampers are controlled by the same signal and can close off without "excessive" leakage.

E Ensure that the variable frequency drives, inlet guide vanes or other equipment employed to modulate the capacity of the supply and return fans is operating and capable of achieving the specified flow modulation for the job.

F. Remove any mechanical or software "stops" that may be limiting the operation of the outdoor air, return air and exhaust air dampers.

G. Perform verification of new and existing equipment and controls with the following "sanity checks" at the extreme positions of the coupled outdoor air, return air and exhaust air dampers.

H. These checks, at fully closed and fully open outdoor air damper positions can, in addition to verification of the flow sensing accuracy, also be used for rough verification of accuracy of temperature and CO_2 sensing and for verification of proper placement of outdoor air temperature and CO_2 sensing points.

I. With the outdoor air damper fully closed (0 % position), the return (recirculating) air damper is fully open and the exhaust air damper is also fully closed. Under this condition, all return air is recirculated (with all separate building exhausts shutdown) and the supply air and return air flows should be equal. This should be verified at various supply flows. This method can be used as a quick check that verifies the supply air flow station accuracy against the return air flow station.

J. The outdoor air temperature and CO_2 sensing points must not be affected by changes in the outdoor air damper position.

K. When the outdoor air damper is fully open, the mixed air temperature should be equal to the outdoor air temperature and the supply air CO_2 should be equal to the outdoor air CO_2. If large differences are observed, the placement of sensing points and calibration of the sensors should be questioned.

L. When the outdoor air damper is fully closed, the mixed air temperature should be equal to the return air temperature and the supply air CO_2 should be equal to the return air CO_2. Again, if large differences are observed, the placement of the sensing points should be reconsidered. When the indirect method of outdoor air flow measurement is used for closed loop ventilation control, the CO_2 measurement reliability at relatively low outdoor air flows, with the outdoor air damper almost closed, is the most important.

M. Once the supply air flow station and CO_2 measurement are verified, another "sanity" check can be performed with the outdoor air damper fully open (100 % position). In this condition, the return air damper is fully closed and the outdoor air flow (calculated from CO_2 concentrations) should be equal to the supply air flow (measured by the flow station). This check should be performed at various supply flows and any difference between the two air flow measurements should be identified. If the outdoor air flow is

lower than the supply air flow, it could be caused by leaks of equipment room air or return air into the negatively pressurized mixed air plenum. The leaks can be traced with a powder gun and located. Sealing the leaks as well as possible to minimize the flow difference is essential to general system performance and energy efficiency as well as ventilation control strategy.

3.8 DEMONSTRATION AND TRAINING

A. The BMS/ATC contractors shall provide three copies of an operator's manual describing all operating and routine maintenance service procedures to be used with the temperature control and Facility Management Systems supplied. The Contractors shall instruct the MAA's designated representatives in these procedures during the start-up and test period.

B. Instructions to MAA Personnel: The Control Contractor shall include in his bid price the cost of providing the services of competent instructors to fully instruct designated personnel in the adjustment, operation, and maintenance, including pertinent safety requirements, of the equipment and systems specified. The training shall be oriented toward the installed system rather than being a general (canned) training course. Each instructor shall be thoroughly familiar with all aspects of the subject to be taught. The number of man-days of instruction furnished shall be specified below. All equipment and material required for classrooms training shall be provided by the Contractor.

C. Training Program: Each of the two training programs shall be accomplished in three phases for the time interval specified for each phase. A training day is defined as eight (8) hours of instruction including two 15-minute breaks and excluding lunchtime.

D. Phase I

1. This phase will be for a period of (3) days prior to the acceptance test period at a time mutually agreeable between the Contractor and the MAA. Operating personnel shall be trained in the functional operations of the installed system, the procedures employed for system operation and the maintenance of FMS equipment.

2. The first (2) days of training shall include:

   a. General FMS Architecture

   b. Operation of Computer and Peripherals

   c. Command Line Mnemonics

   d. Operation Control Functions

e. Graphics Generation

3. The third day of training shall include:

a. General Equipment Layout

b. Troubleshooting of FMS Components

c. Preventive Maintenance of FMS Components

d. Sensor Maintenance and Calibration

E. Phase II: This phase of training shall be conducted approximately four (4) weeks after system acceptance testing for a period of three (3) days. The first day of training shall be condensed review of the entire first phase subject material. The second and third days shall be based upon subject matter proposed by MAA personnel. One week prior to the date of the first Phase II training session, the MAA shall submit to each of the two Contractors a detailed list of subject matter which shall determine the content of the program (e.g., system software operational problems, software utilization, capability and usage, etc.).

F. Phase III:

1. Provide detailed training for two MAA's personnel for a minimum of five days (total 80 hours) at the Manufacturer's plant or training facility. Training must be in depth in the operation, maintenance, troubleshooting, and repair of the chillers.

2. Schedule training with MAA, through Engineer, with at least 60 days advance notice.

3.9 WARRANTEE

A. The control system herein specified shall be free from defects in workmanship and material under normal use and service. If within one (1) year from the date of acceptance by the Engineer, any of the equipment herein described is proved to be defective in workmanship or material, it will be adjusted, repaired, or replaced free of charge by the BAS Contractor.

3.10 MAA ACCEPTANCE

A. The FMS shall be considered acceptable to the MAA when the following conditions have been met.

1. Successful completion of the acceptance test.

2. Receipt of Operation and Maintenance Manuals.

3. Receipt of spare parts.

4. Correction of all punchlist items.

5. Receipt of all other documentation required, as noted below.

6. Phase I of Instructions to MAA's personnel as specified.

3.11 COMMISSIONING, TESTING, AND ACCEPTANCE

A. Perform a three-phase commissioning procedure consisting of field I/O calibration and commissioning, system commissioning, and integrated system program commissioning. Document all commissioning information on commissioning data sheets which shall be submitted prior to acceptance testing. Commissioning work which requires shutdown of system or deviation from normal function shall be performed when the operation of the system is not required. The commissioning must be coordinated with the MAA and construction manager to ensure systems are available when needed. Notify the operating personnel in writing of the testing schedule so that authorized personnel from the MAA and construction manager are present throughout the commissioning procedure.

1. Field I/O Calibration and Commissioning: Prior to system commissioning, verify that each control panel has been installed according to plans, specifications, and approved shop drawings. Test, calibrate, and bring on line each control sensor and device. Commissioning to include, but not be limited to:

   a. Sensor accuracy at 10, 50, and 90 percent of range.

   b. Sensor range.

   c. Verify analog limit and binary alarm reporting.

   d. Point value reporting.

   e. Binary alarm and switch settings.

   f. Actuator and positioner spring ranges.

   g. Fail safe operation on loss of control signal, electric power, network communications, etc.

   Record calibration and test data on commissioning data sheets. Sufficient space should be provided near each point name for sign off.

PART 4 - MEASUREMENT

4.1 METHOD OF MEASUREMENT

A. No separate measurement shall be made for work under this Specification Section.

PART 5 – PAYMENT

5.1 METHOD OF PAYMENT

A. No separate payment will be made for work under this Specification Section. The cost of the work, complete in place, described in this Specification Section shall be included in the respective Lump Sum Bids under Item 01010-1 "Building Construction."

B. Costs include all labor, material, services and equipment necessary to complete the work in every respect.

END OF SECTION 13975

SECTION 16430 - POWER MONITORS FOR LOW VOLTAGE SWITCHGEAR

PART 2 - PRODUCTS

2.1 COMPONENTS

A Multifunction Digital-Metering Monitor: All double-ended substations shall be equipped with a multifunction digital-metering monitor located at each secondary main circuit breaker. Metering monitor shall be sole-sourced exclusively from Square-D. There will be "No Exceptions Allowed". Metering monitor shall have as a minimum all capabilities of Square-D CM3350 circuit monitor. Metering monitor display and control unit shall be flush or semi-flush mounted in instrument component door. Metering monitor shall be fully compatible with Johnson Controls N2 protocol for monitoring and displaying basic electrical data.

END SECTION 16430

SECTION 16442 - PANELBOARDS

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: All Panelboards shall be sole-sourced exclusively from Square-D. There will be "No Exceptions Allowed".

2.2 MANUFACTURED UNITS

A. Enclosure Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.

B. Phase and Ground Bus Material: Hard-drawn copper, 98 percent conductivity.

C. Panel Short-Circuit Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals.

D. Branch Overcurrent Protective Devices:

1. All circuit breakers shall be bolt-on type, whenever possible, replaceable without disturbing adjacent units.

2. All 120/240 VAC rated circuit breakers shall have VISI-TRIP trip indicator.

E. <Insert other features as required for specific project>.

END OF SECTION 16442

SECTION 16714 –FLEXIBLE RESPONSE SYSTEM

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. The existing Flexible Response System is manufactured by Fire Lite Alarms, Inc., therefore modules shall be exclusively by Fire Lite Alarms, Inc. only. All other products required for system integration shall be submitted and approved by MAA with input from TENN security.

2.2 CONTROL PANEL

A. Provide monitoring modules and addressable control relay modules as described below for existing Fire Lite control panel MS-9200 for expansion.

2.3 MONITORING MODULE

Provide addressable monitoring module suitable for monitoring a normally open, dry contact device. Module shall be able to mount inside a single gang device box. Module shall have direct dial address entry (01-99).

Acceptable Product:
Fire-Lite Alarms, Incorporated, MMF301, Monitoring Module.

2.4 ADDRESSABLE CONTROL RELAY MODULE

Provide addressable control relay module with two independently addressed and controlled normally open relays. Model shall have direct dial address entry (01-99).

Acceptable Product:
Fire-Lite Alarms, Incorporated, CRF C304 Control Module

2.5 SECURITY STROBES

Strobe lights shall provide high Intensity flashes for fast premise identification, excellent visibility for the widest-angle coverage, 12V operating voltage and suitable for surface mounting. Red strobe light shall be Ademco Series SL1R or approved equal. Amber strobe light shall be approved equal.

Acceptable Product:
Amesco Series SL1A, Amber Strobe Light
Amesco Series SL1B, Blue Strobe Light

2.6 PIEZO HORN

Horn shall provide minimum 100 dB output at 175 mA or as recommended by manufacturer.

Acceptable Product:
Moose MPI-47 or approved equal Piezo Horn.

2.7 POWER SUPPLY

Power supply shall be a complete assembly of 16VA transformer (120V primary to 12V secondary), battery charger, 12V, 2.6AH sealed lead acid battery in NEMA 1 enclosure. It shall provide precision voltage regulation, transient protection and blowout protection for efficient operation of strobe lights, horns, panic button, footbar, etc. It shall activate devices during normal as well as emergency operation.
Acceptable Product:
Moose Product Inc. Series CH-12 or approved equal power supply.

2.8 FOOT BAR

Foot bar shall be 18 inches wide cast aluminum and operated by upward toe movement for security alarm with key re-settable indicator flag. It shall be provided with double pole double throw switch to activate audio and visual alarms.
Acceptable Product:
Ademco No. 266 or approved equal foot bar.

2.9 PANIC BUTTON

Panic button operation takes place when two large levers on either side of the switch are depressed simultaneously in order to activate alarm, and alarm signal cannot be activated if one lever is accidentally depressed. Panic button shall have key re-settable indicator flag and double pole double throw contacts to activate audio and visual alarms.
Acceptable Product:
Ademco Catalog No. 268 or approved equal panic button.

2.10 SILENCE KEY SWITCH

Silence key switch shall be provided with lock-mounted switch and key for silence operation. It shall be provided with double pole double throw contacts to activate audio and visual alarms.

Acceptable Product:
Ademco Catalog No. 269 or approved equal.

2.11 CONDUCTOR

Provide twisted shielded copper cables as recommended by manufacturer.

2.12 AUTOMATED EXTERNAL DEFIBRILLATORS

A. Defibrillator shall be 10.5 inched wide x 11.6 inches high x 4.0 inches deep, lightweight portable, with low maintenance requirements and long shelf life non-rechargeable lithium batteries. Biphasic Technology shall be used to deliver defibrillation truncated exponential with voltage and duration for patient impedance at 200 to 360 joules energy levels as recommended by the American Heart Association and International Guidelines Display of low battery alert service, shock count, CPR time and real time on two lines, 20 characters LCD on each line.

Acceptable Product:
Medtronic Physio-Control, Life Pack Series 500 Defibrillator.

B. Automated external defibrillator cabinets. Defibrillator cabinet shall be 12 inches wide x 16 inches high x 6 inches deep, with glass front door, magnetic contact, lead wires for monitoring module connection and disable alarm key in white epoxy finish. Provide BWI Fire Marshall approved sign above cabinet.

Acceptable Product:
Medtronic Physio control Series 3012604, Cabinet

END OF SECTION 16714

SECTION 16724 – CONTROLLED ACCESS SECURITY SYSTEM

PART 2 – PRODUCTS

2.1 MANUFACTURERS

The existing Controlled Access Security System is manufactured by General Electric Infographics; therefore, networked Intelligent Controllers, Card Readers and Remote Modules shall be exclusively by General Electric Infographics only. All other substituted products shall be submitted and approved by MAA with input from ADT. There will be "No Exceptions Allowed".

2.2 NETWORKED INTELLIGENT CONTROLLER (ACU)

A. The Networked Intelligent Controller (ACU) shall be a microprocessor-based device, which utilizes a 32-bit processor and a 32-bit bus structure. The controller shall have a minimum clock speed of 90 MHz, and shall be provided with at least 16 Mbytes of battery backed-up dynamic RAM. The controller shall feature a direct LAN/WAN connection to the controller bus structure in addition to two RS-232 or RS-485 connections, all of which shall be designed for use in communication with the existing server. The communication architecture of the ACU shall be such that in the event that the primary communication channel to the server is lost, the unit shall be capable of automatically switching to a secondary communication channel using one of the host RS-232 or RS-485 connections, and if required, shall be able to establish communications via dial-up modem.

B. The ACU shall be provided with a parallel printer port, which will enable it to print transaction data during loss of communication with the existing server. The ACU shall be capable of dynamically allocating its memory between database information and transaction history, which shall be stored if the controller has lost communication with the existing server. Such transaction history shall be automatically uploaded to the server once communication has been restored. The ACU shall be configured for local storage of no less than 100,000 cardholders. In its maximum configuration, the ACU shall be capable of storing 500,000 cardholders, and its memory utilization shall be such that if storing database information for 10,000 cardholders, it shall also be capable of storing one million transactions.

C. The ACU shall support the monitoring and control of 16 readers, with or without keypads. It shall also be provided with at least 12 five-state, fully supervised and fully configurable input points, and at least 12 fully configurable auxiliary output control relays mounted on the main circuit board.

D. Each controller must also be capable of expansion, by external Remote Input Modules (RIMs) and/or Remote Relay Modules (RRMs), to support a combination of up to 172

fully configurable five-state supervised input points or 156 output relays per ACU depending on configuration.

E. Each ACU shall be provided with a UL Listed uninterruptible power supply (UPS) mounted within the ACU enclosure. It shall provide sufficient battery backup to sustain complete operational effectiveness of all devices and equipment connected to the ACU including card readers Remote Reader Electronic (RRE) modules, electric locks, RIMs and RRMs for a minimum of four (4) hours of normal operation.

F. Each ACU shall utilize on-board self-diagnostic LEDs, removable terminal strips and a pop-in/pop-out circuit board.

G. Each ACU in addition to its on-board LAN/WAN connection shall support RS-232 and multi-drop RS-485 communication topologies. Provision of external LAN terminal server devices that are connected through serial communications to the ACU are not acceptable.

H. Each ACU shall support RS-485 bi-directional communication paths (dual multi-drop paths back to file server) with no additional hardware or firmware required.

I. Each ACU shall be supplied with all specified options available, including an enclosure with a tamper switch and lock.

J. Each ACU shall be capable of reporting the following alarm conditions to the existing ACAM file server:

1. Enclosure door tamper.
2. Primary power failure.
3. Low battery conditions.
4. Lost of communications.
5. All access control violations.

Acceptable Product:

GE Infographics System ACU2XL/16-E-2-UL-UPS-24V, Network Intelligent Controller.

2.3 RMS CARD READER/PINPAD

A. Reader shall be a single stage design to include a swipe/pass-through and the electronic interface to the ACU2 Controller. Each shall include a 32-character LCD display that allows the use of various text messages for user prompts or event notices.

B. LED lamps (red, yellow, green) shall visually display reader status with an internal audible annunciation providing response to keypad entries and door alarm conditions.

C. The readers can be configured for card with keypad.

D. The readers shall include four supervised alarm inputs that are user-configured for door contact, door release button and two general-purpose alarm points. The reader shall also have a solid state output that can be configured to operate the door strike.

E. The reader shall provide two single pole double throw relays. One relay can be used for door unlock. The other relay can be used for remote control functions.

Acceptable Product:

GE Infographics Systems Series RMS-2 Card Reader.

2.4 REMOTE INPUT MODULE

A. The Remote Input Module (RIM) shall be provided to support additional input points as required. The RIM shall support all industry standard alarm input devices.

B. Each RIM shall support 16 five-state supervised input points and two output relays. The status of each input point shall be indicated by a tri-state LED, and shall be available if required with an enclosure with a tamper switch through which these status LEDs can be viewed, and it shall be possible to append legends denoting the connection details of each input point on the outside of the enclosure. Each RIM shall be capable of being powered by the on-board UPS of an ACU or by a local 24 VDC UPS.

C. Each RIM shall utilize on-board self-diagnostic LEDs, industry standard terminal strips and a pop-in/pop-out circuit board.

D. Each RIM shall be supplied with all specified options available, including an enclosure with a tamper switch and lock. Quantity and location of remote input modules shall be as required for a physically complete and operational system. The RIM shall be Infographics Systems, no substitutions.

Acceptable Product:

GE Infographic RIM REND 1N0-RPL-E-2-RPL02, Remote Input Module.

2.5 REMOTE RELAY MODULE (RRM)

A. The Remote Relay Module (RRM) shall be provided to support additional output relays. The RRM shall utilize industry standard dry contact output relays.

B. Each RRM shall support eight SPST and eight DPDT output relays. Each RRM shall be capable of being powered by the on-board UPS of an ACU.

C. Each RRM shall utilize on-board self-diagnostic LEDs, and a pop-in/pop-out circuit board.

D. Each RRM shall be support 2 unsupervised inputs and 16 output relays. Each enclosure shall be provided with a tamper switch and lock. Quantity and location of RRMs shall be as specified in contract documents and drawings. The RRM shall be Infographics Systems, no substitutions.

Acceptable Product:

GE Infographic REND 1-RPL, Remote Relay Module.

2.6 DOOR RELEASE BUTTON

Release button shall be mounted in stainless steel green lit outlet. It shall be SP/ST rated for 10 amp, 24 VDC.

Acceptable Product:

Securitron No. PB2E, or approved equal, Door Release Button.

2.7 DOOR POSITION SWITCH

Door position switch shall be surface mount, SPDT, and accommodate wider break distance to minimize false alarm. Contact and magnet shall be 3.9" L x 0.6" W x 0.7" D to provide faster installation.

Acceptable Product:

Sentrol Series 1045, or approved equal, Door Position Switch.

2.8 EMERGENCY DOOR RELEASE BUTTON

Emergency button shall be mounted in custom made lexon cover junction box for emergency release. It shall be SP/DT to send "Door Release" alarm signal to ACU panel and locally unlock power to the electromagnetic lock.

Acceptable Product:

Securitron No. EEB2 or approved equal, Energy Door Release Button.

2.9 ELECTRICAL POWER and BACKUP

A. Normal System Power Supply: 120 V, 60 Hz from lockable disconnect device. System components shall be supplied with power through the ACU battery back-up and field located power supplies. Refer to the Contract Drawings for ACU and field power supply locations.

B. Power Source Transfer: When normal power is interrupted, system is automatically switched to back-up supply without degradation of critical system function or loss of signals or status data.

C. Field Power Supplies: Provide power supplies for supply of power to the electrical door hardware at locations detailed on the Contract Drawings. Power supplies shall be as recommended by the equipment manufacturer for devices being powered from supply. Power supplies shall provide four (4) hours of battery backup under full load of devices supported. Submit battery back-up calculations for each power supply to the Engineer for approval.

2.10 CONDUCTORS

A. Wire and cabling shall be as recommended by the manufacturer and all wire and cabling shall be installed in an enclosed conduit and raceway system.

B. After installation and before termination, all wiring and cabling shall be checked and tested to insure there are no grounds, opens or shorts on any conductors or shields.

C. Visually inspect wire for faulty insulation prior to installation. Protect cable ends at all times with acceptable end caps except during termination.

END OF SECTION 16724

SECTION 16740 – PUBLIC ADDRESS SYSTEM

PART 2 - PRODUCTS

2.1 MANUFACTURERS

The existing Public Address System is manufactured by Innovated Electronics Designs, Inc.; therefore, Announcement Control System, Ambient Analysis System, Testing and Monitoring System shall be exclusively by Innovated Electronics Design, Inc., only. All other substituted products shall be submitted and approved by MAA with input from WPS. There will be "No Exceptions Allowed."

2.2 ANNOUNCEMENT CONTROL SYSTEM (ACS)

A. Main Frame and Expansion Cards (ACS)

1. Main Frame

Mainframe shall consist of a modular mainframe with 16 ACS plug in cards without disconnecting system wiring. Mainframe provides digital interface and DC power connection to ACS plug in cards.

2. Microphone Interface Card

Microphone interface card addresses and decodes 8 microphone stations for microprocessor / CPU card. Microphone interface card buffers, isolates and routes audio signals through solid state switches to internal audio buses. Microphone interface card directs the audio signal from microphone stations to appropriate internal audio busses per ACS software configuration.

3. Central Processing Unit

CPU manages the all functions of ACS without need of external PC. CPU controls audio routing, relays, play back, and microphone stations. CPU also commutates with ACS PC.

4. Zone Output Card

Zone output card distributes the audio from the internal audio busses to the system zones per ACS software configuration. Zone output card allows software to select any signal from any one of the 8 internal audio busses to direct to any bus or zone output at any time. Zone output cards have two modes for background

music. One mode uses background music bus and send same signal to all zone outputs and other modes allows individual background music to each zone.

5. Relay Card

Relay Card activates relay for zone when it detects audio signal per ACS software configuration.

6. Hard Drive Card

Hard drive cards stores non-volatile programs, operating system data, control program, configuration files and permanent messages. Watchdog timer of hard drive card can refresh pulse to CPU and resets Announcement control system. Manual switch of hard drive card can reset announcement control system.

7. Digital Record/ Playback Card

Digital Record/ Playback card can play 8-recorded messages on 8 different audio channels simultaneously. Audio signals are digitized and store in DRAM. When messages are stored permanently, it transmits to hard drive card.

8. Rack Mounted Computer System

Rack mounted computer system consists of PC, monitor, keyboard and mouse drawer.

9. Power supply

Power supply provides 110 Watts, + 5 V DC output voltage with +/- 10 % output adjustment. Power supply has 25 A, 32 V (auto fuse) overload protection for + 5 VDC output circuits. Micro controller of power supplies allows main processor to switch the supply on and off by relay.

10. Power supply

Power supply provides 200 Watts, +/- 15 V DC output voltages with +/- 5 % output adjustment. Power supply has 10 a, 2 AG overload protection for +/- 15 VDC output circuits.

Micro controller of power supplies allows main processor to switch the supply on and off by relay. Power supply also allows the voltage adjustment by microprocessor.

Acceptable Products:

IED 500 M Main Frame
IED 500 C Microphone Interface Card
IED 500 CPU Central Processing Unit
IED 500 D Zone Output Card
IED 500 DR Relay Card
IED 500 P Hard Drive Card
IED 500 R Digital Record/ Playback Card
IED 590 R Rack Mounted Computer System
IED 405 L Power supply
IED 415 L Power supply

A. B. Microphone Stations

1. Limited Function Page 4 Button Stations – Limited function page stations shall have 4 zone group select buttons and ready/busy LEDs. Mounting configurations shall be horizontal or vertical orientation, flush or surface mount, desktop, or locking door enclosure. Microphone shall be handheld HFM_H series.

Acceptable Products:

IED 500 series microphone station with hardware

2. 2. Full Function Page 12 Button Stations – Full function page stations shall have a 12-button keypad for data entry, an LCD digital display and ready/busy LEDs. Mounting configurations shall be horizontal or vertical orientation, flush or surface mount, desktop, rack mount (with or without powered speaker), or locking door enclosure. Microphone options shall be handheld handset.

Acceptable Products:

IED 508 series microphone station with hardware

2.3 AMBIENT ANALYSIS SYSTEM (AAS)

A. Main Frame

1. Mainframe shall consist of a modular mainframe that holds 11 AAS plug in cards. Mainframe provides remote sensor interface and DC power connection to AAS plug in cards.

2. Central Processing Unit

CPU compares channel signals with sensor signal per AAS software and sends signals to each channel digital attenuator.

3. Power supply

Power supply provides 130 Watts, +31 VDC, +/- 15 V DC output voltage with +/- 10 % output adjustment. Micro controller of power supplies allows main processor to switch the supply on and off by relay.

4. Attenuator Card

Each Attenuator card channel controls the signal level of the program audio.

5. Remote Sensor

Sensors samples audio signal and sends to attenuation card to compare signal with channel signal by CPU.

Acceptable Products:

IED 540 M Main Frame
IED 540 CPU Central Processing Unit
IED 540P Power supply
IED 540 I Attenuator Card
IED 540 AC Attenuator Card
IED 540 IAC Attenuator Card
IED 540 S Remote Sensor

2.4 AUTOMATIC TEST AND MONITOR SYSTEM (ATMS):

A. ATMS Mainframe: The existing ATMS mainframe has spare points available for connection of points as indicated in the block diagram to the existing system.

1. The Contractor shall interface the additional equipment required into the existing Automatic Test and Monitor System. Programming shall follow the current methodology and also be completed by the Contractor.

2. Contractor shall provide equipment, as shown on contract documents, including interface cables as required.

Acceptable Products:

IED 596ML/H Audio Monitor/Test Switch Mainframe

B. Power Amplifiers

1. The power amplifiers shall be of a modular design using a slide in amplifier card installed in an existing mainframe. Each mainframe shall accommodate eight (8) amplifier cards. Card shall be 100-Watt dual-channel amplifier or 200-Watt single channel amplifier.

2. The amplifiers shall be of a high efficiency design to provide for long term operating efficiency. Minimum efficiency shall be 79 percent at full rated power.

Acceptable Products:

Dual 100 Watt 70-Volt Amplifier Cards: IED 6272L/ Single 200 Watt-70Volt Amplifiers w IED 6000 Series Frame and IED 596GS modules.

B. C. Equalization: The equalization system shall be modular and provide for up to twenty-two (22) processor-controlled four channel equalizers, a central processing unit (CPU), and available redundant power supplies.

1. Equalizers shall have nine (9) parametric or configurable bands.

2. Contractor shall provide interface cabling and software as required to interface this system with the existing ACS and Ethernet network.

Acceptable Products:

Four Channel Equalizer: IED 8044DSP Digital Signal Processing Card Main Frame IED 8001MF, IED 8001 CPU, IED 8102PS

C. D. Fiber Optic Interface:

1. Ethernet Network Interface shall be a 10/100 baseT Ethernet switch with a minimum of 6 ports. Cat #IED 903

2. The fiber optic transmission system shall be a network-based system capable of transmitting and receiving both data and professional audio signals over multimode fiber optic cabling. The system shall be 19" EIA/TIA standard rack mountable and shall have the following system features:

a. Dynamically controlled routing and switching.

b. Scalable network
Acceptable Products:

BEC Technologies – OMNInet Series or equal Fiber Optic Transmission System.

3. System Rack Chassis: The system rack chassis shall have the following specifications.

   a. Redundant power supplies.

   b. 21 Slot back plane for hot swappable modules.
   Acceptable Products:
   BEC Technologies OCHSYS or equal rack.

4. Network Interface Module: The network interface module shall have the following specifications.

   a. 147.456MB/s effective rate

   b. Redundant network operation

   c. Hot swappable

   d. Non volatile memory for storage of system information

   e. Automatic detection and reporting of system level problems

   f. System power and data accuracy indicators

   g. Integrated network management system
   Acceptable Products:

   BEC Technologies FC101 or equal Network Interface Module.

5. Two Channel Slow Scan Data Input/Output (I/O) Module: The I/O module shall have the following specifications.

   a. Individual channel allocation

   b. Two channels per card

   c. I/O software configurable to RS232, RS422, and RS485

   d. Normal and fast transfer modes

   e. 84 sub-nets per fiber optic strand – 672 on fully loaded network

f. Hot swappable

Acceptable Product:

BEC Technologies SSD002 or equal Scan Module

6. 24 Bit Professional Audio Input Module: The audio input module shall have the following specifications.

   a. Four channel audio inputs

   b. Hot swappable

   c. Burr Brown INA103 low noise analog front end

   d. Phantom switching of individual mic preamps, 0 to +60dB gain control

   e. Dynamic Range: 116dB typical

   f. Frequency Response: 10Hz – 22 kHz +/- .1dB

   g. THD+N: 0.0002% typical

   h. Crosstalk: < 120dB

   i. Sample Rate: 48 kHz Fixed

   j. Oversampling: 64x

   k. Group Propagation Delay: 1.23mS

   l. Signal Indicators: Green = Signal Present > -60dB Reference FS

      Amber = Signal > -24dB Reference FS

      Red = Clip

   Acceptable Product:
   BEC Technologies ADA424 or equal audio input module.

7. 24 Bit Professional Audio Output Module: The audio output module shall have the following specifications.

   a. Four channel audio outputs

   b. Hot swappable

   c. Dynamic Range: 116dB typical

d. Frequency Response: 10Hz – 22 kHz +/- .1dB

e. THD+N: 0.0002% typical

f. Crosstalk: <108dB

g. Sample Rate: 48 kHz Fixed

h. Oversampling: 64x

i. Output Drive: > 50ohm Active Balance Line

j. Signal Indicators: Green = Signal Present > -60dB Reference FS

Amber = Signal > -24dB Reference FS

Red = Clip

Acceptable Product:
BEC Technologies DAA424 or equal Audio Output Module

8. Universal AC Input Power Supply Module: The power supply module shall have the following specifications.

a. Hot swappable

b. Redundant Operation

c. 90 – 264 VAC Input

d. 47 – 440 Hz Input Frequency

e. Output Power: 200 Watts Continuous, 220 Watts Peak

f. Output Voltages: +5 Volts Digital Supply

+12 Volts Analog Positive Supply

-12 Volts Analog Negative Supply

+48 Volts Phantom Power Supply

g. Input Surge Current: 25 Amps maximum, Cold Start

h. Operating Temperature: 0 – 50 degrees C

i. Approvals: UL, Ulc recognized and TUC Approved

Acceptable Product:
BEC Technologies PSA01 or equal Power Supply Module

D. E. Equipment Cabinet:

1. Equipment Cabinet shall be 83 1/8" high, 24 1/4" wide, 32 1/2" deep and have mounting rail spacing to support mounting of standard 19" EIA equipment.

2. Equipment Cabinet shall be provided with front vented and rear solid locking doors.

3. 3. Equipment Cabinet shall include copper grounding buss bar system.

4. Equipment cabinet shall be void of open spaces on the front the cabinet. Provide blank panels, vent panels and cabinet top panels as required for full cabinet build out.

Acceptable Products:
Middle Atlantic WRK Series or equal equipment cabinet.

E. F. Terminal Cabinet

Terminal Cabinets provided for the termination of system cables shall have minimum dimensions of 24"W X 36" H x 4" deep. Equipment enclosures shall be provided with locking doors (keyed as directed by BWI technical staff) and backboard for termination fabrication and cable routing.

Acceptable Products:
Hoffman Type 1 Enclosure Series or equal Terminal Cabinet.

F. G. Type 1 Loudspeaker Assembly: 4-inch, flush mounted speaker assembly in acoustic tile or bulkhead with grille, enclosure, mounting hardware and transformer.

1. Sensitivity shall be at least 88 dB average (1 Watt/1 Meter)

2. Frequency Response: 75 to 20 kHz

3. Transformer shall have 70 Volt primary and multiple taps and an 8-ohm secondary.

4. Transformer shall mount integrally to the loudspeaker.

5. Grille shall be a low profile.

6. Power handling: 25 Watts
Acceptable Products:

Atlas FAP42T or equal Type 1 speaker Assembly

H. Type 2 Loudspeaker Assembly: Assembly shall be a multiple driver speaker cabinet, mounted on corrugated ceilings, with grille, backbox and all mounting accessories.

1. Sensitivity shall be at least 94 dB SPL (1 Watt at 1 meter).

2. Frequencies Response: 62 to 20 kHz.

3. Power Handling: 500W continuous.

4. Transformer shall mount integrally to the loudspeaker.

5. Grille shall be a low profile, with finish to match surface to which it is mounted. Prior to ordering the grille the Contractor shall submit color/finish for architectural approval.

Acceptable Products:

EAW CP499 and support system or equal Type 2 speaker assembly.

G. I. Type 3 Loudspeaker Assembly: Assembly shall be dual 4" drivers and 1" dome tweeter, in surface mounted enclosure, mounting hardware and transformer.

1. Sensitivity shall be at least 85 dB Peak (1Watt/1Meter)

2. Frequency Response: 120 to 20 kHz

3. Transformer shall have 70 Volt primary and multiple taps.

4. Transformer shall mount integrally to the loudspeaker.

5. Grille shall be a round profile, with finish to match surrounding surface.

6. Power handling: 90 Watts

Acceptable Products:

TOA H-1 or equal speaker assembly.

J. Type 4 Loudspeaker Assembly: Assembly includes 8" woofer and 1" exit coil compression driver on a 90X60 Constant Directivity horn, mounting hardware and transformer. System shall attach to structure as required.

7. 1. Sensitivity shall be at least 95 dB Peak (1Watt/1Meter)

8. 2. Frequency Response: 89 to 18 kHz

3. Transformer shall have 70 Volt primary and multiple taps.

4. Transformer shall mount integrally to the loudspeaker.

5. Cabinet shall be finished to match surrounding surface.

6. CD horn shall be able to rotate in 90degree increments.

7. CD horn shall have optional 120x60 degree pattern available to fix cabinet.

8. Custom mounting hardware.

9. Power handling: 300 Watts

Acceptable Products:

EAW MK8196T or equal speaker assembly.

K. Type 5 Loudspeaker Assembly: Assembly includes weather resistant 2 way speaker with asymmetrical coverage.

10. 1. Sensitivity shall be at least 95 dB Peak (1Watt/1Meter)

11. 2. Frequency Response: 100 to 15 kHz

12. 3. Transformer shall have 70 Volt primary and multiple taps.

13. 4. Speaker pattern shall be 70 – 120 degrees horizontal by 75 degrees vertical.

14. 5. System shall have 2 – 8" low frequency drivers.

15. 6. System shall have 1 – 1" titanium driver for High frequencies.

16. 7. Cabinet shall be hand laminated fiberglass with gray gel coat and black powder coated grille.

17. 8. Custom mounting hardware.

18. 9. Power handling: 200 Watts

Acceptable Products:

Community WET2V8 or equal Type 6 speaker assembly.

L. Type 6 Loudspeaker Assembly: Flush mount acoustical ceiling speaker assembly shall include flush mount Backcan, 8" speaker with baffle and support hardware.

19. 1. Sensitivity shall be at least 95 dB (1Watt/1Meter)

20. 2. Frequency Response: 100 to 16 kHz

21. 3. Transformer shall have 70 Volt primary and multiple taps.

22. 4. Speaker pattern shall be 90 degrees conical.

23. 5. System shall have 10 ounce magnet dual cone speaker.

24. 6. Backcan shall be a flush mount enclosure with ½' and ¾' knockouts.

25. 7. Power handling: 15 Watts

Acceptable Products:
Atlas SD72W or equal speaker baffle assembly

Atlas EZ 96-8 or equal backcan/supports

H. M. Type 7 Loudspeaker Assembly: Assembly includes surface mount re-entrant horn.

1. Sensitivity shall be at least 105 dB (300-3000Hz. Band limited)

2. Frequency Response: 280 to 8 kHz

3. Transformer shall have 70 Volt primary and multiple taps.

4. Speaker pattern shall be 100 degrees by 60 degrees.

5. System shall have a compression driver.

6. Enclosure shall be a weather resistant surface mount horn assembly with weatherproof cable.

7. Power handling: 60 Watts

Acceptable Products:
Electrovoice Cobraflex III horn with 1829BT Convertible Driver or equal.

I. N. Type 8 Loudspeaker Assembly: Flush mount speaker assembly for gypsum ceiling shall include a 12" coaxial speaker with backcan, baffle and support hardware

1. Sensitivity shall be at least 99 dB (1Watt/1Meter)

2. Frequency Response: 58 to 15 kHz

3. Transformer shall have 70 Volt primary and multiple taps.

4. Speaker pattern shall be 90 degrees conical.

5. System shall have 12" low frequency driver.

6. System shall have 1 – 1" titanium compression driver for High frequencies.

7. Backcan shall be a flush mount square enclosure with ½' and ¾' knockouts with 4 cubic feet of volume minimum.

8. Power handling: 250 Watts

Acceptable Products:
Atlas 12CXT60 or equal speaker
Atlas Q4712 or equal backcan

Atlas 164-12A or equal baffle

J. O. Type 9 Loudspeaker Assembly: Assembly includes weather resistant surface mount speaker system for working side of aircraft general paging coverage.

1. Sensitivity shall be at least 98 dB (100-16,000Hz.)

2. Frequency Response: 90 to 16 kHz ± 5dB.

3. Transformer shall have 70 Volt primary and multiple taps.

4. Speaker pattern shall be 90 degrees horizontal by 40 degrees vertical.

5. System shall have 12" low frequency driver.

6. System shall have 1 – Kaladex driver for High frequencies.

7. Enclosure shall be finished in roto-molded gray polyethylene supplied with heavy duty bracket.

8. Power handling: 60 Watts

Acceptable Products:

Community R.5-94T or equal speaker assembly

K. P. System Wiring

1. Unless otherwise required, Contractor shall use the following cables, or approved equals:

2. Microphone and line-level audio cable in conduit or cable tray:

   a. Nominal Capacitance of 35 pF/ft

   b. Nominal Outside dimension of 0.118 inch

   c. 100% shield with Z- Fold shielding

   Acceptable Products:
   Belden 82761 or equal audio cable

3. Microphone and line-level audio cable for internal cabinet wiring:

   a. Nominal capacitance of 24 pF/ft

   b. Nominal outside dimension of 0.175 inch.

   c. 100% shield with Z-Fold

   Acceptable Products:
   Belden 8761 or equal audio cable.

4. Loudspeaker signal lines shall be sized to allow no greater than 5 percent loss from source to first speaker. Lines shall be twisted pair, Plenum jacketed with no shield.

   a. Minimum conductor strand count: 19

b. UM type CMR or CL3R

Acceptable Products:

Belden 6000UE series or equal.

L. Q. Audio Termination System

1. Provide wall mount termination located in terminal cabinet to connect incoming field microphone station lines.

2. Termination system shall provide:

a. Compression terminal blocks certified for stranded and solid wire.

b. Rigid mount terminals which can be replaced if damaged

c. Designation strips for contractor to provide label information on.

3. Provide as many units as necessary.

Acceptable Products:

Electrovert K11620PA or equal.

R. Speaker Terminal Strips

1. Provide speaker terminal strips to terminate incoming speaker field circuits to amplification equipment in terminal cabinets.

2. Provide track system with end stops and terminal blocks with screws for terminations.

Acceptable Products:

MP Flexi-Block System or equal.

END OF SECTION 16740

SECTION 16782 - CLOSED-CIRCUIT TELEVISION (CCTV) SYSTEM

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. The existing Closed Circuit Television System is manufactured by Philips Communication; therefore, Matrix Switches, digital recorders, camera, and power supplied shall be exclusively by Philips Communication only. All other products required for system integration shall be submitted and approved by MAA with input from ADT. There will be "No Exceptions Allowed."

2.2 GENERAL

A. Provide CCTV systems, of types, sizes, capacities and electrical characteristics indicated below, consisting of CCTV cameras, LCD monitors, video matrix switcher, keyboard controllers, signal equipment, camera enclosures, power supplies, and other components as required for complete installation. Except as otherwise indicated, provide manufacturer's standard CCTV system components as indicated by published product information, designed and constructed as recommended by manufacturer.

2.3 SATELLITE MATRIX SWITCHER

A. The Matrix System shall integrate the specified CCD cameras and peripheral products into a comprehensive extension of the existing MAA CCTV system. A built-in cable compensation circuit on every input channel shall provide high quality picture and control. The system's extensive program capability shall include versatile camera sequences, alarm mode, time/date event scheduling, password protection, operator's access level, priority and system partitioning, providing outstanding flexibility.

B. A keyboard controller shall be used for setup, camera control and video routing. The keyboard controller unit's 2-line character LCD display and function keys shall provide direct menu access to cameras.

C. The system shall have 80 inputs and 4 outputs as base configuration; by adding 16-channel video input modules, and/or 4-channel video output modules the system can be expanded to accommodate up to 256 cameras, 64 monitors and 32 keyboard controllers.

D. The system shall have the ability to integrate external devices such as computers, printers and alarm input devices. The built-in RS-232C port shall permit up and downloading of the system data for back-up and restore purposes with a PC. The system can be controlled and programmed through the RS-232C port, if a printer is connected,

the system set-up data can be printed and verified. The built-in diagnostic program shall help to identify a malfunction speedily for system maintenance and repair. The power source shall be 120VAC, 60Hz. The system shall be UL listed.

E. The system shall have a data connection via a fiber optic multiplexer specified elsewhere within this specification for communications with the existing matrix switcher. The Contractor shall be responsible for all required new and existing system programming for a functionally complete and operational system.
Acceptable Products:
Philips Model LTC 8800 System Matrix Switcher.

The Matrix shall be manufactured by Philips Model LTC 8800 System, no substitutions. The following parts, in quantities as required, shall be included in Matrix Switcher:
Philips LTC 8801/60 CCTV switching bay, CPU and power supply.
Philips LTC 8821/00 Video input module, 16-video inputs per card.
Philips LTC 8834/00 Video output module, 4-video outputs per card.
Philips KBD Universal Universal Digital Keyboard Controller.

2.4 DIGITAL VIDEO RECORDER

A. General: The digital video recorder (DVR) shall have the following general specifications:

1. Video Inputs - 16

2. Software - Windows 2000

B. The DVR shall provide full screen or selectable multi-screen displays of 2x2 (quad), 3x3, and 4x4 formats.

C. The recorder shall be capable of sequencing the 16 camera inputs as four quad displays.

D. The date/time, recorder name, and camera name shall be stored with each image recorded.

E. The recorder shall provide 16 video inputs with independently configurable frame rate settings (ips).

F. The recorder shall provide 16 video inputs with independently configurable frame rate settings (ips). Each recorder input for this project shall be configured for 3.75 ips. Recorded digital video shall be stored for a period of 30 days for all inputs.

G. The digital recorder shall be capable of recording at the following images per second (ips) rates:

1. Up to 120 ips (1 to 4 cameras) or up to 80 ips (5 to 16 cameras) with one compression card installed.

2. Up to 240 ips (1 to 8 cameras) or up to 160 ips (9 to 16 cameras) with two compression cards installed.

H. The recorder shall use temporal compression based on proprietary MJPEG and H.263 technology.

I. Image integrity shall be maintained using proprietary codec, time/date stamp, watermark authentication.

J. The recorder shall be capable of providing simultaneous recording and playback.

K. The recorder shall provide five independently configurable motion detection zones per camera.

L. The recorder shall provide a function to bookmark a specific time and date of a video file for easy retrieval at a later date.

M. The recorder shall provide pre and post alarm recording.

N. The recorder shall provide both local and remote pan/tilt/zoom control.

O. The system shall provide the following minimum TV Lines of Resolution (TVL) as related to the digital memory resolution:

1. 450TVL at 640H x 480V; 280TVL at 320H x 240V; 120TVL at 160H x 120V

P. The recorder shall include the following:

1. CDRW unit.

2. SCSI-2 interface connection to allow video archiving to a disk array.

3. 3.5 Floppy drive.

4. Inputs for sixteen (16) programmable, N/O, N/C dry alarm contacts.

5. Sixteen (16) programmable output relays.

6. 480 Gigabyte hard drive for storage of digital video.

Q. The recorder shall provide the capability to load a bitmap image of a facility, then drag and drop camera and alarm icons to create an overview of the installation thereby allowing an operator to click on the camera icons to view video from the selected camera.

R. The recorder shall be capable of recording single channel audio.

S. The recorder shall include remote viewer Graphical User Interface (GUI) software to allow simultaneous access via Ethernet to live and recorded video. This software shall also provide system configuration and pan/tilt control supporting up to sixteen (16) recorders. The Contractor shall configure this software and program the GUI for connection to an Ethernet system provided by others. Contractor work shall include physical connection of the recorders to the Ethernet switch and configuration of the software on a computer workstation provided by others.

T. The recorder shall have remote administrator configuration capability.

U. The recorder shall provide a POS database interface that allows search parameters for time, date, camera, merchandise, and cash amount of sale.

V. Electrical Specifications:

1. Video Input: 1Vp-p, composite video, 75 ohms.

2. Video Output: 1Vp-p,composite video 75 ohms.

3. Power supply: Switch selectable between 110 VAC, 60Hz and 220 VAC, 50Hz. 4. Audio: 1-channel (line in or mic. in, line out).

4. Connectors:

a. Video input: 16 BNC, non-looping

b. Video output: RCA (BNC converter supplied.

c. SCSI-2 HD-50 interface to disk array

d. RJ-45 10/100 Mb base-T Ethernet connection.

e. Audio: 1/8-inch mini phone jack.
Acceptable Product:
Philips Model DR16248 Digital Video Recorder.

2.5 QUAD VIDEO PROCESSOR

A. The quad video processor shall permit viewing of 4 cameras on a single LCD display.

B. The unit shall offer full time quad display and full screen display of video images.

C. The unit shall have 720 x 484 pixel resolution and 525 lines resolution.

D. The rear panel shall feature 4 loop through Auto Terminated BNC video inputs, 4 alarm

input connections, one BNC monitor output, one BNC record output, and a RS-232 remote callup 15-pin D input.

E. The unit shall be rack-mountable. The power source shall be 120VAC, 60Hz, and shall be UL listed.
Acceptable Product:
Philips Model LTC 22377/60, Quad Video Processor.

2.6 CLOSED-CIRCUIT TELEVISION CAMERAS

A. General: Provide CCTV color cameras, associated accessories and wiring for MAA surveillance. Cameras shall be connected to the existing MAA matrix switcher via fiber optic multiplexers installed under this project.

B. Fixed Color Cameras: Provide 1/3 inch format cameras using solid state, interline transfer, charge coupled device (CCD) image sensors. Cameras shall produce standard EIA video signals with composite output level of 1.0 v p-p and 75 ohms impedance. Output connectors shall be BNC types. All cameras shall feature no geometric distortion, immunity to electrical and magnetic fields. All cameras shall be provided as standard resolution for color as specified herein and indicated on plans.

1. Standard resolution for color cameras shall have the following features.

   a. The minimum scene illumination to obtain "usable video " shall be 2 lux at F 1.4 (0.2 foot-candle) based on scene illumination, 75 % reflectance factor, automatic gain control (AGC).

   b. Signal to noise ratio shall be 50 dB, minimum with AGC off.

   c. The camera shall incorporate back light compensation (BLC), aperture correction and auto tracing white balance (ATW).

   d. The camera shall conform with UL 544 and 1409 and radiation standards of FCC class B. Input power shall be 24 volt AC, 60 Hz.

   e. The camera shall accept C and CS mount lenses and shall be capable of functioning over a temperature range of -20° – 32° F. External dimensions of camera shall not exceed 2.65 inches wide x 2.56 inches x 4.81 inches length and weight shall not exceed 2 pounds. The housing shall be weatherproof metal case with top heater, blower and bottom mounting provision.
   Acceptable Product:
   Philips Model LTC 0450/21, Cameras.

C. Integrated high-speed dome color pan/tilt/zoom camera: Cameras shall be provided complete with all back boxes, mounting adapters, and hardware required to install camera in location shown on the Contract Drawings.

1. Integrated dome pan/tilt/zoom camera shall be suitable for in-ceiling mount, pendant mount, or wall mount as required for the camera location and meet the following specifications:

   a. 99 Presets

   b. 0.5° preset accuracy

   c. Proportional Pan and Tilt

   d. Privacy Masking

   e. Guard Tour

   f. Image sensor:

      1) Sensor shall incorporate integral infrared cutoff filter.

      2) Image sensor shall be a color 1/4-inch interline transfer CCD.

      3) Sensor shall be free of blemishes as defined by EIA-330, and shall not have dead pixels.

      4) Sensor shall have at least 768 horizontal pixels and 494 vertical pixels.

2. Resolution: Camera shall have at least 470 lines of horizontal resolution. Resolution shall not vary over the life of the camera.

3. Signal-to-noise ratio: At least 50 dB unweighted with no gain.

4. Sensitivity:

   a. Slow shutter off: 0.025 fc/0.25 lux.

   b. Slow shutter on: 0.0016 fc/0.016 lux.

5. Automatic Circuits: The camera shall have:

   a. Automatic white clip.

   b. Automatic white balance.

   c. Automatic gain control.

d. Electronic light control (electronic shutter speed).

e. Auto-iris drive.

6. Lens:

a. Lens shall be equipped with an auto-iris mechanism.

b. Lens shall be an 18 times optical (4.1mm - 73.8mm) and 12 times digital zoom with an aperture range of f/1.4 to f/3.0.

7. Dome pan/tilt drive:

a. Shall be supplied as part of the integrated assembly.

b. Dome shall have continuous 360° pan capability.

c. Pan speed rate shall be variable from 0.1-120° per second (manual operation).

d. Shall have variable-rate, proportional pan and tilt speed that shall decrease the pan and tilt speed in proportion to the zoom focal length.

e. Presets position speed rate shall be 360° per second, +/- 0.50° accuracy.

f. Dome bubble shall be smoked gray color or clear as approved by the Engineer.

g. Dome drive shall have auto flip functionality and have quick disconnect for mechanical and electrical connections.

h. Domes for outdoor use shall be rated as follows:

1) NEMA 4X.

2) Humidity: 0% to 90% relative, non-condensing.

3) Operating Temperature Range: -40°F to +122°F

8. Mount shall be furnished complete with all interface cards, receiver/drivers, translator cards, cables and appurtenances so they are fully functional and compatible with the existing switcher and pan/tilt control system.

9. Contractor shall consult with the Engineer on color of pendants and exposed hardware and submit samples to the Engineer for approval.

Acceptable Product:

Philips G3 Autodome Bu ENV Euvito Dome Series.

D. Vari-focal lenses: Provide 1/3-inch format auto iris vari-focal lens with the following operational features.

1. Focal length: 2.8 -6 mm, 3.5 - 8 mm, and 5 - 50 mm. As required for each specific camera location.

2. Iris Range - F1.2 - close

3. Focus Range: 1 foot to infinity

4. Weight: .18 lbs

5. Lens mount: CS

6. Angle of view: Wide 88.7° x 69.2°
Tele 44.2° x 34.0°

7. Iris Type: Automatic
Acceptable Product:
Philips Models LTC-3364/20, LTC-3364/31, and LTC-3374/20 lenses, no substitutions.

E. Indoor Housing for Fixed Camera: Provide indoor housing for fixed or suspended ceilings with following features.

1. Maximum camera/ lens size: 8" L x 4" W x 4" H.

2. Dome: .13-inch thick polycarbonate.

3. Mounting: suspended ceiling mount.
Acceptable Product:
Philips Model LTC 9370/00, Camera.

F. Camera Power Supply: Provide 120/24 VAC, 60 HZ camera power supply with the following characteristics:

1. Camera outputs: 4, 8, and 16.

2. Voltage input: 120 VAC, 60 Hz.

3. Voltage outputs: 24 VAC.

4. Current Output: Maximum current available for each terminal pair is 1.85 AC.

5. Controls and indicators Power LED and on/off switch inside cabinet.

6. Connectors: Screw terminals.

7. Construction/finish: Beige metal case.

8. Dimensions: approximately 11.25 " W x 3.5 " D x 11.25.
Acceptable Product:
Philips Model LTC 540X/60 Series, Power Supply where X equals the number of outputs as required per number of cameras fed."

2.7 9-INCH COLOR MONITOR

A. The 9-inch color monitor shall be mounted in a 19-inch vertical cabinet located within the MDF Room A206.
Acceptable Product:
Philips Model LTC 2810/90, 9-inch color monitor.

2.8 42-INCH LDC MONITOR

A. General:

1. Video displays shall be provisioned with UL, CE or ETL labeling indicating compliance with recognized standards.

2. Suitable manufacturers of LCD video screens include: Eternal Graphics, NEC, Philips, or approved equal.

B. Display Characteristics:

1. Minimum Active Area: 41.4" for 42-inch units.

2. Aspect ratio: 16:9.6

3. Resolution: WVGA (1280 x 768)

4. Horizontal Viewing Angle: 170°

5. Vertical Viewing Angle: 170°

6. Brightness: 450 Cd/m^2

7. Color Range: 16.7 Million colors

8. Contrast Ratio: 600:1

C. Physical Parameters & Special Features:

1. Unit Dimensions (WxHxD): 36.5"x23.2"x3.95"

2. Backlight Half-Life: 50,000 Hours

3. Power Consumption: 110-120VAC/50-60Hz, 240 Watt

4. Unit Weight: 53 lbs.

5. Ambient Temperature/Humidity: warranted operational range + 32°F to +95° F and 20 to 80% relative humidity (non-condensing)

D. Signal & Control Features for Video Displays

1. RS-232 Video Display Remote Control

2. Infra-Red Remote Control

3. Video Signal Input:

a) Data: VGA (640x480), WXGA (1280x768), DVI-I

b) Video: Composite Video (NTSC, PAL, SECAM), S-Video (NTSC, PAL)

2.9 DIGITAL FIBER OPTIC VIDEO MULTIPLEXER AND DATA TRANSCEIVER

A. Provide digital fiber optic video/data multiplexers as required. Multiplexer shall allow transmission of 4 channels of high resolution, real-time color video, as well as bi-directional data simultaneously on one optical fiber. The unit shall employ 8-bit digital encoding for transmission of these signals. The multiplexer shall consist of a video transmitter/data transceiver, and a video receiver/data transceiver. The multiplexer shall allow bi-directional transmission of Manchester Encoding, Bi-Phase, RS-232, RS-422 or RS-485 (2 or 4 wire) data protocols. No in-field electrical or optical adjustments or in-line attenuators shall be required. All units shall be available in both rack mount and surface mount versions. The units shall have solid-state limiters on all power lines, which shall provide for automatic reset. All rack mount units shall have an internal DC power supply. A short circuit in one unit shall not affect operation of other units powered from the common power supply. The rack mount units shall be hot swappable with no risk of damage to other units or rack during replacement. The unit shall be UL listed. Operating temperature shall be –40°C to +74°C for all units.

Acceptable Products:

IFS model VT7420DRDT-R3. The video transmitter/data transceiver rack mount rack mount.

IFS model VR7420DRDT-R3. The video receiver/data transceiver rack mount.

B. 19" Rack Mount Panel – Provide IFS R3 card cages, no substitutions with the following characteristics:

1. Input Voltage: 115 VAC (line cord)

2. Power supply (to plug-ins): 20 VAC @ 2.8A

3. # Slots/Spacing: 14 slots available, with internal power supply.

4. Size (In.) (W x H x D): 19.0 x 5.2 x 7

5. Fusing: 1A slow blow (Rack Power supply) (Plug-in modules individually fused)

2.10 ETHERNET SWITCH

A. The Contractor shall provide Ethernet switches to support the transmission of digital video between the remote DVRs and the existing DVR workstation as specified herein and detailed on the contract drawings. This includes provision of the proper quantities of media ports. The Ethernet switches shall be intelligent, layer 2 and SNMP manageable. Provide all intra-rack cabling, connectors and transceivers required for operating the system.

B. Ethernet switches shall be compatible with the existing MAA/BWI CISCO network: Rack mount 24 port 100BaseTX switch, with redundant Power supply unit and fiber optic GBIC uplinks.

C. Coordinate with MAA IT/Network representative for, IP address, network management and redundancy scheme.

Acceptable Product:
Cisco 2950G-EI Ethernet Switch.

2.11 19-INCH EQUIPMENT CABINET

A. Provide 19-inch equipment cabinets as specified in Section 16741 - Premise Wiring and Distribution Systems.

2.12 SIGNAL TRANSMISSION COMPONENTS

A. CCTV camera cable: Cellular-polyethylene dielectric, bare copper double braided shield with 95 percent minimum shielding factor, No. 18 AWG stranded copper conductor and PVC jacket, RG-6U.

B. CCTV coaxial cable Connectors: Type BNC, 75 ohms.

C. CCTV coaxial cable splitter: Type BNC, 75 ohms.

D. CCTV camera covert operations outlets: Recessed, Type BNC, 75 ohms.

Fiber Optic Patch Cords: Provide all required fiber optic patch cords. Patch cords shall be as specified in Section 16741.

END OF SECTION 16782

ITEM L-109 MODIFICATIONS AND ADDITIONS TO AIRFIELD LIGHTING CONTROL SYSTEM

EQUIPMENT AND MATERIALS

109-2.1 COMPUTERIZED AIRFIELD LIGHTING CONTROL SYSTEM (CALCS) MODIFICATIONS, ADJUSTMENTS, AND CALIBRATION. Modify the existing computerized airfield lighting control system (CALCS) so that the display reflects new Lighting Circuits. Add new components to control and monitor new regulators and adjust the existing (CALCS) equipment as required including additional wiring and conduits. Provide all necessary wire and conduit to accommodate new components necessary to provide a working system. The Contractor shall sub-contract Siemens Airfield Solutions (SAS) to modify the existing computer system software and screen graphics to reflect the changes required by this contract. All screen graphic and software changes shall be submitted to the Engineer for approval prior to installation. Work under this contract shall not void any existing warranties on the existing system. After all lights are installed and all other electrical modifications have been made, recalibrate all lighting circuits which have had load changes. This will require field work to verify that lighting fixtures are properly operating (or recording outages). It is the Contractor's responsibility to restore the computerized lighting control system at the Air Traffic Control Tower, Electrical Vault or Portable Personal Computers, and any other existing airfield monitoring locations to full calibration and operation reflecting all changes at the end of the project.

Materials for changes to the CALCS shall be in all ways matched to and compatible with the existing system component parts.

All new components shall be compatible with the existing SAS CALCS system installed in 2000. Contact SAS at 860-408-9546 for system details.

a. TESTING AND COMMISSIONING

1. The Contractor in cooperation with SAS shall prepare and submit a proposed testing and commissioning procedure for the CALCS. Prepare these documents listing the testing and commissioning procedures and expected test results. As a minimum, tests shall include:

(a) Point-to-point wiring continuity tests.

(b) Insulation and grounding tests.

(c) Fiber-optic network communications tests. Include in Pay Item Section 16134.

(d) Verification of all remote control functions for each controllable element.

(e) Touch-screen monitor operations, screen display sections, command select acknowledgement, and action confirmed representations, alarm indications.

(f) AEMS computer tests.

b. WARRANTY. Provide a written guarantee that the CALCS equipment and components supplied and installed are guaranteed against defects and malfunction for a period of 12 months from date of completion of commissioning.

109-2.2 INDIVIDUAL LAMP CONTROL AND MONITORING SYSTEM

a. Addressable Device

The lighting series circuits shall be used as the transmission backbone or infrastructure of a communication command and information network. Addressable devices shall provide the interfacing between the controlled and monitored elements (lamps, signs, etc.) and the rest of the system. To allow communication to a controllable element in the field, via the lighting series circuit, the only required airfield hardware installation is to plug an addressable device into the secondary circuit of the relevant FAA L-830 isolation transformer. The addressable device shall be enclosed in a permanently sealed watertight epoxy case and suitable for installation in L-867 or L-868 size B light base. No additional wires shall be required between the field elements and the electrical vault. No bypasses or filters shall be required in the field.

The addressable device shall be designed to control and monitor individual airfield elevated or inpavement lighting fixtures and to receive signals from sensors and detectors. The addressable device shall be able to function properly on circuits powered by various CCR styles and different manufacturers. The device shall be capable of functioning properly on constant current series circuits having various wave shapes, load variations and high noise levels.

The addressable device shall be a microprocessor-based unit and consist of:

1. Master. The Master shall be able to communicate with remote units via series circuit and shall have an interface with the existing CALCS. The Master shall have lightning protection equal to that on the output of the CCR. Input power for Master shall be 120 VAC, 60 HZ.

2. Remote. The remote shall provide the following data:

(a) ON/OFF switching and flashing of elements (lights, signs, stop-bar, segments of lights, runway guard light, etc.).

(b) Collection of signals from airplane position sensors and their transmission via the lighting series circuit.

(c) Detection of burnt out lamps.

(d) Short-circuiting of isolation transformer in case of lamp failure.

(e) Watchdog timer to provide a fail-safe mode.

109-3 COMPUTERIZED AIRFIELD LIGHTING CONTROL EQUIPMENT - GENERAL

a. Control and Monitoring Equipment

1. The control and monitoring equipment shall be of a distributed nature and shall not be a PLC based. The IU (Interface Unit) units shall be installed locally at each Constant Current Regulator (CCR), which requires control and/or monitoring within the airfield lighting electrical vault(s).

2. Each new CCR shall be connected to an IU.

3. The IU shall be a microprocessor based module that includes all of the communication, control commands, input/output interface and failsafe functionality.

4. The IU shall be connected to both existing networks associated with the Redundant Communications Network (RCN) via quick disconnects.

5. The IU can communicate back to the Vault computer via either of the networks.

6. Removal of any IU unit(s) from the vault network shall not affect the operations of the CALCS system.

7. The IU shall be a universal device that can be used on any type of CCR from any manufacturer.

8. Each IU shall be identical and have interchangeable components.

9. The IU unit shall be optically isolated from the airfield series circuit via a quick disconnect.

b. Existing Redundant Vault Control and Monitoring Network

1. A Redundant Communication Network (RCN) using two (2) existing independent communication networks in the electrical vault(s).

2. The existing RCN has two (2) cables each consisting of two (2), 24AWG, shielded twisted pairs with a common (drain wire) meeting EIA RS-422 applications (Belden™ No. 9842 or equivalent).

3. The network shall be used to control and monitor all the CCR(s).

4. Each CCR shall be interfaced to an IU.

5. Any malfunction in one network shall not affect the operation of the system.

6. Any malfunction in one of the IU communication ports, transfers communication to the remaining port without affecting system functions.

c. Overview of Operation

1. Each IU unit shall have a unique factory set address and a field programmable communication address.

2. The IU receives commands via the existing RCN, executes those commands, and transfers back the status of the element to the existing vault computer.

3. The IU shall perform the following functions:

(a) Brightness setting control of the CCR(s) or ON/OFF control as required by the controlled element.

(b) CCR output voltage and current monitoring.

(c) CCR status monitoring (i.e., remote/local, loss of input power).

(d) Monitor all requirements per FAA L-827 monitoring requirements (See Monitoring section).

(e) Perform all failsafe functions.

(f) Communication via both networks to the vault computer.

(g) Self-diagnostic function to monitor for proper operation.

(h) Locally store all data and parameters specific to the controlled CCR.

d. Subcomponents: Each IU unit shall consist of the following six components:

1. Input/Output Module

(a) Interface for all control and monitoring connections.

(b) Distribution bus for interfacing internal boards.

(c) Easy access, quick disconnect terminal blocks.

2. Processor Module

(a) Interface for redundant communication network.

(b) Easy access, quick disconnect terminal block connections for RCN.

(c) Receives and transmits data to the vault computer.

(d) Interface for insulation resistance monitoring.

(e) Quick disconnect connection for interface to the Insulation Resistance Monitoring Module.

3. Monitoring Module

(a) Interface for current and voltage monitoring.

(b) Quick disconnect connections for interface to the Voltage and Current Sensor Module.

(c) Receives current and voltage samples from the Voltage and Current Sensor Module.

(d) Can interface with up to one (1) circuit.

4. Display Module

(a) The following LED's shall be installed as a minimum on the IU's and provide the following information:

(1) Running status: LED indicator display of IU status.

(2) Brightness Step: LED display indicating the commanded step of the CCR.

(3) Remote/Local: LED display indicating the status of the remote local switch of the CCR.

(4) Primary Power: LED display indicating the status of the input power to the CCR.

(a) Over Current Shutdown: LED display indicating over current shutdown of the CCR.

(b) Open Circuit Shutdown: LED display indicating open circuit shutdown of the CCR.

(c) Channel A: LED display indicating the status of existing channel A of the existing redundant communication network.

(d) Channel B: LED display indicating the status of existing channel B of the existing redundant communication network.

(5) Current and Voltage Module (CVM)

(a) Collects current and voltage samples.

(b) Transmits current and voltage samples to the Monitoring Board.

(c) Interfaces to the output of the CCR.

(d) Shall be isolated from the series circuit via a quick disconnect interface.

(e) Quick disconnect connections for interface to the Monitoring Board.

(6) Insulation Resistance Monitoring Module (IRMM)

(a) Collects insulation resistance samples.

(b) Transmits insulation resistance samples to the Processor Board.

(c) Interfaces to the output of the CCR.

(d) Shall be isolated from the series circuit via a quick disconnect interface.

(e) Quick disconnect connection for interface to the Processor Board.

e. Control and Feedback Interface

1. The IU unit shall have the following interface points available:

(a) Control: Five mechanical latching output points (expandable to 16). These control points shall also be self-monitored and provide back-indication to the Vault computer verifying proper execution of control command.

(b) Feedback: Two digital-isolated input points (expandable to 6).

(c) Current/Voltage Monitoring: One digital interface (expandable to 3).

(d) Insulation Resistance Monitoring: Two digital interface.

f. Monitoring

(1) The IU unit shall provide full FAA L-827 monitoring per FAA AC 150/5345-10 (current edition).

(2) The IU shall include the monitoring board and provide the following information for each CCR:

(a) Loss of input power to the CCR.

(b) CCR shutdown by open-circuit/over-current protective devices.

(c) Drop of more than 10 percent in the CCR VA load.

(d) Failure of the CCR to deliver the selected output current.

(e) The number of burnt-out lamps in each series circuit.

(f) Remote/local status of the CCR.

(g) Actual CCR output current.

(h) Actual CCR output voltage.

(i) Actual CCR output load (wattage).

(3) The Monitor and Control Equipment (MCE) will also monitor the control relays that are interfaced to the control equipment.

(a) Each relay output is fed to a discrete digital input on the IU device.

(b) Each digital input is monitored for proper execution by the IU device.

(c) This type of contact monitoring provides positive back indication that the correct control commands have been executed by the IU device.

5. The system shall include software for calibrating the following measurements:

(a) The number of burnt-out lamps in the series circuit.

(b) Actual CCR output current.

(c) Actual CCR output voltage.

(d) Actual CCR output load (wattage).

g. Programming

1. Each IU unit shall have a unique factory set address and specific parameters, which are field-programmable. Downloading of the IU's parameters shall be done from the existing electrical vault computer.

2. The control system shall continuously scan all the IU units and detect any malfunctioning units as well as inconsistency between the commanded brightness step and the actual brightness step.

3. Each IU unit shall transmit internal diagnostic information to the control system and provide detailed information regarding its operating status. Any malfunction can easily be isolated to the exact location through the use of troubleshooting and diagnostic screens available at the vault computer.

4. A computer when connected to the IU port, shall be able to perform the following functions:

(a) Monitor the commands being received at the MCE unit.

(b) Perform ON/OFF and brightness step switching of the CCR.

(c) Monitor the communications status of the Redundant Communication network.

(d) Read all the status information of the CCR (i.e., Remote/Local).

(e) Read the current, voltage and wattage of the CCR.

(f) Monitor all the information received at that location.

(g) Perform/transmit any control operation that the MCE is capable of.

(h) Configure and test the MCE at that location.

h. Interface Device Reliability: The MCE device shall have an actual minimum calculated Mean Time Between Failure (MTFB) of 150,000 hours.

i. Communication

1. Each IU unit shall support a data communication rate of up to 115.2 kbaud.

2. The communication protocol shall include adequate security to prevent unauthorized access to the network.

j. Failsafe

1. Each IU unit shall provide a self-contained failsafe feature that shall perform the following functions:

(a) Ensure default operation of the airport lighting, even if the entire airport lighting control system is not functioning.

(b) Display the commands sent by the existing computer to the CCR's and/or to the other controllable items.

(c) Self-monitor the IU outputs and verifies proper commands are executed.

(d) Adaptable to each CCR regardless of internal or external control voltage.

(e) Permits maintenance of portions of the control system, without changing the operational status of the lighting system.

2. The failsafe mode of each IU unit shall be defined per the requirements of the airport. The failsafe modes are as follows:

(a) Active Failsafe Mode: This mode shall be executed as follows:

(1) If the CCR was switched ON before the failure, it shall remain ON at the same brightness level.

(2) If the CCR was switched OFF before the failure, it shall switch ON to a pre-determined brightness level.

(b) Passive Failsafe Mode: This mode shall be executed as follows:

(1) If the CCR was switched ON before the failure, it shall remain ON at the same brightness level.

(2) If the CCR was switched OFF before the failure, it shall remain OFF.

3. Technical Specifications

(a) The failsafe system shall operate independently of the computer, providing failsafe interfacing to the CCR and/or other controllable elements.

(b) The failsafe system shall be based on electromechanical latching relays with the following characteristics:

(1) Maximum Switching Voltage: 240 VAC, 125 VDC.

(2) Nominal Switching Capacity: 8A/250 VAC, 5A/30 VDC.

(3) Rated Current (Resistive): 5A.

(4) Operational Life: Mechanical 5 x 10^7, Electrical 10^5.

(5) Protection: IP67 (protection against ingress of dust and water in harmful quantities).

(6) Approval: UL and CSA.

4. Mode of Operation

(a) The commands executed by the IU to switch the CCR and/or controllable element shall be momentary commands.

(b) The control commands shall be mechanically latched upon execution.

(c) Failure of the IU and/or loss of communication to the network shall not change the status of the airport lighting.

(d) The active failsafe mode shall be triggered by the internal watchdog of the IU unit upon detection of a failure within the IU unit or with the control system. The watchdog shall activate the failsafe and switch any controllable items that are OFF to their predetermined state.

(e) IU Unit shall be manufactured by ADBA Siemens Company.

109-2.4 INSULATION RESISTANCE MONITORING SYSTEM

a. General

1. The insulation resistance monitoring system (IRMS) shall be an integral component of the IU unit.

2. The IRMS shall be capable of automatically or manually monitoring and reporting the insulation resistance value of the series circuit cabling (one IRMS per circuit).

3. The IRMS shall be capable of measuring the cable leakage current and display the actual insulation resistance.

4. The IRMS shall be capable of measuring from 20k Ohms up to 1000M Ohms.

5. The IRMS DC test voltage shall have an automatic range of 500 and 1000 volts with current limiting to 5 milliamperes.

6. The IRMS system shall be capable of taking resistance readings on circuits that are energized or de-energized. This will allow the system to be used as a troubleshooting tool for assisting in locating circuit faults.

7. The IRMS system shall provide database record keeping that allows for graphical trend analysis of the insulation resistance readings.

b. Overview of Operation

1. The IRMS shall operate while the circuit is energized or de-energized and allow for automatic or manual readings during either condition. This shall allow for a more flexible troubleshooting tool for maintenance personnel versus systems that only operate while the circuit is energized.

2. The IRMS shall have a self-calibration feature that performs checks on the hardware to verify proper operation prior to taking measurements.

3. The IRMS shall be flexible, user programmable and allow for all of the following variables to be programmed by the user at any computer location:

(a) Start Time 1: This represents the first time of the day in which the IRMS is to take the first automatic reading of the series circuit.

(b) Start Time 2: This represents the second time of the day in which the IRMS is to take the first automatic reading of the series circuit

(c) Period: This specifies how often the circuit is measured. The period selection shall be made from an options list that includes the following choices: 1 hour, 8 hours, daily, weekly (once a week), biweekly (every 2 weeks), Monthly (once a month) or any variation defined by the operator

(d) Charge Time: This is the amount of time, in seconds, that the IRMS shall charge the circuit before taking a reading. The charge time shall be a number from 15 to 900 seconds. Charge time adjustments allow for greater flexibility in the IRMS system and provide readings that are more accurate for those circuits that are older and/or are longer runs.

(e) Warning Limit: This is a limit value, in Ohms, at which point a resistance warning shall be generated. If a resistance reading is below this value, the warning shall be sent to the event database. When the value goes above this level, the warning shall be marked as cleared in the event database. This number can be any value between 20k Ohm and 1G Ohm.

(f) Alarm Limit: This is a limit value, in Ohms, at which point a resistance alarm shall be generated. If a resistance reading is below this value, the alarm shall be sent to the event database. When the value goes above this level, the alarm shall be marked as cleared in the event database. This number can be any value between 20k Ohm and 1G Ohm.

4. All user programmable variables shall be able to be changed at any specified computer within the CALCS system.

5. The IRMS data for all of the series circuits shall be viewable from any specified computer within the CALCS system.

6. All the IRMS data shall be viewable in real-time or historical at any specified computer location. The IRMS information shall be available at all times and shall not require any special transferring of data between the IRMS system and the control system since the IRMS shall be an integral component of the CALCS.

END OF ITEM L-109

PASSENGER BOARDING BRIDGE SPECIFICATIONS

MARTIN STATE AIRPORT

BWI BALTIMORE/WASHINGTON INTERNATIONAL Thurgood Marshall AIRPORT

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Base Technical Specification (Design Standard): This base specification is setup to provide guidance to the engineer for inclusion in the contract documents for bridge installation and procurement. The designer must thoroughly review the guidance indicated and obtain direction as needed from the MAA to complete the specification. The specification sections will have to be modified and tailored as discussed below. The engineer should confirm the procurement process prior to utilizing this specification. ***(ALL ITEMS ITALICIZED AND BOLD MUST BE CONFIRMED BY THE ENGINEER)***

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ITEM PBB-100 APRON DRIVE PASSENGER BOARDING BRIDGES

DESCRIPTION

100-1 This item shall consist of the following. (***Engineer should define removal; storage, reinstallation, and/or installation dependent on the scope of work) (Engineer's description should include defining whether the bridges are purchased, provided, existing, including fixed sections, and all accessories)***.

Any PBB that is scheduled to be removed and intended for disposal shall be disposed of by the Contractor off Airport property at an approved disposal site. Under no conditions should a PBB intended for disposal be disposed of on-site.

The PBBs covered by this specification are designed to extend from a terminal or concourse departure lounge doorway to the aircraft boarding door such that passengers can enplane and deplane during normal or emergency operations while providing an environment that is protected from hazardous and atmospheric conditions. The complete assembly is protected against inclement weather conditions, both when sealed against an aircraft and when parked with the weather door closed.

All new PBB's shall be Regional Jet capable with accessories that include but are not limited to:

- Handrails
- Floor modification for RJ mating
- Cushion attachment to prevent any gaps between the bridge and fuselage.

NOTE: The model numbers indicated on the Contract Documents are based on **[FMC-Jetway Systems]** equipment (or equal). However, other manufacturers' equipment that meet or exceed the fully retracted and fully extended operational limits of the **[Jetway]** models identified will be considered. Note also that the observer is

positioned with his/her back to the terminal end and facing the aircraft end of the PBB when referring to left or right.

Each PBB shall be managed as shown on the contract documents and as described below.

****

THE DESIGNER SHOULD EDIT THE FIRST PARAGRAPH ABOVE TO INCLUDE ONLY PROJECT SPECIFIC ITEMS. THE DESIGNER SHOULD THEN USE SUB-PARAGRAPHS HERE TO DESCRIBE THE PROJECT SPECIFIC WORK FOR EACH ITEM IDENTIFYING EACH GATE AFFECTED BY PBB CHANGES AND WHAT THE AFFECTS ARE. SAMPLE TEXT FOLLOWS, BUT OTHER FORMATS THAT CLEARLY DESCRIBE THE WORK FOR THE CURRENT PROJECT ARE ACCEPTABLE.

THE DESIGNER SHOULD MAKE REFERENCE ON THE CONTRACT DOCUMENTS THAT THE OBSERVER IS POSITIONED WITH HIS/HER BACK TO THE TERMINAL AND FACING THE AIRCRAFT WHEN REFERRING TO LEFT OR RIGHT AND ORGANIZE PLANS ACCORDINGLY.

PROJECTS INSTALLING OR MODIFYING PBBS SHOULD BE DESIGNED AND SPECIFIED TO ALLOW THE OPERATION OF THE PBBS TO ACCESS THE FORWARD TWO LEFT PASSENGER DOORS (L1 AND L2) OF THE AIRCRAFT WHERE APPLICABLE.

****

a. The gates requiring PBB removal during this project are **[provide gate numbers]** as shown on the Plans.

b. The gates requiring installation of existing PBBs are **[provide gate numbers]**

c. The gates that will have new PBBs installed are **[provide gate numbers]** and are shown on plans and details.

REQUIREMENTS

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DESIGNER TO ENSURE PLANS INCLUDE ADEQUATE INFORMATION TO INDICATE THE INSTALLATION OF THE ITEMS LISTED BELOW. NOTE THAT RENOVATIONS TO EXISTING BOARDING BRIDGES SHALL INCLUDE BRINGING THE PBB UP TO CURRENT NFPA STANDARDS.

****

100-2 GENERAL REQUIREMENTS FOR ALL PBBS WHETHER NEW, REINSTALLED, OR RENOVATED. Existing PBBs shall be inspected to determine which modifications are required and which are already in place. Contractor shall have responsibility to confirm conditions of bridge prior to removal if bridge is to be reinstalled. Confirmation shall include the condition of the fire retardant material connecting the bridge to the terminal (will be replaced as part of installation), identification of the parameters in the Pro Logic Cabinet (PLC), and identification of the settings for recalibration of the potentiometers after the bridge has been reinstalled per the manufacturers requirements. Pre and Post placement operational checks shall be conducted and documented by the Contractor, MAA Contractor responsible for maintenance of the bridges and the Construction Manager. These checks should test the total functionality of the bridge to document and all existing problems prior to the Contractor performing the work.

****

DESIGNER SHALL CONFIRM THAT EXISTING BRIDGES HAVE THE REQUIRED ACCESSORIES TO BE RJ CAPABLE. DESIGNER SHOULD ALSO CONFIRM LIMITS ON BRIDGES FOR PURPOSES OF AIRCRAFT MATING AND FLEET MIX CAPABILITY.

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100-2.1 Wheel bumpers are required.

100-2.2 The support column is the structural support for the PBB and each is custom made by the manufacturer to meet specific site conditions (DESIGNER SHALL REQUIRE CONTRACTOR TO CONFIRM STRUCTURAL INTEGRITY OF COLUMNS FOR BRIDGE IF USING EXISTING COLUMN OR PROVIDING NEW). There is limited adjustment for height once the column is built. Therefore, it is important that the vertical dimension (from the passenger service level finished floor to the top of concrete of the PBB foundation) and the horizontal dimension (from the service level face of the building to the center of the anchor bolt pattern)

be accurately determined and transmitted to the PBB manufacturer by the contractor at least 15 days prior to the requested ship date.

100-2.3 The anchor bolt pattern and details for the new or existing PBB foundation shall be provided by the PBB's manufacturer. Contractor shall modify the existing foundation as needed to match the bolt pattern provided by the manufacturer.

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DESIGNER SHALL CONFIRM ANCHOR BOLT PATTERN OF EXISTING FOUNDATION, EXISTING BRIDGE, AND SUPPORT COLUMN IF AN EXISTING BRIDGE IS TO BE REINSTALLED. DESIGNER SHALL CONFIRM THAT BRIDGE BOLT PATTERN WILL FIT EXISTING FOUNDATION BOLT PATTERN.

****

100-2.4 New foundations shall be provided in accordance with the details in accordance with paragraph **[100-4.4]. Contractor shall have responsibility for foundation adjustments if bridge manufacturer is substituted.**

****

DESIGNER SHALL PROVIDE FOUNDATION DETAIL BASED ON STANDARD BRIDGE MANUFACTURER AND MODEL NUMBER. CONTRACTOR SHALL HAVE RESPONSIBILITY FOR FOUNDATION DESIGN IF BRIDGE MANUFACTURER AND MODEL NUMBER IS REVISED.

****

100-2.5 Locks shall be provided and installed by the contractor on the door to the outside apron and shall meet the requirements specified in paragraph **[100-3.3a]**.

100-2.6 PBB signage is required and shall meet the requirements specified in paragraph **[100-3.7k]**. The Contractor shall be responsible for providing signage that is visible from the taxilanes/taxiways that will pass the final Use and Occupancy inspection.

100-2.7 Task lighting is required and shall meet the requirements specified in paragraph **[100-3.7j (2)]**.

100-2.8 A flashing beacon and audible alarm mounted under the cab is required and shall meet the requirements specified in paragraph **[100-3.4a (2) (h)]**.

100-2.9 A GFI duplex outlet is required on the drive column wheel carriage. Refer to paragraph **[100-3.5b]** for additional information.

100-2.10 Spare conductors are required in conduit from the rotunda to the control panel. Refer to paragraph **[100-3.5d]** for additional information.

100-2.11 An electrical disconnect panel, mounted on the rotunda support column is required. Refer to paragraph **[100-3.1c]** for additional information.

100-2.12 Emergency Lighting is required and shall meet the requirements specified in paragraph **[100-3.5c]**.

100-2.13 Provisions for telephone or intercom equipment is required and shall meet the requirements specified in paragraph **[100-3.5a]**.

100-2.14 **400 Hz/PC Air.** The PBB shall be provided with a three-inch diameter aluminum pantograph with length to cover the movable sections of the PBB for routing power to the PC Air and 400 Hz units. Regardless of whether a unit will be installed as part of this project, the Contractor is required to provide the dead loads (as provided in the Contract Drawings) to the PBB manufacturer for inclusion in the structural design. **[See note to designer regardless of whether or not 400Hz/PC Air will be installed.]**

100-2.15 **Aircraft Side Shift Cab.** The PBB shall be provided with the capability to adjust its alignment to increase its flexibility to minimize the time required to service multiple aircraft configurations as specified in paragraph [**100-3.7b**].

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NOTE TO DESIGNER: In addition to the items outlined in the specifications, which are required with all installations, the following items are to be considered and included in the design:

- **THE FOLLOWING ITEMS SHALL BE INCLUDED IN THE PBB DESIGN WHETHER OR NOT 400HZ/PC AIR IS TO BE INCLUDED AS PART OF THE CURRENT PROJECT. THE DESIGNER SHALL PROVIDE ADEQUATE INFORMATION IN THE PLANS AND SPECIFICATIONS TO ENSURE THAT THE LOAD REQUIREMENTS, THE POWER REQUIREMENTS, AND CONTRACTUAL ARRANGEMENTS ARE SATISFIED.**
- **DESIGNER SHALL REFERENCE MAA DST 2001-11, "PRE-CONDITIONED AIR AND 400 HERTZ SYSTEMS AND ASSOCIATED LOADING BRIDGE REQUIREMENTS" AND DST 2002-01, "HARMONICS PRODUCING EQUIPMENT SPECIFICATIONS REQUIREMENTS".**

- **DESIGNER TO PROVIDE STRUCTURAL REQUIREMENTS FOR THE 400HZ/PC AIR WHICH ARE DEPENDENT ON THE CRITICAL DESIGN AIRCRAFT FOR NEW LOADING BRIDGES.**
- **DESIGNER TO EVALUATE EXISTING LOADING BRIDGES TO ENSURE THE STRUCTURAL LOADS CAN BE SUPPORTED BY THE PBB.**
- **THE ELECTRICAL CAPACITY OF THE PIER MUST BE CHECKED TO ENSURE RESERVE CAPACITY IS AVAILABLE TO PROVIDE 400 HZ/PC AIR TO ALL GATES ON THE PIER.**
- **THE DESIGNER MUST PERFORM ELECTRICAL LOAD CALCULATIONS TO ENSURE THE LOADS CAN BE SUPPORTED BY EXISTING ELECTRICAL INFRASTRUCTURE ON AN EXISTING LOADING BRIDGE. AIRCRAFT SIZING CONSIDERATIONS.**
- **THE SIZE OF THE AIRCRAFT SHOULD BE DICTATED BY THE SIZE AIRCRAFT THAT CAN ACCESS THE ALLEY, NOT THE SIZE ANTICIPATED USING THE GATE.**
- **AIRCRAFT USAGE OF THE GATE SHALL BE LIMITED BASED ON THE HOLDROOM SIZING REQUIREMENTS (CURRENTLY UNDER DEVELOPMENT. DESIGNER SHALL COORDINATE WITH THE MAA PROJECT MANAGER IF THE DST HAS NOT BEEN ISSUED AT THE TIME OF THE PROJECT).**

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100-3 SPECIFIC REQUIREMENTS FOR NEW BRIDGES AND REINSTALLED/RENOVATED BRIDGES AS NOTED IN SECTION 100-2.

100-3.1 Rotunda Assembly

The Rotunda assembly is made up of a corridor, rotunda and support column. The assembly shall be designed so that no loads or vibrations are transmitted to the building.

The rotunda assembly shall be designed as the terminal end pivot for PBB's vertical and horizontal motion. As the main pivot for the PBB, the rotunda assembly shall allow the PBB to swing a total of 175°, 87.5° clockwise and 87.5° counterclockwise from the corridor centerline.

Slope, over-travel and operational swing limits shall be located on the rotunda assembly. Slope limits shall be adjustable up to 10% (5.71°) for both up and down slopes as needed to meet local operating conditions and requirements.

The over-travel swing limit switch shall be located on the support column. The trip plate for this switch shall be located on the rotunda and shall be adjustable to meet local conditions. When this switch is actuated it shall cut off all control power so that

the PBB can be moved only by using the by-pass switch in the control console. The rotunda frame shall be equipped with rubber bumper-type mechanical stops to prevent collapse of the telescoping tunnel sections.

A potentiometer on top of the rotunda shall be provided to sense the position of the PBB swing and sound a warning buzzer at the control console prior to the actuation of the over-travel swing limit. The actuation of this warning buzzer shall be adjustable to meet local conditions. The warning buzzer shall be within the over-travel limit envelope and signals the rotational operational limits.

a. Corridor

The corridor is the interface between the rotunda and the terminal building or fixed passageway. The rotation of the PBB may restrict the inside clear width of the corridor to 4'-4 1/2" (1334 mm) for a minimum distance of 15" (381 mm). The clear height shall be a minimum of 7'-7" (2311 mm).

The design of the corridor shall allow the installation of flexible weather seals and a floor threshold to the face of the building or fixed passageway.

b. Rotunda

The rotunda floor remains stationary and level at all times and provides a smooth transition between the terminal and telescoping tunnels.

Flap-type seals provide weather protection between the rotunda and the hinged telescoping tunnel section. The rotunda shall provide a dry environment free from storm blown rain water, snow, and ice.

c. Support Column

The support column is the structural support for the PBB. The support column rests on a foundation that shall be supplied by the Contractor.

Anchor bolt patterns and details for the new PBB's shall be provided by the PBB's manufacturer.

An electrical disconnect panel shall be mounted on the rotunda support column to provide electrical disconnects, over current protection and transformers needed to adapt the specified terminal power to the PBB's electrical requirements.

100-3.2 Telescoping Tunnels

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NOTE TO DESIGNER: APRON DRIVE PBBS ARE AVAILABLE IN EITHER TWO OR THREE TELESCOPING TUNNEL MODELS IN A WIDE VARIETY

OF LENGTHS. THE TELESCOPING TUNNELS, "A" (SMALLEST), "B" (MID-SIZE ON THREE TUNNEL PBBS, LARGEST ON TWO TUNNEL PBBS), AND "C" (LARGEST, THREE TUNNEL PBB ONLY), ARE RECTANGULAR IN CROSS SECTION. THE TUNNELS WITH THE LARGEST CROSS SECTION ARE CLOSEST TO THE AIRCRAFT.

THE SELECTED PBBS WILL ACCOMMODATE THE PROPOSED AIRCRAFT PARKING ARRANGEMENTS AND EXISTING TERMINAL FLOOR HEIGHTS. THE OPERATIONAL TUNNEL FLOOR SLOPE SHALL MEET THE MOST CURRENT ADA AND NFPA 415 STANDARDS. REFER TO 100-3.7I (NOTE TO DESIGNER) FOR METHOD OF COMPUTATION.
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The roof, wall, and floor panels shall be constructed from 14 gauge (.0747") corrugated steel.

A hinged transition ramp shall accommodate the difference in elevation where telescoping tunnel sections overlap. This area shall consist of a section of floor that is sloped with respect to the tunnel centerline and hinged transition ramp. A very shallow slope shall be provided in the transition area (approximately 3 feet measured with respect to the tunnel centerline). All hinged or elevated surfaces in walkways shall be designed to prevent tripping hazards. Handrails shall be provided on both sides of the tunnel in the ramp area.

Minimum interior clear dimensions for both two-tunnel and three-tunnel PBBs shall be as follows:

Minimum Floor Width	4' - 10" (1473 mm)
Minimum Interior Height	7' - 0" (2134 mm)
Minimum Inter-tunnel Ramp Width	4' - 8" (1422 mm)
Minimum Corridor Width	4'-4 1/2"(1334 mm)

The telescoping tunnels shall be equipped with an exterior electrical cable conveyance system mounted under the PBB. This system shall be accessible to maintenance personnel for inspection or cable addition at all PBB positions and operating conditions. Access to the conveyance system shall not impede passenger traffic or PBB operation. The system shall be capable of supporting a combination of cables and hoses with a maximum weight of 12 pounds per foot (17.9 kg/m) and a maximum cross-sectional area of 12 square inches (7742 mm^2) consisting of two 6 in^2 (3871 mm^2) areas. The largest tunnel shall be equipped with an aluminum wire way to continue electrical cable routing beyond the electrical cable conveyance system.

A 3-inch aluminum pantograph shall be provided for future use.

100-3.3 Service Access

A service door, landing and stair leading to the apron area constitute the service access. The service access shall be located on the right hand side of the cab end of the PBB to provide access between the PBB and apron for authorized personnel.

a. The service door shall be steel, half wire-glass, hollow core, and shall meet or exceed the ¾-hour fire rating per ASTM E152. The minimum door is 2'-6" (762 mm) wide and 6'-8" (2032 mm) high. The door shall be equipped with medium-duty commercial-type hardware and automatic door closure. The door opens outward onto the landing. A keyed outside knob with inside knob shall be provided. A 30" (762 mm) stainless steel kick plate shall be provided to cover the lower inside portion of the door.

b. The service stair landing shall be parallel to the adjacent tunnel floor and shall be made of hot dipped galvanized steel, open mesh grating. The landing shall be protected on the open sides by galvanized steel handrails designed to meet the OSHA standards. A switch operated light shall be provided above the landing.

c. The service stair shall be equipped with self-adjusting risers and open mesh steel treads, which shall be expanded metal with a serrated edge for a gripping surface. All steps shall have an equal rise. The tread width shall be 28" (711 mm) and the maximum tread rise shall be 9-1/2" (241 mm). The length of the stair stringers varies depending on the type of aircraft serviced. (DESIGNER SHALL CONFIRM BASED ON LIMITS AND FLEET MIX OF AIRCRAFT) The service stair shall be equipped with handrails on each side that are designed to meet OSHA standards for handrails located at stairs. The entire service stair assembly shall be galvanized steel. The service stair shall be accessible to ramp service personnel at all operational heights and positions of the PBB.

d. The baggage slide shall be provided as part of the bridge purchase.

100-3.4 Control Station

The control station or operator compartment shall be located at the aircraft end of the PBB to provide the operator with a control console, service utilities, and control interlocks required to accomplish PBB operation. This compartment shall be

positioned on the left side of the cab and oriented to position the operator facing forward in full view of the aircraft during the maneuvering and docking operations. It shall provide the optimum PBB maneuvering visibility for 95% of the adult population (as defined by Henry Dreyfuss in "Human Factors in Design") without obstructing passenger traffic flow. A 10 lb ABC fire extinguisher shall be supplied and mounted in the Control Station Area in a way as to be readily accessible but not interfere with the operation of the PBB.

a. Control Console

The control console shall be located in the operator compartment and is protected from the outside environment.

(1) Controls

All PBB motion controls shall be the momentary contact type (deadman) controls. All of the motion controls shall be designed to be relative to the function of the PBB being controlled, i.e., for raise and lower functions, the "raise" push button shall be located above the "lower" push button. The control console shall include the following controls:

(a) A three-position master key switch used to select "OFF", "OPERATE" or "AUTO" (automatic leveling). The key should be able to be removed only in the "OFF" or "AUTO" positions.

(b) A lever arm (joystick) to control forward and reverse motions while push button controls steer right and left. As the joystick is moved progressively forward or back, PBB speed shall increase proportionally to the position of the joystick. Steering, left or right, shall be able to be accomplished at the same time as forward and reverse motions. An interlock shall prevent the PBB from being driven forward when the aircraft closure is deployed.

(c) Push button switches for raising and lowering the cab end of the PBB.

(d) Push button switches for cab rotation, left or right.

(e) Push buttons for independent adjustment of the left and right side of the bellows-type aircraft closure.

(f) A switch for floodlights that illuminate the apron area under the aircraft and drive column undercarriage.

(g) A switch to change the digital position indicator from its normal vertical height index to a horizontal rotation index.

(h) A switch to change the cab floor level adjustment from an automatic operation to a manual operation.

(i) A relative motion push-button switch to control the cab floor level adjustment while in the manual mode.

(j) An emergency stop button which shuts down all PBB movement when pressed.

(2) Indicators

The control console shall have indicators that display the current PBB status. The PBB status indicators shall be as follows:

(a) A digital position indicator to display the relative vertical position of the lift column. This indicator shall also be able to be switched to give the relative horizontal rotation of the PBB. This indicator is used to vertically and horizontally pre-position the PBB prior to the arrival of the aircraft. The horizontal rotation position indicator shall also allow the operator to accurately move the PBB to an assigned parking position in aircraft "power-out" operations.

(b) A wheel position indicator to display wheel orientation with respect to the operator's position. The wheel position indicator shall maintain correct wheel orientation while the cab is being rotated.

(c) An amber light to indicate that the auto-leveling system is energized and functioning.

(d) A red light and audible warning to indicate the autoleveler sustained travel timer has tripped.

(e) A red light to indicate that the PBB has reached the operational horizontal rotation limits. Illumination of this light shall be preceded by an audible warning.

(f) A red light to indicate aircraft closure is deployed. The closure must be fully retracted before the PBB can be moved forward.

(g) A red light to indicate vertical drive column fault.

(h) Other required indicators that are not located on the control console but shall be provided include a flashing amber beacon mounted under the cab to indicate that power is on and the PBB may move at any moment; and an audible warning bell mounted on the lower wheel bogie which shall ring at 98 decibels measured ten feet (3048 mm) from the PBB when the PBB is moving.

(i) Safety decals shall be placed on the cross tube of the lower wheel assembly. These decals shall warn against storing anything on the cross tube and the chance of getting run over when the bridge is in operation.

(j) External mirrors shall be placed on the PBB to aid operators during PBB movements.

(k) Limits shall be coordinated and verified with installed accessories to ensure that no damage will occur to the accessories or PBB.

100-3.5 Utilities

a. A six pair (twelve conductor) wire outlet for the installation of telephone or intercom equipment shall be located on left side wall adjacent to the control console and on the right wall of the rotunda corridor assembly.

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DESIGNER TO PROVIDE ADEQUATE INFORMATION IN THE PLANS TO ENSURE TELEPHONE SERVICE IS PROVIDED.

b. Duplex outlets (unswitched 120 volt, single phase, 15 amp) shall be located on the access door of the control console, and in the rotunda corridor. An additional GFI duplex outlet shall be provided on the drive column wheel carriage cross beam where it is accessible to maintenance personnel at ground level.

c. Provisions for hardwire emergency lighting shall be provided.

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NOTE TO DESIGNER: VERIFY THAT CONNECTION TO EMERGENCY BACKUP IS AVAILABLE, IF NOT, NOTIFY MAA DURING DESIGN PHASE AND DETERMINE IF BATTERY BACK-UP WILL BE APPROVED. IF SO, INSERT THE FOLLOWING TEXT IN PLACE OF THE TEXT FOR 100-3.5c.

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"Sufficient Battery powered emergency light packs shall be provided in the PBB to meet the requirements of Section 5.9 of NFPA 101, "Life Safety Code" for all possible PBB configurations."

d. A minimum of eight spare conductors (#12 THHN) shall be provided in conduit from the rotunda to the control panel for possible future additions or changes to the control system.

e. A fire alarm shall be provided that is connected to the Honeywell METASYS system.

100-3.6 Control Features and Interlocks

a. Mechanical interlocks shall be provided to prevent damage to control circuits or PBB components by selecting opposite motions simultaneously. For example, depressing the "up" button shall prevent depressing the "down" button.

b. When the master key switch is in the "OFF" or "AUTO" position, the controls for horizontal and vertical movement, steering, aircraft closure and cab rotation shall be inoperative.

100-3.7 Aircraft Side Shift Cab

a. The aircraft cab with operator's station shall be designed to rotate a minimum of 125 degrees, a minimum of 92.5 degrees ccw and 32.5 degrees cw on bridges with right-side service stairs and a minimum of 92.5 degrees cw and 32.5 degrees ccw on bridges with left-side service stairs from the tunnel centerline to facilitate alignment with multiple aircraft parking configurations. The rotation speed shall be between 2 and 2.5 degrees per second. The cab shall be enclosed to provide maximum security and protection from the outside environment throughout the docking and passenger boarding operation.

b. The cab shall have the capability of shifting a minimum of 24 inches (12 inches left and right of center) to increase the flexibility and minimize the time required to perform the aircraft docking process. This movement shall be controlled by individual push-buttons marked "Cab Shift Left" and "Cab Shift Right."

c. The operator's station shall be located on the left-hand side of the cab and shall be protected from the outside environment as well as passenger interference. The cab shall be equipped with a forward facing control console. The console shall be located behind laminated glass windows. Operation of the PBB shall be able to be accomplished without opening the weather doors. Additional visibility shall be obtained through the vision panels in the cab side-coiling curtains and windows located in front, left and right of the operator. The front window size shall be 2'-8" x 2' (813 mm x 610 mm). The left window size shall be 11" x 30-1/2" (279 mm x 775 mm). The right window shall be 2'-8" x 6" (813 mm x 152 mm).

d. Weather doors shall be provided adjacent to the console to seal the interior from adverse weather conditions and secure the PBB from unauthorized access when the PBB is not in use. These doors shall be swinging double doors that open inward and can be latched closed. The opening shall have a clear width of 44 inches and a minimum clear height of 7 feet 6 inches. The double swinging doors shall be equipped with 12 inch wide by 32 inch high safety glass windows to enhance visibility.

e. A full width spacer (10'-2" {3099 mm}) shall be located at the aircraft end of the cab floor. The spacer material, which shall meet the fire protection specifications of NFPA-415, shall be sufficiently flexible and non-abrasive to prevent scratching or other damage to the aircraft fuselage.

f. The cab side coiling curtain slats shall be equipped with two (2) view panels in every other curtain slat. The view panels shall be in the low normal positions on the right side and high normal position on the left side. Windows shall be a minimum of 1 ¼ inches wide by 12 inches long. Wind flaps shall be provided around top of curtains.

g. The side coiling curtain barrel assemblies shall be covered to protect them from the weather. Covers shall be hinged to allow easy access to curtain assemblies.

h. A closed circuit television (CCTV) system shall be provided complete with a monitor housed in or near the control console. The camera shall be focused on the horizontal drive wheel bogie and service stair so that the operator has an unobstructed view when servicing all aircraft.

i. The outer most end of the cab shall be equipped with an adjustable floor. The floor shall be individually actuated and independently adjustable to adapt to all aircraft doorsills. This floor must be designed to be automatic with a manual override control switch. The floor shall be capable of providing a level surface adjacent to the aircraft door sill for PBB slopes from –10% to +10%. No portion of the cab floor shall exceed 8.33% slope in the direction of the expected passenger traffic.

(1) The double hinged floor shall provide a smooth transition between the level floor and the tunnel section. This transition floor shall provide a smooth platform sloped approximately in the direction of passenger traffic flow. There shall be no raised surfaces that may introduce a tripping hazard to the passengers. Adjacent surfaces shall be the same level regardless of the position of the cab floor or the PBB.

(2) The floor shall be provided with a Regional Jet (RJ) aircraft service adapter kit. The kit shall allow docking to the Canadair Regional Jet (CRJ), the Embraer Regional Jet (ERJ) with the plug style door, as well as the standard narrow/wide body aircraft mix. The interface between the (CRJ) aircraft and boarding bridge shall be a smooth transition. The top of the cab floor shall abut to the top of the CRJ aircraft step/sill walking surface. The operation of the floor shall be mechanized. A hand ramp to cover any gaps may not be used. The bridge cab floor to aircraft interface is a critical juncture and shall not have any tripping hazards. The bridge cab floor shall be designed to provide positive protection to the CRJ

door, the CRJ door retract cable, and the adjacent pivot tube. The floor shall be equipped with an angle of attack sensor that will slow and/or stop the PBB motion if collision with the aircraft is imminent. The cab floor section that interfaces with the CRJ door shall be free to tip/rotate/move upward so as to prevent serious damage to the CRJ aircraft door in case of misdock or auto-leveling failure.

(3) The passenger boarding bridge shall be designed such that initial docking to the CRJ or ERJ aircraft is made with the full bridge moving to the aircraft to the point that the cab bumper is adjacent to the fuselage. The moving floor shall then be driven out to mate up with the CRJ door top step or to cover the gap under the ERJ TAT sensor. This design shall reduce the possibility of damage to the CRJ aircraft door or ERJ TAT sensor.

(4) Foldable type handrails shall be provided for use when servicing RJ aircraft with retractable air stairs.

j. Exterior floodlights shall be provided for nighttime operation to illuminate the apron area ahead of the PBB. A floodlight shall also be provided to illuminate the drive column wheel bogey area. This light shall be located under the tunnel section.

(1) A weatherproof fluorescent fixture shall also be provided outside the weather doors to illuminate the cab-aircraft interface.

(2) A junction box on the underside of the cab area with a terminal block and 120V circuit shall be provided for connection of external task lights. The junction box shall be labeled "120V-Circuit for External Task Lights." Task lighting shall consist of two floodlight fixtures. The first shall be mounted four feet above the top of the PBB on the right side of the PBB to illuminate the apron area in the swept path of the PBB. The second floodlight fixture shall be mounted ten feet above the left side of the PBB to illuminate the apron area adjacent to the aircraft. Task lighting shall contain two sixty-minute rotary timers.

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DESIGNER TO PREPARE STRUCTURAL AND ELECTRICAL LOAD CALCULATIONS TO ENSURE THE ADDED STRUCTURAL AND ELECTRICAL LOADS CAN BE SUPPORTED BY BOTH THE PBB AND THE ELECTRICAL INFRASTRUCTURE.
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k. Three-face, cab-mounted, (internally) illuminated signs shall be provided. The gate sign shall be installed on top of the cab roof of each new passenger boarding bridge. The sign shall be elevated above the top of bridge with the bottom of sign a minimum 18 inches above the canopy hardware forward of sign. The sign will be weatherproof and designate the gate number on all three sides. Each surface of the sign is to be 30 inches high by 42 inches long with 18 inch high white letters on a black background. The sign shall be controlled by a photocell located on the underside of the passenger boarding bridge.

l. The passenger boarding bridge shall be capable of docking to the Canadair Regional Jet (CRJ), the Embraer Regional Jet (ERJ) with the plug style door, as well as the standard narrow/wide body aircraft mix.

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DESIGNER SHALL VERIFY THE CURRENT LIST OF REGIONAL JETS AND FLEET MIX FOR THE SPECIFIC ALLEYWAY WITH MAA OPERATIONS DURING DESIGN TO DEVELOP RANGE. DESIGNER SHALL USE METHODOLOGY PROVIDED IN THE DESIGN STANDARD TO COMPLETELY ANALYZE THE FULL FLEET MIX.
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The interface between the CRJ aircraft and boarding bridge shall be a smooth transition. The top of the cab floor and the top of the CRJ aircraft step/sill shall be flush. The boarding bridge floor shall not lie atop the CRJ aircraft step/sill, but rather shall abut the aircraft walking surface. The apron drive cab floor shall be a mechanized floor and shall be designed to negotiate the sensors on ERJ and CRJ jet aircraft.

The operation of the floor shall be mechanized. A hand ramp to cover any gaps shall not be used.

The bridge cab floor shall not have any steps, ledges, gaps, or surface protrusions when docked to the specified aircraft. These may present tripping hazards at the bridge to aircraft interface and are not permitted.

The bridge cab floor shall be designed to provide positive protection to the CRJ door. The cab floor section that interfaces with the CRJ door shall be free to tip/rotate/move

upward so as to prevent damage to the CRJ aircraft door in case of misdock or auto-leveling failure.

The canopy closure of the boarding bridge shall form a weather seal around the door of the aircraft specified and shall be constructed so as to clear all aircraft antennas, pitot tubes, etc. The canopy shall be designed to keep all heated probes out of the contact of passengers.

Handrails shall be provided to direct and support passengers as they enter/exit the regional jet aircraft. The handrails shall be able to support 200 lbs. loading. The handrails shall keep the passengers away from any heated probes on the regional jet aircraft. The handrails shall be affixed to the bridge and shall be easy to deploy. The handrails shall provide a full barrier system to keep passengers from exiting off of the front of the bridge at any time after the boarding bridge has been docked.

The regional aircraft cab floor shall be controlled from the bridge console. The floor shall extend and retract to accommodate the regional jet aircraft steps and sensors. The extend/retract portion of the cab floor shall use a rubberized belt mechanism to ensure smooth surfaces and excellent traction in the passenger path. The extend/retract portion of the cab floor shall be located on the left side (when facing the aircraft) of the apron drive cab floor area.

The cab floor shall be equipped with appropriate sensors to safeguard the aircraft.

100-3.8 Aircraft Closure

The aircraft end of the cab shall be equipped with a folding bellows aircraft closure. The closure, when fitted against the fuselage, shall surround both the open aircraft door and the doorway to protect passengers from the elements. The covering shall not absorb water, shall be highly tear resistant, and shall remain flexible from -31 °F (-35 °C) to 127 °F (52.8 °C). The aircraft closure color shall be gray.

a. Each side of the aircraft closure shall be independently actuated to seal against aircraft contours.

b. Pressure sensitive switches shall be incorporated into the closure mechanisms to prevent excessive pressure on the aircraft.

c. The contacting seal shall be a soft material to prevent scratching or damage to the aircraft skin. The seals that contact the aircraft shall be segmented and attached to the main closure assembly with Velcro type fastener strips for easy replacement.

100-3.9 Automatic Leveling

The PBB shall be equipped with an automatic leveling system (autoleveler) which shall allow the PBB to follow changes in the aircraft elevation that occur during aircraft loading and unloading. This system shall function with equal reliability for all aircraft contours. The autoleveler shall be located on the right side of the cab and be in full view of the operator at the control console.

(a) The autoleveler shall operate such that it is engaged when the master key switch is in the "AUTO" position.

(b) The autoleveler circuit shall include a sustained travel timer. The timer limits autolevel operation to a time which is adjustable from 1.6 to 16 seconds **[(Jetway recommends 4 seconds)]**. A fault condition shall be assumed if the operation exceeds the set time limit. This fault condition shall cause all motor power to be disconnected and audible and visual alarms to sound.

(c) The main auto level sensing switch shall be activated upon a 5 degree auto level wheel rotation.

100-3.10 Drive Column

The drive column shall provide the vertical and horizontal motion for the PBB. The drive column and control systems shall be designed for smooth, quiet operation. The vertical and horizontal movements shall be capable of being operated simultaneously.

The drive column shall be divided into two major components: Vertical Drive and Horizontal Drive.

a. Vertical Drive

The PBB shall be able to be moved vertically by means of two recirculating ball bearing screw assemblies.

(1) Each assembly shall be independent with individual motors and brakes and shall be capable of supporting the PBB under full design load to provide 100% redundancy.

(2) The ball nut shall be equipped with wiper brushes to remove grit or dirt from the screw threads and shall be equipped with a special thread profile designed to support the PBB in the absence of the recirculating ball bearings.

(3) The vertical drive motors shall be AC induction motors with integral reducer and brakes. The brakes shall be spring applied

and electrically released and shall hold securely at all elevations whenever electrical power is not applied.

(4) A fault detector capable of sensing differential motion of the ball screw assemblies shall be provided. The detector shall disconnect electrical power from the vertical drive motors if a fault is detected.

(5) The vertical travel speed shall be 3.6' (1097 mm) per minute (1057 mm/min for 50 Hz applications) minimum.

(6) Hydraulic lift cylinders with mechanical stops to prevent overtravel shall be provided.

b. Horizontal Drive

A variable speed, electro-mechanical drive system shall provide horizontal travel.

(1) The PBB tires shall be solid rubber.

(2) The horizontal drive system shall use AC gearmotors with integral brakes. The AC motors shall be driven by solid state variable frequency motor controllers. The AC drive system shall provide high efficiency, smooth performance, and good component availability. The controller shall provide a variable frequency signal to provide adjustable speeds from 0 to 90' (27.4 m) per minute. The controller shall be capable of being adjusted to provide optimum responsiveness to the horizontal controls and shall provide built in diagnostics to assist with trouble shooting.

(3) A steer angle of 180° shall be possible. Steering speed shall be adjustable from 16°/sec minimum to 42°/sec maximum.

(4) A regenerative braking system shall allow the PBB to come to smooth controlled stops. Integral spring-applied electrically-released brakes shall be provided with each drive motor to lock the PBB in place when electrical power is disconnected. This shall also occur when the joystick is in the neutral position.

(5) The horizontal drive motors shall be equipped with manual brake releases allowing the PBB to be towed in the event of

power failure. Tow lugs shall be a component of the lower wheel frame.

100-3.11 Interior Finishes

The interior finish of the PBB shall be designed to be durable and easy to clean. The materials shall be time proven to withstand the environmental exposure of airport traffic. All interior finishes shall be Class A rated.

a. The ceiling shall be made of plank type panels. Each plank shall be 7-1/4" (184 mm) wide with a 3/4" (19 mm) space between adjacent planks. The planks shall run perpendicular to the tunnel centerline and continuously from wall to wall. The planks shall be manufactured from 0.020" (0.51 mm) thick aluminum, with a white baked-on enamel finish. Planks located at the ends of light fixtures shall have a black finish to match the fixtures.

b. Tunnel and rotunda interior lighting shall be provided by F32 SPX T8, Bi-Pin, 32 Watt, 2950 Lumen, High Output, Energy Saving, Cool White, Single Lamp, Flourescent Light Fixtures that are powered by instant start electronic ballast's that provide a 1.0 ballast factor. The light fixtures shall be located eight-foot (2438 mm) on center. The average light intensity at the floor shall be 18 foot candles (194 lux). Please note that lighting intensity levels vary significantly with changes in interior color designs. The measurements noted above are based on an interior design that incorporates white wallboard with light colored carpeting and white ceiling.

Single three-way switches shall be located in the rotunda and on the wall near the service door at the aircraft end of the PBB. These switches shall control interior tunnel, bubble, and rotunda lights and the weatherproof florescent cab floodlight mounted outside the cab weather door.

c. The aluminum corner molding that finishes the ends of the ceiling plank and the top edge of the wall panels shall be black to match the interior light fixtures.

d. Insulation in the ceiling shall be 1/2" (12.7 mm) thick, black, fire resistant fiberglass.

e. The subfloor in the cab and bubble area shall be 3/4" (19 mm) marine grade plywood, which has a high resistance to moisture and moisture damage. The subfloor in the remainder of the PBB shall be 3/4" (19 mm) thick American Plywood Association rated Oriented Strand Board Exposure 1.

f. Ribbed rubber 1/4" (6.4 mm) thick shall be applied to the floor from the aircraft end of the PBB to the terminal side of the service door.

g. PBB interior floor covering, other than covered in paragraph 6 above, will be carpet meeting the properties identified below:

Weave:	Tufted
Surface Texture:	Multilevel Loop
Gauge:	5/64
Face Yarn:	3-Ply Dupont BCF Antron Legacy Nylon
Face Yarn Weight:	32 ozs./sq. yd.
Width:	18" Modules
Color:	Light Gray

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DESIGNER SHALL CONFIRM CARPET TYPE WITH MAA TASK MANAGER.

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Aluminum carpet molding shall be supplied with the PBB.

h. The tunnel wall treatment shall consist of floor to ceiling high pressure laminate phenolic and melamine plastic panels. The panels shall be approximately 4' (1219 mm) on center and shall be supported by clear anodized aluminum trim with a black accent strip. The design allows each panel to be removed individually. This built-up wall structure results in an average thermal resistance R of 2.6 Hr-Ft^2 ^{o}F/BTU (.46 m^2 ^{o}C/W). The color shall be white.

The walls of the rotunda pivoting section shall be developed using a series of 2-1/2 inch (63.5 mm) wide formed galvanized steel slats that shall be connected together to develop a coiling curtain assembly.

Wall treatments in the cab pivoting section shall be galvanized steel slats. Every other slat in the cab side coiling curtain shall be equipped with a 1-1/2 inch (38mm) wide x 12 inch (305 mm) high wire glass vision panel to enhance operator visibility.

i. Other Interior Surfaces Exposed to Passengers

(1) **Surface preparation**:

(a) Contaminants shall be removed from the surface in accordance with SSPC SP-1 and appropriate SSPC commentaries.

(b) The surface shall be mechanical cleaned in accordance with SSPC SP-3 to remove loose scale and contaminants from the surface where required.

(c) The cab surface shall be dry abrasive blast cleaned in accordance with SSPC SP-6 to obtain a 1-3 mil profile.

(2) **Primer:**

One coat of Sherwin-Williams High Build "Chromate Free" Epoxy Primer E65AC8\E65RC5 (or equivalent) shall be applied. The dry film thickness shall be 2-10 mils.

(3) **Finish Coat:**

Sherwin-Williams high solids Polane H Poly- urethane (or equivalent) shall be applied. The dry film thickness shall be 2-3 mils. The color shall match the wallboard color unless otherwise specified.

The total dry film thickness shall be 4-10 mils.

j. Interior Surfaces Not Exposed to Passengers

(1) **Surface preparation:**

(a) Contaminants shall be removed from the surface in accordance with SSPC SP-1 and appropriate SSPC commentaries.

(b) The surface shall be mechanically cleaned in accordance with SSPC SP-3 to remove loose scale and contaminants from the surface where required.

(2) **Primer:**

One coat of Sherwin-Williams High Build "Chromate Free" Kem Aqua 70P (Grey E61A570) primer shall be applied. The dry film thickness shall be 1.1 mils (27 microns).

k. Small Miscellaneous Assemblies

(1) **Surface preparation:**

The surface shall be dry abrasive blast cleaned in accordance with SSPC SP-6 to obtain a 0.5-1.5 mil profile.

(2) **Finish Coat:**

One coat of Morton Int. Corvel Zinc Rich Gray Epoxy Powder #13-7004 shall be applied and heated to 350°F for 20 minutes. The finished coating thickness shall be 2-5 mils.

100-3.12 Exterior Finishes

a. Surface Preparation:

(1) Contaminants shall be removed from the surface in accordance with SSPC SP-1 (Solvent Wipe) requirements and commentaries.

(2) The surface shall then be dry abrasive blast cleaned in accordance with SSPC SP-6 (Commercial Blast Cleaning) requirement to obtain a 1-3 mil profile.

b. Primer:

One coat of Sherwin-Williams High Build Epoxy Chromate Free Primer E65 AC8\E65RC5 shall be applied over the prepared surface to a dry film thickness shall be 3-17 mils (75-425 microns).

c. Finish Coat:

One finish coat of Sherwin-Williams polane (aliphatic) high solids, catalyzed, pigmented Polyurethane, shall be applied over the primer coat at a dry film thickness shall be 2-3 mils (50-75 microns). The color shall be white.

The total exterior finish shall provide a minimum dry film thickness shall be 6 mils (150 microns).

DESIGN CRITERIA FOR NEW PBBS AND NEW FOUNDATIONS

100-4 The PBB shall be designed in accordance with good engineering practices and the standards developed and adopted by the passenger boarding bridge industry. Particular attention shall be given to keeping components simple, rugged and easily accessible for routine maintenance, including lubrication, component exchange and

ease of adjustment. All access panels and openings shall be sized to accommodate the component being changed or adjusted, as well as the equipment and personnel necessary to accomplish the work.

100-4.1 Environmental Considerations, The PBB shall operate satisfactorily under ambient temperature conditions of -25 °F (-32 °C) to 125 °F (52 °C), with wind up to 60 mph (97 kph). All components and materials shall be individually and collectively designed or selected for long service life under such conditions.

100-4.2 Power Requirements. The PBB shall operate on 480/277 V.A.C., 3 phase, 60 Hz. Wye configuration with neutral and separate ground (5 wire). The 480 V.A.C. shall be transformed to 120/240 VAC for lighting and controls.

100-4.3 Structural Loads

a. The PBB shall support the following loads. These loads may be applied in total or in part, singularly or simultaneously. The design shall be based on the combination that imposes the most adverse loading. PBB manufacturer shall confirm that PCAir and 400Hz unit dead loads submitted by the Contractor can be supported on the new bridges. In addition to the dead loads and strain caused by movement, the entire PBB shall support:

(1) A live load of 40 pounds per square foot (psf) (195 kg/m^2)

(2) A retracted and stowed wind load of: 25 psf (122 kg/m^2) or an approximate wind velocity of 90 mph (145 kph).

An operation wind load of: 12.5 psf (61 kg/m^2) or an approximate wind velocity of 60 mph (97 kph).

(3) A roof load of 25 psf (122 kg/m^2).

b. The structural design shall provide sufficient torsional rigidity to avoid excessive sway when the PBB is brought to a gradual stop.

c. All mechanisms for actuating, guiding and restraining the PBB and its components shall be designed to minimize noise and sway so that no sense of insecurity shall be apparent to passengers. No operating loads shall be transmitted to the terminal building.

100-4.4 Structural Support Elements (Foundation Design)

a. It shall be the Contractor's responsibility to design the foundations for the Passenger Boarding Bridges based on load data provided by the bridge manufacturer. Foundation designs shall be submitted to the Engineer for information and record. Designs shall be signed and sealed by a professional engineer registered in the state of Maryland.

b. Anchor Bolt Assemblies: Anchor Bolts shall be ASTM A36 or ASTM A307 material. Bolts, nuts, washers, and related components shall be hot-dipped galvanized in accordance with ASTM A 123 and ASTM A 153.

All anchor bolts shall be properly protected from bending and damage during, and after construction. The Contractor shall furnish layout templates, anchor bolts, anchor and leveling nuts, as required to complete the installation. Nuts shall meet the requirements of ASTM A 449 and shall be galvanized. In addition, after installation, tack welds shall anchor the nuts to the base. All zinc coating removed or damaged by welding or by any other reason shall be cleaned and repaired with galvanizing repair primer meeting the requirements of FS TT-P-641 G (1).

c. The Contractor shall confirm the PBB configuration and foundation locations prior to fabricating any materials associated with the support column. Exact shaft locations and anchor bolt configuration may vary based on the actual PBB manufacturer and Model being provided. The Contractor shall provide drawings and template location for all anchor bolt locations and detailing all work required to set the anchor bolts. Any expense incurred because of any error in setting anchor bolts shall be borne by the Contractor.

d. An approved non-shrinking, grout shall be used underneath the column baseplate and leveling-plate. Grout shall be a no-iron mix to preclude unsightly rust marks.

CODES, REGULATIONS, AND REFERENCES

100-5 PBBs shall be designed to meet U.S. Codes and Regulations that have been adopted by the passenger boarding bridge industry as described below.

100-5.1 Structural

a. American Institute of Steel Construction (AISC) Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings.

b. American Welding Society (AWS) Standards.

c. Structural Design and Corrugated Steel Panels based on Van Karmon Theory and on buckling studies by Peterson and Card.

100-5.2 Material

Structural Plate/Steel/Shapes:	ASTM-A36
Structural Tube:	ASTM-A500
Steel Pipe:	ASTM-A53
Steel Sheet:	ASTM-A570
Steel Plate:	ASTM-A514
Hinge Pins:	ASTM-A311 Grades 1018 & 1144
Bolts:	High Strength SAE-J429 Grades 5 & 8 or ASTM-A325 & A440

100-5.3 Mechanical. All mechanical components and designs shall conform to the recommendations and standards established by the Society of Automotive Engineers (SAE) and the American Society of Mechanical Engineers (ASME).

100-5.4 Electrical. The PBB shall be listed by ETL Testing Laboratories, an NRTL testing laboratory, for conformance to ANSI/UL-325. All equipment and methods of installation shall conform, where applicable, to the requirements and recommendations of the National Electrical Manufacturers Association (NEMA) and the National Electrical Code (NEC) latest issue.

100-5.5 Fire Protection. PBBs shall meet the requirements of the National Fire Protection Association (NFPA) 415, "Standard on Airport Terminal Buildings, Fueling Ramp Drainage, and Loading Walkways," and NFPA 101, "Life Safety Code."

100-5.6 Paint. Surface preparation and painting of the PBB shall conform to the guidelines and standards of the Structural Steel Painting Council (SSPC).

MANUALS AND TRAINING

100-6.1 Operation and Maintenance manuals shall follow the intent of the Air Transport Association (ATA) Specification 101 and shall include preventative maintenance requirements and problem solving procedures.

100-6.2 Operation and maintenance manuals shall be provided to the Engineer by the Contractor:

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DESIGNER TO INSERT NUMBER BASED ON FOLLOWING SCHEDULE:

a. One PBB - Three Operation and Maintenance Manuals.

b. Two PBBs - Four Operation and Maintenance Manuals.

c. Three PBBs - Five Operation and Maintenance Manuals.

d. Four or More PBBs - Six Operation and Maintenance Manuals.

****

100-6.3 PBB operator training shall be provided, by PBB type, at scheduled times during the installation. The training schedule shall be set by the MAA for uninterrupted four-hour blocks per PBB type between 8:00 a.m. and 5:00 p.m. during the standard workweek.

WARRANTY

100-7.1 The Contractor shall warrant that the PBBs and all components and accessories comply with the requirements of the contract documents, including approved drawings and this specification. The PBB shall perform to the design function for a minimum period of one (1) year from the date of final acceptance of the PBB by the Owner. Failures caused by normal wear and tear, acts of God, and modifications by the Owner, which have not been approved by the manufacturer, will be excluded from the coverage in this section.

100-7.2 The Contractor shall warrant that the PBBs and all their components are new and manufactured using new materials, are of good quality, are suitable use on aircraft, and are free and clear from liens, encumbrances and title defects.

100-7.3 The Contractor (and/or the manufacturer of the PBB, as applicable) further agrees to repair or replace any warranty defect, including both parts and labor, at his expense, within twenty-four (24) hours of notification from the Owner.

100-7.4 The Contractor (and/or the manufacturer of the PBB, as applicable) further agrees to repair or replace (parts and labor), at his expense, within twenty-four (24) hours, any defect which constitutes a breach of warranty, provided the Contractor is notified of such defect within twelve (12) months following the date of formal written Final Acceptance by the Owner.

100-7.5 Upon Owner's submission of a claim as provided above and following its substantiation, Contractor (and/or the manufacturer of the PBB, as applicable) shall at its option either (1) repair or replace its product or work at the final delivery point or (2) refund an equitable portion of the purchase price.

100-7.6 Failure caused by: (a) Owner's abuse (b) acts of God, which shall include but not be limited to hurricanes, earthquakes, and natural disasters are specifically excluded from the coverage of this section.

CONSTRUCTION METHODS

100-8.1 **General.** The Contractor shall install the Passenger Boarding Bridges at the locations indicated in the Contract Drawings.

100-8.2 **Transport and Deliveries.** Removal and transport to the storage location shall be coordinated with the Engineer and MAA Operations. Delivery of new Passenger Boarding Bridges shall be coordinated with MAA Operations and occur at BWI Gate 55. Contractor will be required to provide security in compliance with the security requirements at Gate 55 when deliveries or transport of the PBBs are scheduled.

100-8.3 **Foundations.** The Contractor shall be required to install new or reinstall existing Passenger Boarding Bridges on existing foundations. Any modifications to the foundations will need to be designed, signed and sealed by a PE registered in the State of Maryland and submitted to Engineer for information and record prior to the installation.

100-8.4 **Utilities.** The Contractor shall be responsible for all interface connections between the PBB and the building systems. During removal, installation, or re-installation, the contractor shall coordinate with MAA Maintenance regarding disassembly and reconnection of building systems with the PBB.

100-8.5 **Safety and Weathersealing.** Prior to removal of the PBB, the Contractor shall submit to the Engineer a plan for temporarily covering the opening left by the PBB removal. The covering shall be weathertight to prevent any penetration of water into the building as a result of the removal of the PBB.

100-8.6 **Testing.** After installation or re-installation of a Passenger Boarding Bridge, the Contractor and a Manufacturer Representative of the Passenger Boarding Bridge shall test the PBB according to the Specifications and the satisfaction of the Engineer. The operation of each PBB shall undergo an aircraft test park for the most demanding aircraft docking procedures to ensure proper mating of the PBB to the aircraft. Temporary tape shall be used for the stop bar and lead-in lines for the aircraft test park. Following a successful test part, the final pavement marking for the aircraft may be placed. If any problems are encountered with regards to the Passenger Boarding Bridge the Contractor shall correct at his expense and to the Engineer's satisfaction and re-tests.

METHOD OF MEASUREMENT

****

DESIGNER SHALL DEFINE THE METHOD OF MEASUREMENT BASED ON THE TYPE OF PROCUREMENT FOR THE PROJECT. THE MAA TASK MANAGER SHOULD APPROVE THE METHOD OF MEASURMENT AND THE ITEMS INCLUDED. A STANDARD LIST IS PROVIDED.

****

100-9.1 PASSENGER BOARDING BRIDGE REMOVAL AND STORAGE: The work for this item shall be measured per each and includes performing all mechanical and electrical system disconnects, removal of the bridge from the foundation, protection of the terminal gate openings, transport of the bridge to the storage location identified on the Contract Documents, protection of the PBB from damage during transport and storage, and provision of all materials, labor, transport, handling, storage materials and fees, and other associated items necessary to accomplish this work.

100-9.2 PASSENGER BOARDING BRIDGE REMOVAL AND DISPOSAL: The work for this item shall be measured per each and includes performing all mechanical and electrical system disconnects, removal of the bridge from the foundation, protection of the terminal gate openings, transport to an approved disposal site, and provision of all materials, labor, transport, handling, storage materials, disposal fees, and other associated items necessary to accomplish this work.

100-9.3 PASSENGER BOARDING BRIDGE REINSTALLATION WITH FIXED SECTION INSTALLATION: The work for this item shall be measured per each and includes transport from the storage area, installation of the bridge onto an existing foundation, performing all mechanical and electrical system connections, protection of PBB and terminal gate openings, fixed section installation, and other incidentals as shown on the plans. This item also includes electrical and communication capacity upgrades required for the bridges.

100-9.4 PASSENGER BOARDING BRIDGE REINSTALLATION WITHOUT FIXED SECTION INSTALLATION: The work for this item shall be measured per each and includes transport from the storage area, installation of the bridge onto an existing foundation, performing all mechanical and electrical system connections, protection of PBB and terminal gate openings, and other incidentals as shown on the plans. This item also includes electrical and communication capacity upgrades required for the bridges.

100-9.5 FURNISH AND INSTALL A NEW PASSENGER BOARDING BRIDGE: The work shall be measured per each and includes the purchase, delivery, and transport of the new bridge, storage and protection of the PBB as needed prior to installation, installation of the bridge onto an existing foundation, performing all mechanical and electrical system connections, protection of PBB and terminal gate openings,

furnishing of all materials (including the pantograph), labor, testing, certifying, handling, equipment, tools, and all associated effort required to accomplish this work. This item also includes provision of Operations and Maintenance Manuals to the Engineer and provision and coordination of Training for the users.

100-9.6 PASSENGER BOARDING BRIDGE FOUNDATION CONSTRUCTION: The work shall be measured per each and includes the furnishing of all materials, labor, design, testing, certifying, handling, equipment, tools, and all associated effort required to complete this item.

100-9.7 PASSENGER BOARDING BRIDGE FOUNDATION MODIFICATION: This work shall be measured per each and includes the furnishing of all materials, labor, design, testing, certifying, handling, equipment, tools, and all associated effort required to complete this item.

BASIS OF PAYMENT

****

DESIGNER SHALL SELECT THE PAY ITEMS BASED ON THE TYPE OF PROCUREMENT METHOD FOR THE BRIDGES. THE ITEMS SHALL BE DISCUSSED AND APPROVED BY THE TASK.

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100-10 The accepted quantities for the items listed under Method of Measurement shall be paid for at the Contract unit price per each, complete and accepted in place.

Payment will be made under:

Item PBB 100-10.1	Passenger Boarding Bridge Removal and Storage – Per Each
Item PBB 100-10.2	Passenger Boarding Bridge Removal and Disposal – Per Each
Item PBB 100-10.3	Passenger Boarding Bridge Reinstallation with Fixed Section – Per Each
Item PBB 100-10.4	Passenger Boarding Bridge Reinstallation without Fixed Section – Per Each
Item PBB 100-10.5	Furnish and Install a New Passenger Boarding Bridge – Per Each
Item PBB 100-10.6	Passenger Boarding Bridge Foundation Construction – Per Each
Item PBB 100-10.7	Passenger Boarding Bridge Foundation Modification – Per Each

END OF ITEM PBB-100

COMMUNICATIONS SYSTEMS AND INFRASTRUCTURE SPECIFICATIONS

MARTIN STATE AIRPORT

BWI BALTIMORE/WASHINGTON INTERNATIONAL Thurgood Marshall AIRPORT

270000-TC – COMMON WORK FOR TELECOMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Maryland Department of Transportation/Maryland Aviation Administration Standard Provisions for Construction Contracts Volume 1, Maryland State Highway Administration, Anne Arundel County and Interim Standard Addenda; and other Division 01 Specification sections, apply to this Section.

B. Related Sections:

271343-TC	Communications Services Cabling
270526-TC	Grounding and Bonding
270528-TC	Hangers and Support
271116-TC	Cabinets, Racks, Frames and Enclosures
271119-TC	Termination Blocks and Patch Panels
271313-TC	Cable Splicing and Termination
271323-TC	Optical Fiber Splicing and Terminations
271519-TC	Horizontal Cabling
271543-TC	Faceplates and Connectors for Systems
270553-TC	Identification
275116-TC	PA and Emergency Tenant Paging

1.2 SUMMARY

A. Section Includes:

1. Communications equipment coordination, submittal, and warranty requirements.

2. Common communications equipment installation requirements.

1.3 DEFINITIONS

A. DCI: Designer, contractor or installer.

B. OT: Maryland Aviation Administration Office of Technology

1.4 REFERENCES

A. The publications listed below form a part of this specification. The publications are referred to in the text by basic designation only.

B. Specific reference in specifications to codes, rules, regulations, standards, manufacturer's instructions, or requirements of regulatory agencies shall mean the latest printed edition of each in effect at the date of contract unless the document is shown dated.

C. Conflicts:

1. Between referenced requirements: Comply with the one establishing the more stringent requirements.

2. Between referenced requirements and contract documents: Comply with the one establishing the more stringent requirements.

3. OT Engineer will make final determination between conflicts

D. References:

1. Underwriters Laboratories Inc. (UL) Cable Certification and Follow Up Program

2. National Electrical Manufacturers Association (NEMA)

3. National Electrical Code (NFPA-70)

4. National Electrical Safety Code (NESC)

5. Building Industry Consulting Service International (BICSI) Telecommunications Distribution Methods Manual (TDMM)

6. Local, county, state and federal regulations and codes in effect as of date of purchase

7. Equipment of foreign manufacture must meet U.S. codes and standards. It shall be indicated in the proposal the components that may be of foreign manufacture, if any, and the country of origin.

1.5 SUBMITTALS

A. The DCI shall perform no portion of the work requiring submittal and review of record drawings, shop drawings, product data, or samples until the respective submittal has been approved by the OT. Such work shall be in accordance with approved submittals.

B. Qualifications: The DCI shall submit qualification data sheets for firms and persons as specified in the “Quality Assurance” article of this specification to demonstrate their capabilities and experience.

C. Proposed product data sheets: The DCI shall submit catalog cut-sheets that include manufacturer, trade name, and complete model number for each product specified. Model number shall be handwritten and/or highlighted to indicate exact selection. Identify applicable specification section reference for each product.

D. Samples: The DCI shall provide one sample of each type of cable for testing and approval by the OT upon request.

E. Testing Plan: The DCI shall provide a test plan for testing prior to beginning testing. The following minimal items shall be submitted for review:

1. All testing methods

2. Product data for test equipment

3. Certifications and qualifications of all persons conducting the testing

4. Calibration certificates indicating that equipment calibration meets National Institute of Standards and Technology (NIST) standards and has been calibrated at least once in the previous calendar year

5. Examples of test reports, including all graphs, tables, and charts necessary for display of testing results

F. Testing Reports: The DCI shall submit cable test reports as follows:

1. Submit certification test reports of DCI-performed tests

2. The tests shall clearly demonstrate that the media and its components fully comply with the requirements specified herein.

3. Electronic and hardcopy versions of test reports shall be submitted together and clearly identified with cable identification.

4. Submit data electronically on CD-ROM in Microsoft Excel format, listing products furnished, including:

5. Manufacturer's name

6. Manufacturer's part numbers

G. Record Drawings: Furnish CAD drawings of completed work including cable ID numbers following the OT's labeling standards. Submit in hardcopy (two full size and two half size) and electronic formats.

H. Standard products:

1. Equipment and materials shall be standard products of a manufacturer regularly engaged in the manufacture of structured cabling products and shall be the manufacturer's latest standard design.

2. Items of the same classification shall be identical. This requirement includes equipment, modules, assemblies, parts, and components.

3. All components of each kind shall be covered by a single warranty program with a single point of contact. Cable and connecting hardware shall be manufactured by the same company or be part of the same system, i.e. warranted by the manufacturer(s) as one system.

1.6 WARRANTY

A. The DCI shall provide a joint written warranty of the manufacturer(s) and the installer(s), on a single document. The document shall warrant complete installation of the equipment, system to be free from defects in materials and workmanship for a period of no less than 20 years for copper and 25 years for fiber, starting with the date of Final System Acceptance.

B. DCI shall warrant that all approved components meet or exceed the specifications provided in the product data submittal and exceed standards referenced for the warranty period. The warranty shall apply to all components.

C. The DCI shall warrant that the proposed merchandise will conform to its description and any applicable specifications, and shall be of good quality for the known purpose for which it is intended.

D. The product warranty shall cover the replacement or repair of defective products and labor for the replacement or repair of such defective products.

1.7 MAINTENANCE AND SUPPORT

A. System Assurance: The System Assurance shall cover the failure of the system to support the application which it was designed to support, as well as additional application(s) introduced in the future for the warranty period.

B. System Certification: Upon successful completion of the installation and subsequent inspection, the DCI shall be provided with a numbered certificate, from the manufacturing company, registering the installation.

C. Support Availability: The DCI shall commit to make available local support for the product and system during the Warranty period.

1.8 PROJECT CONDITIONS

A. Verify that field measurements are as shown on Project Documents; no media, fiber or copper, shall be installed in lengths surpassing Standards based length requirements.

B. Cable routing shown on Drawings is approximate unless dimensioned. Route cable as required to meet Project Conditions.

C. Where cable routing is not shown, and destination only is indicated, determine exact routing and lengths required. Record actual routing on as-builts including, but not limited to all conduit larger that ¾ inch, all exterior conduit/cabling, and all Work Area communications outlet information.

1.9 DELIVERY AND STORAGE

A. Equipment shall be delivered in original packages with labels intact and identification clearly marked.

B. Equipment shall not be damaged in any way and shall comply with manufacturer's operating specifications.

C. Equipment and components shall be protected from the weather, humidity, temperature variations, dirt, dust, or other contaminants. Equipment damaged prior to system acceptance shall be replaced at no cost to the OT.

1.10 COORDINATION

A. Determine required separation between other work.

B. Coordinate to avoid interference with other work disciplines.

C. Coordinate installation with other trades and furniture installers.

D. Coordinate with all DCIs providing equipment outside the scope of this contract.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify liquid-carrying pipes are not installed in or above voice and data system communications rooms. Do not proceed with installation in affected areas until removed.

3.2 INSTALLATION

A. Install work following drawings, manufacturer's instructions and approved submittal data.

B. All installation shall be done in conformance with standards, BICSI methods, industry standards and manufacturers' installation guidelines. The DCI shall ensure that the maximum pulling tensions of the specified distribution cables are not exceeded and cable bends maintain the proper radius during the placement of the facilities. Failure to follow the appropriate guidelines shall require the DCI to provide in a timely fashion the additional material and labor necessary to properly rectify the situation. This shall also apply to any and all damages sustained to the cables by the DCI during the implementation.

C. Test Equipment

1. Test equipment used under this contract shall be from manufacturers that have a minimum of 5 years experience in producing field test equipment. Manufacturers shall be ISO 9001 certified.

2. The test instrument shall be within the calibration period recommended by the manufacturer.

3. Test instruments shall have the latest software and firmware installed.

4. All test tools of a given type shall be from the same manufacturer, and have compatible electronic results output.

5. Test adapter cables shall be approved by the manufacturer of the test equipment. Adapters from other sources are not acceptable.

6. All test equipment purchased for use under these tasks shall become the property of the MAA upon systems acceptance. The MAA reserves the right to provide test equipment for the use of the DCI

D. No system shall be put into service until it is fully tested and accepted by the OT.

E. Install work following drawings, manufacturer's instructions and approved submittal data.

F. Equipment Clearances

1. Clearance distances are measured from the outermost surface of devices installed in rack or mounted on wall, rather than from the rack or backboard.

2. Provide a minimum of three feet of space in front and rear of cabinets and racks.

3. Provide a minimum of one-foot side clearance in corners.

4. Provide a minimum of one-foot clearance above cable tray/ladder rack.

5. Provide a minimum of one-foot clearance above top-most item (cable tray, ladder rack or fiber trough) to any ceiling or overhead condition.

3.3 CLEANING

A. Remove all unnecessary tools and equipment, unused materials, packing materials, and debris from each area where Work has been completed unless designated for storage on a daily basis unless directed by OT.

3.4 ACCEPTANCE

A. Once all work has been completed, test documentation has been submitted and approved, and the OT is satisfied that all work has been completed in accordance with contract documents, the OT will notify DCI in writing of formal acceptance of the system.

B. Acceptance shall be subject to completion of all work, successful post-installation testing which yields 100 percent PASS rating, and submittal and approval of full documentation as described above.

C. OT reserves the right to conduct, using DCI equipment and labor, a random re-test of up to five percent of the cable plant to confirm documented results. Random re-testing, if performed, shall be at the expense of the DCI, using standard labor rates. Any failing cabling shall be re-tested and restored to a passing condition at no cost to the OT. In the event more than two percent of the cable plant fails during re-test, the entire cable plant shall be re-tested and restored to a passing condition at no additional cost to the OT.

C. OT may agree to allow certain cabling runs to exceed standardized performance criteria (e.g. length). In this event, such runs shall be explicitly identified and excluded from requirements to pass standardized tests.

END OF SECTION 270000-TC

270526-TC - GROUNDING AND BONDING FOR TELECOMMUNICATIONS SYSTEMS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Maryland Department of Transportation/Maryland Aviation Administration Standard Provisions for Construction Contracts Volume 1, Maryland State Highway Administration, Anne Arundel County and Interim Standard Addenda; and other Division 01 Specification sections, apply to this Section.

1.2 SUMMARY

A. Section includes:

1. General requirements for providing all labor, materials, tools and equipment required for the complete installation of work called for in the Construction Documents.

2. Descriptions of the the products and execution requirements relating to furnishing and installing Grounding/Earthing and Bonding for Communications Systems.

3. Minimum requirements for the following:

   a. Grounding/Earthing System

   b. Telecommunications Grounding Busbar (TGB)

   c. Telecommunications Main Grounding Busbar (TMGB)

   d. Telecommunications Bonding Backbone (TBB)

   e. Rack Grounding/Earthing and Bonding

4. Product specifications, general design considerations, and installation guidelines are provided in this document. Quantities of grounding/earthing products, typical installation details and cable routing will be provided as an attachment to this document.

1.3 SUBMITTALS

A. Submittal requirements shall be in accordance with Section 270000-Common Work for Telecommunications Systems.

1.4 DEFINITIONS

A. The purpose of the grounding/earthing system is to create a low impedance path to earth ground for electrical surges and transient voltages. Lightning, fault currents, circuit switching (motors turning on and off), and electrostatic discharge are common causes of these surges and transient voltages. An effective grounding/earthing system minimizes the detrimental effects of these electrical surges, which include degraded network performance and reliability and increased safety risks.

B. Bonding – The permanent joining of metallic parts to form an electrically conductive path that will assure electrical continuity and the capacity to conduct safely any current likely to be imposed.

C. Common Bonding Network (CBN) – The principal means for affecting bonding and earthing inside a building.

D. Ground/Earth – A conducting connection, whether intentional or incidental, by which an electric circuit or equipment is connected to earth, or to some conducting body of relatively large extent that serves in place of the earth.

E. Retrofit Rack Grounding/Earthing – The application of grounding/earthing products and technology where equipment is already deployed and functioning.

1.5 REFERENCES

A. The following industry standards are the basis for the grounding/earthing and bonding system described in this document.

TIA/EIA	
TIA-942	Telecommunications Infrastructure Standard for Data Centers
J-STD-607-A	Commercial Building Grounding/Bonding Requirements
TIA/EIA-606	Administration Standard for the Telecommunications Infrastructure of Commercial Buildings
IEEE	
Std 1100	IEEE Recommend Practice for Powering and Grounding Electronic Equipment (IEEE Emerald Book)
NFPA	
NFPA-70	National Electric Code (NEC)

B. Conflicts:

1. If the bid documents are in conflict, this specification shall take precedence.

2. The most recent versions of all documents apply to this project. If there is a conflict between applicable documents, the order above shall dictate the order of precedence in resolving the issue unless an enforceable local or national code is in effect.

1.6 QUALITY ASSURANCE

A. The communications grounding system shall be designed and/or approved by a qualified PE, licensed in the state that the work is to be performed. The communications grounding system shall adhere to the recommendations of the ANSI/TIA-942 and J-STD-607-A standards, and shall be installed in accordance with best industry practice.

B. A licensed electrical contractor shall perform installation and termination of the main bonding conductor to the building service entrance ground.

C. The successful vendor shall meet or exceed all requirements for the cable system described in this document.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. STRUCTUREDGROUND™ Grounding System (STRUCTUREDEARTH™ Earthing System) or approved equal kits, components, and hardware shall be used to construct the grounding/earthing system.

2.2 EQUIPMENT

A. Use lugs when connecting conductors to the TMGB and TGB.

2.3 GROUNDING/EARTHING SYSTEM

A. The ground/earth system must be designed for high reliability. Therefore, the grounding/earthing system shall meet following criteria:

1. Local electrical codes shall be adhered to.

2. The grounding/earthing system shall comply with ANSI/TIA-942 and J-STD-607-A.

3. All grounding/earthing conductors shall be copper.

4. Lugs, HTAPs, grounding strips, and busbars shall be UL Listed and made of premium quality tin-plated electrolytic copper that provides low electrical resistance while inhibiting corrosion. Antioxidant shall be used when making bonding connections in the field.

5. Wherever possible, two-hole lugs shall be used because they resist loosening when twisted (bumped) or exposed to vibration. All lugs shall be irreversible compression and meet NEBS Level 3 as tested by Telcordia. Lugs with inspection windows shall be used in all non-corrosive environments so that connections may be inspected for full conductor insertion (battery rooms are an exception where windowless lugs may be used).

6. Die index numbers shall be embossed on all compression connections to allow crimp inspection.

7. Cable assemblies shall be UL Listed and CSA Certified. Cables shall be a distinctive green or green/yellow in color, and all jackets shall be UL, VW-1 flame rated.

PART 3 – EXECUTION

3.1 INSTALLATION

A. The grounding/earthing system must be intentional, visually verifiable, adequately sized to handle expected currents safely, and directs these potentially damaging currents away from sensitive network equipment. As such, grounding/earthing must be purposeful in its design and installation. Four issues require special consideration:

1. Although AC powered equipment typically has a power cord that contains a ground/earth wire, the integrity of this path cannot be easily verified. Thus, many equipment manufacturers require grounding/earthing above and beyond that which is specified by local electrical codes, such as the National Electrical Code, etcetera. Always follow the grounding/earthing recommendations of the manufacturer when installing equipment.

2. While the building steel and metallic water piping must be bonded to the grounding/earthing system for safety reasons, neither may be substituted for the telecommunications bonding backbone (TBB).

3. Electrical continuity throughout each rack or cabinet is required to minimize safety risks. Hardware typically supplied with bolt-together racks is not designed for grounding/earthing purposes. Additionally, most racks are painted. Paint is an insulator. Unless rack members are deliberately bonded, continuity between members is incidental, and in many cases, unlikely.

4. Any metallic component that is part of the data center, including equipment, racks, ladder racks, enclosures, cable trays, etc. must be bonded to the grounding/earthing system with a 1 ohm resistance between 2 points.

B. Grounding/Earthing and Bonding

1. The Telecommunications Grounding Busbar (TGB) in each telecommunications space will be grounded/earthed to the Telecommunications Main Grounding Busbar (TMGB) located at the service entrance. The gauge of the connecting ground/earth cable, known as the Telecommunications Bonding Backbone (TBB) will follow J-STD-607-A guidelines, as is shown in the table below.

Sizing of the TBB	
TBB Length in Linear meters (feet)	TBB Size (AWG)
Less than 4 (13)	6
4-6 (14-20)	4
6-8 (21-26)	3
8-10 (27-33)	2
10-13 (34-41)	1
13-16 (42-52)	1/0
16-20 (53-66)	2/0
Greater than 20 (66)	3/0

2. The TMGB will be bonded to building steel and grounded/earthed to the electrical service ground according to BICSI TDM Manual and J-STD-607-A guidelines. Local codes may supersede these requirements. In telecommunications spaces with only one rack, the rack jumper cable can be connected directly to the TGB.

3. Cable Sizes for Other Grounding/Earthing Applications

Cable Sizes for Other Grounding/Earthing Applications	
Purpose	Copper Code Cable Size
Aisle grounds (overhead or under floor) of the common bonding network	#2 AWG or larger (1/0 preferred)
Bonding conductor to each PDU or panel board serving the room.	Size per NEC 250.122 & manufacturer recommendations
Bonding conductor to HVAC	6 AWG

equipment	
Building columns	4 AWG
Cable ladders and trays	6 AWG
Conduit, water pipe, duct	6 AWG

4. Route the TBB to each TGB in as straight a path as possible. The TBB should be installed as a continuous conductor, avoiding splices where possible. Use HTAP kits to provide a tap from the TBB to each TGB. When more than one TBB is used, bond them together using the TGBs on the top floor and every third floor in between with a conductor known as a Grounding Equalizer (GE). Use the J-STD-607-A guidelines for sizing of the TBB when sizing the GE (shown in the table above).

5. Avoid routing grounding/earthing conductors in metal conduits. If the grounding/earthing conductor must be routed through a metal conduit, bond each end of the conduit to the grounding/earthing conductor. Use grounding clamps to bond to the conduit, and a #6 AWG copper conductor to connect the GPL grounding clamp to the HTWC HTAP.

C. Rack Grounding/Earthing

1. Equipment and racks shall be bonded in accordance with the methods prescribed in ANSI/TIA-942, as is shown in the figure below.

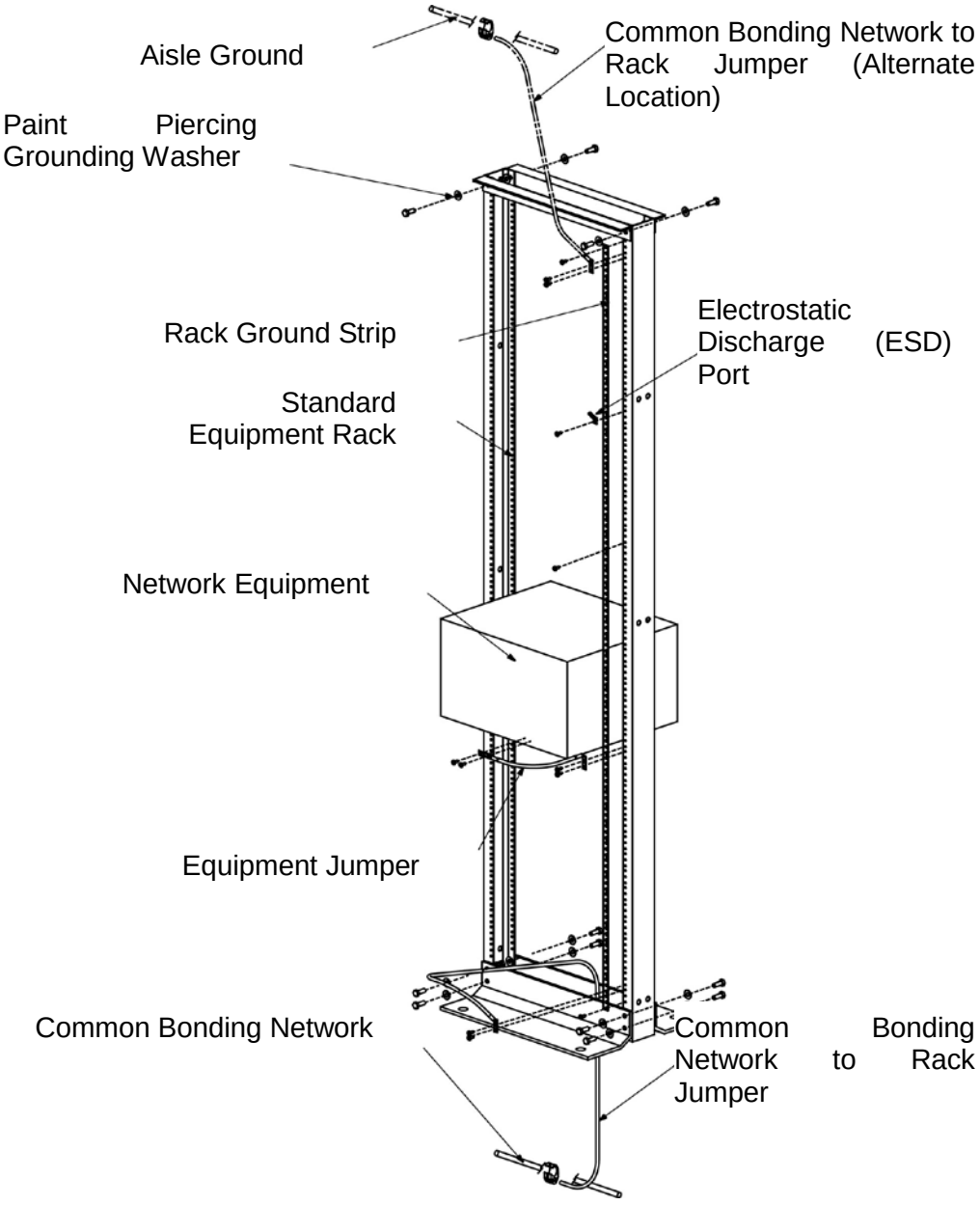


Figure 1 - Properly Grounded/Earthed Rack (Back of Rack Shown)

2. To provide electrical continuity between rack elements, paint piercing grounding washers, shall be used where rack sections bolt together, on both sides, under the head of the bolt and between the nut and rack.

3. When the equipment manufacturer provides a location for mounting a grounding connection, that connection shall be utilized. Use the appropriate jumper for the equipment being installed and the thread-forming screws provided in the kit.

4. Do not bond racks or cabinets serially. Use the copper compression HTAP that comes with the kit to bond the conductor to the common bonding network.

D. Retrofit Rack Grounding/Earthing

1. If the racks already have network equipment installed, it may not be feasible to install the rack ground strip without disrupting data cables. Further, it may be undesirable to disassemble rack hardware to install paint piercing grounding washers

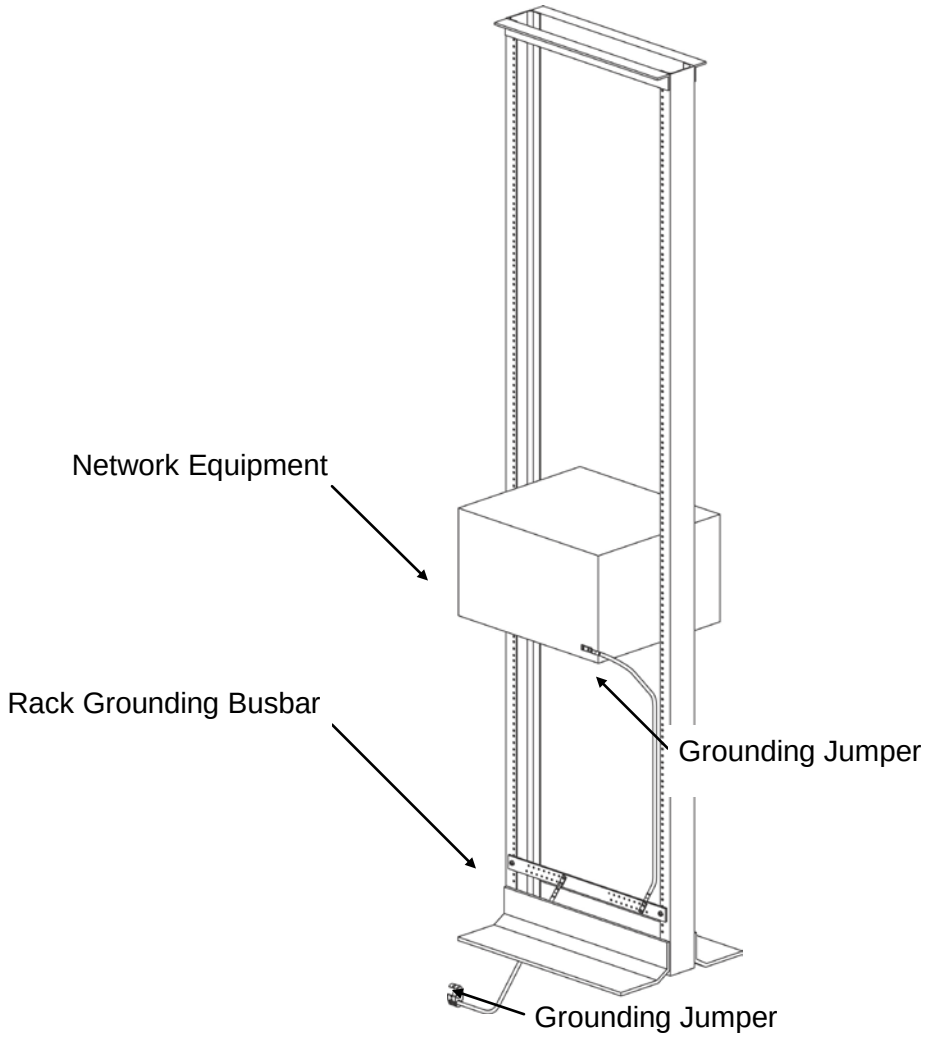


Figure 2 - Retrofit Rack Grounding/Earthing

2. RGW paint piercing grounding washers are not used in this scenario. Thus, the grounding busbar provides continuity through the vertical channels of the rack, but not the top and bottom of the rack. Thus, wherever practical, the solution using the RGS rack grounding strip and the RGW paint piercing washers shall be used instead of the retrofit rack grounding kits.

3. All other grounding/earthing requirements apply to retrofit installations without exception.

END OF SECTION 270526-TC

270528-TC - HANGERS AND SUPPORT FOR TELECOMMUNICATIONS SYSTEMS

PART I – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Maryland Department of Transportation/Maryland Aviation Administration Standard Provisions for Construction Contracts Volume 1, Maryland State Highway Administration, Anne Arundel County and Interim Standard Addenda; and other Division 01 Specification sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Descriptions of the products and execution requirements relating to furnishing and installing Telecommunications Cabling. Communication cabling support is covered under this document.

2. This section includes minimum requirements for the following:

   a. J-Hooks (not MAA standard, Not allowed without an approved variance)

   b. Threaded Rod Cover

   c. Stackable Cable Rack Spacers

   d. Cable Management

3. Product specifications, general design considerations, and installation guidelines are provided in this document. Quantities of telecommunications outlets, typical installation details, cable routing and outlet types will be provided as an attachment to this document.

1.3 SUBMITTALS

A. Submittal requirements shall be in accordance with Section 270000-Common Work for Telecommunications Systems.

1.4 REFERENCES

A. The following industry standards are the basis for the structured cabling system described in this document.

TIA/EIA	
TIA/EIA-568-B	Commercial Building Telecommunications Cabling Standard
TIA/EIA-569-A	Commercial Building Standard for Telecom Pathways and Spaces
TIA/EIA-606	Administration Standard for the Telecommunications Infrastructure of Commercial Buildings
TIA/EIA-607	Commercial Building Grounding/Bonding Requirements
NFPA	
NFPA-70	National Electric Code (NEC)-1999 ISO/IEC ISO/IEC 11801Generic Cabling for Customer Premises

B. Conflicts:

1. The most recent versions of all documents apply to this project. If there is a conflict between applicable documents, the order above shall dictate the order of precedence in resolving the issue unless an enforceable local or national code is in effect.

2. If the bid documents are in conflict, this specification shall take precedence.

1.5 QUALITY ASSURANCE

A. The successful vendor shall meet or exceed all requirements for the cable system described in this document.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. *J-MOD* ™ Cable Support System or approved equal. Open top cable supports shall be utilized as a pathway for communication cabling. The J Hook cable supports shall be manufactured from a non-conductive material suitable for use in air-handling spaces. The cable support must maintain complete horizontal and vertical 1" bend radius control and must manage up to 50 four-pair UTP cables. The system must allow for the ability to add future cable routing capacity. The cable support must provide the ability to retain the cable bundle with *TAK-TY* ® Hook & Loop Cable Ties or approved equal.

Part Number	Description	Material*	Maximum Static Load (Lbs.)
	J Hook for wall mount applications	Nylon	30
	J Hook for use with brackets	Nylon	30
	Chaining Bracket	Galvanized Steel	120
	Ceiling Mount Bracket – 1 level	Galvanized Steel	180
	Ceiling Mount Bracket – 3 level	Galvanized Steel	180
	Drop Wire Bracket – 1 level	Galvanized Steel	20
	Drop Wire Bracket – 3 level	Galvanized Steel	40
	Threaded Rod Bracket – 1 level	Galvanized Steel	180
	Threaded Rod Bracket – 3 level	Galvanized Steel	180
	Screw-on Beam Clamp Bracket – 1 level	Galvanized Steel	180
	Screw-on Beam Clamp Bracket – 3 level	Galvanized Steel	180

** Not for use with chaining brackets

‡ Available in natural and black

* Suitable for use in air handling spaces per UL 2043. Listed in accordance with CAN/ULC S102.2 when mounted as single units or in pairs. Minimum spacing of 4 ft. (1220mm) required between mount points. (Flame Spread Rating = 0, Smoke Developed Classification = 30)

B. J-PRO ™ Cable Support System or approved equal. Open top cable supports shall be utilized as a pathway for communication cabling. The J Hook cable supports shall be manufactured from a non-conductive material suitable for use in air-handling spaces. The pre-riveted J Hook assemblies must maintain complete horizontal and vertical 1" bend radius control and must manage up to 50 four-pair UTP cables. The cable support must provide the ability to retain the cable bundle with *TAK-TY* ® Hook & Loop Cable Ties or approved equal.

Part Number	**Description**	**Material***	**Max. Static Load (Lbs.)**
	J Hook for wall mount applications only. One ¼" (M6) mounting hole for user supplied screw.	Nylon	30
	J Hook with ceiling mount bracket that has one 3/16" (M5), ¼" (M6), and 3/8" (M10) mounting hole.	Nylon J Hook with metal attachments	30
	J Hook with clip for use with #12 wire, threaded rod up to 3/8" in diameter, or 1/8" –3/8" thick flanges.	Nylon J Hook with metal attachments	10
	J Hook with screw-on beam clamp for use with flanges up to ½" thick.	Nylon J Hook with metal attachments	30
	J Hook with screw-on beam clamp for use with flanges up to ½" thick. Rotates 360 degrees.	Nylon J Hook with metal attachments	30
	J Hook with hammer-on beam clamp for use with flanges 1/8" – ¼" thick. Rotates 360 degrees.	Nylon J Hook with metal attachments	30
	J Hook with hammer-on beam clamp for use with	Nylon J Hook with	30

	flanges 5/16” – 1/2” thick. Rotates 360 degrees.	metal attachments	
	J Hook with hammer-on beam clamp for use with flanges 9/16” – 3/4” thick. Rotates 360 degrees.	Nylon J Hook with metal attachments	30
	J Hook with z-purlin clip for use with angled flanges up to ¼” thick.	Nylon J Hook with metal attachments	30
	J Hook with c-purlin clip for use with vertical flanges up to ¼” thick.	Nylon J Hook with metal attachments	30
	J Hook with under floor pedestal support clamp for use with pedestal support up to 1” in diameter.	Nylon J Hook with metal attachments	30

* Suitable for use in air handling spaces per UL 2043. Listed in accordance with CAN/ULC S102.2 when mounted as single units or in pairs. Minimum spacing of 4 ft. (1220mm) required between mount points. (Flame Spread Rating = 0, Smoke Developed Classification = 30)

2.2 EQUIPMENT

A. Provide all labor, materials, tools and equipment required for the complete installation of work called for in the Construction Documents.

B. The Threaded Rod Cover shall be utilized to protect communication cable from abrasion caused by contact with threaded rod. The Threaded Rod Cover shall be manufactured from a gray flame-retardant polyethylene material that is UL94V-0 rated. The material shall be pliable to allow for easy installation.

Part Number	For Threaded Rod Size	Length
	½” to 5/8”	18”

PART 3 – EXECUTION

3.1 INSTALLATION

A. Horizontal Distribution Cable Installation

1. Cable shall be installed in accordance with manufacturer's recommendations and best industry practices.

2. A pull cord (nylon; 1/8" minimum) shall be co-installed with all cable installed in any conduit.

3. Cable raceways shall not be filled greater than the TIA/EIA-569-A maximum fill for the particular raceway type or 40%.

4. Cables shall be installed in continuous lengths from origin to destination (no splices) except for transition points, or consolidation points.

5. Where transition points, or consolidation points are allowed, they shall be located in accessible locations and housed in an enclosure intended and suitable for the purpose.

6. The cable's minimum bend radius and maximum pulling tension shall not be exceeded.

7. If a J-hook or trapeze system is used to support cable bundles all horizontal cables shall be supported at a maximum of 48 to 60 inch (1.2 to 1.5 meter) intervals. At no point shall cable(s) rest on acoustic ceiling grids or panels.

8. Horizontal distribution cables shall be bundled in groups of no more than 50 cables. Cable bundle quantities in excess of 50 cables may cause deformation of the bottom cables within the bundle and degrade cable performance.

9. Cable shall be installed above fire-sprinkler systems and shall not be attached to the system or any ancillary equipment or hardware. The cable system and support hardware shall be installed so that it does not obscure any valves, fire alarm conduit, boxes, or other control devices.

10. Cables shall not be attached to ceiling grid or lighting fixture wires. Where support for horizontal cable is required, the contractor shall install appropriate carriers to support the cabling.

11. Any cable damaged or exceeding recommended installation parameters during installation shall be replaced by the contractor prior to final acceptance at no cost to the Owner.

12. Cables shall be identified by a self-adhesive label in accordance with the System Documentation Section of this specification and ANSI/TIA/EIA-606.

13. The cable label shall be applied to the cable behind the faceplate on a section of cable that can be accessed by removing the cover plate.

14. Unshielded twisted pair cable shall be installed so that there are no bends smaller than four times the cable outside diameter at any point in the run and at the termination field.

15. Pulling tension on 4-pair UTP cables shall not exceed 25-lbf for a four-pair UTP cable.

END OF SECTION 270528-TC

270553-TC - IDENTIFICATION FOR TELECOMMUNICATIONS SYSTEMS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Maryland Department of Transportation/Maryland Aviation Administration Standard Provisions for Construction Contracts Volume 1, Maryland State Highway Administration, Anne Arundel County and Interim Standard Addenda; and other Division 01 Specification sections, apply to this Section.

1.2 SUMMARY

A. Sections includes:

1. Furnishing labor, equipment, supplies, materials, and testing unless otherwise specified, and in performing the following operations recognized as necessary for the labeling of the telecommunications infrastructure as described on the Drawings and/or required by these specifications.

2. A Class 3 system of administration as per ANSI/TIA/EIA 606-A Standards. As such, all elements must be labeled with unique identifiers as described in the following sections.

3. Minimum requirements for the following:

   a. Labeling Communications Cabling
   b. Labeling Closet Hardware
   c. Labeling Conduit/Hand hole/Inner duct
   d. Labeling Patch Panel Jumpers

B. The Cable Labeling Hierarchy will be the following unless otherwise noted for all Cables, Inner Duct, Conduits, Hand holes, Patch cables and hardware inside plant and outside plant: KB.109.1.1.1.1 whereas, Building, Room, Rack Row number, Rack number, Panel number, Port

1.3 SUBMITTALS

A. Submittal requirements shall be in accordance with Section 270000 – Common Work for Telecommunications Systems.

1.4 QUALITY ASSURANCE

A. The successful vendor shall meet or exceed all requirements for the cable system described in this document.

PART 2 – PRODUCTS

2.1 EQUIPMENT

A. LABELS

1. The size, color and contrast of all labels should be selected to ensure that the identifiers are easily read.

2. All labels are to be mechanically printed, no hand printed labels allowed for any component.

3. Labels should be visible during the installation of and normal maintenanceof the infrastructure.

4. Labels should be resistant to the environmental conditions at the point of installation (such as moisture, heat or ultraviolet light) and should have a design life equal to or greater than that of the labeled component.

5. Provide vinyl substrate with a white printing area and black print. If cable jacket is white, provide cable label with printing area that is any other color than white, preferably orange or yellow – so that the labels are easily distinguishable.

6. Labels shall be flexible vinyl or other substrates to apply easy and flex as cables are bent.

7. Labels shall use aggressive adhesives that stay attached even to the most difficult to adhere to jacketing.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Horizontal Copper Cable Labeling:

1. All horizontal cables shall be labeled with self-laminating marking tape, Brady ID-Pro labeler, Panduit LS7 labeler, or equivalent labeling system. Identification shall be as follows:

a. At the TR end, the cables shall be labeled with the location of where the other end of the cable is terminated including room number, TO number, and jack

position. Place label on a visible part of cable within 12” of termination point for ease of identification after termination.

Example: cable going to room 114, first TO, first jack position would be labeled as: 114-1A1. A cable in the second TO, third jack position would be 114-2A3.

b. At the TO end, the cables shall be labeled 4” from termination with the following: TR – Rack.Patch Panel.Port. This shall be visible by removing outlet cover plate.

Example: TR Room 114, rack row 1, rack 1, patch panel 1, port 03 would be: 114 – 1.1.1.03

c. For voice cabling in older building with separate voice closets and no patch panels, include the TR and as much information as practical such as column, row, block number, and port number or pairs.

d. For CATV coaxial drop cables, at the splitter or tap, the cables shall be labeled with the location where the other end of the cable is terminated including room number, TO number, and jack position. If not collocated with a TO, indicate room number at a minimum. Place label on a visible part of cable within 12” of termination point for ease of identification after termination.

e. For coaxial cables at the TO, they shall be labeled 4” from termination with the room number where the splitter or tap is. This shall be visible by removing outlet cover plate.

B. Telecommunications Outlet (TO) Labeling Scheme:

1. TO’s are labeled alphanumerically in a clockwise rotation around the room. Typically, the first TO located to the left of the main entrance of the room is labeled 1A, followed by 2A, 3A, etc.

C. Horizontal 110 and 66 Block Labeling for voice:

1. For 110 blocks, if the cables are for room terminations, label the appropriate corresponding space for the port with the room number, TO, and jack position.

a. Example: A cable going to room 114, first TO, first jack position would be labeled as: 114-1A1. A cable in the second TO, third jack position would be 114-2A3.

2. For 66 type blocks, if the cables are for room terminations, tag the cable with the room number, TO, and jack position with a loose paper tag that is easily accessible and readable.

    a. Example: A cable in room 114, first TO, first jack position would be labeled as: 114-1A1. A cable in the second TO, third jack position would be 114-2A3.

3. For tie cables between the rack and wallboard a 110 block or 66 block should always be used.

    a. Example: Rack Row 1, Rack 1, patch panel 1, port 03 would be: 1.1.1.03

D. Patch Panel Labeling:

1. For station cabling going to a TO, label each port on the patch panel with the room number, TO, and jack position.

    a. Example: A cable in room 114, first TO, first jack position would be labeled as: 114-1A1. A cable in the second TO, third jack position would be 114-2A3.

    b. Example: A cable going to a floor box TO labeled FB1A in room 114 in the second jack position would be labeled as: 114-FB1A2

E. Vertical/Riser/Intrabuilding Copper Cable Labeling:

1. All riser cables shall be labeled with self-laminating marking tape, Brady ID-Pro labeler, Panduit LS7 labeler, or equivalent labeling system.
2. At the TR, the copper riser cables shall be labeled with from/to, cable number, and count information on both ends.Place label on a visible part of cable close to wiring block for ease of identification after termination.
3. Label cabling every 50’ along the length of the cable in open trays, and on each side of wall penetrations.

F. Interbuilding/Campus/Backbone Copper and Fiber Cable Labeling:

1. All interbuilding cables shall be labeled permanently with from/to information, cable type and size, installation date, and installing contractor at each end, manhole, and pull box the cable passes through.

    a. Example: From Building 500 to 300, a 24 stand fiber single mode cable would be: 500.105.1.1.1 - 300.100.2.1.3 – 24 ST SM

G. Conduit, manhole and hand hole Labeling:

1. All interbuilding and intrabuilding Inner duct and conduit systems shall be labeled permanently with from/to information, Building, manhole/hand hole, bank, and conduit number.

   a. Example: from/to 100.109.1.1-MH5W.3.1

H. Cable Function Color Code

1. As an additional level of identification that allows a particular field type to be quickly located, Color Coded strips, icons, and so on will be installed on all terminated wall plates and block areas. Common equipment refers to PBX equipment, host computer, LAN's and multiplexers. Miscellaneous refers to maintenance alarms, security, paging systems, and other systems and circuits not an integral part of common equipment. Refer to the table below:

Function	Color
Auxiliary and miscellaneous circuits	Yellow
Common equipment	Purple
Customer side of network interface	Green
First level backbone	White
Horizontal cabling to workstations	Blue
Interbuilding backbone	Brown
Key telephone systems	Red
Network side of network interface	Orange
Second level backbone	Gray

Building Reference	Identification
901	Building 901
991	Building 991
TER	BWI Terminal
ARF	ARFF Building
KB	Kauffman Building
MAC	MAC Building
CR<*nnn*>	Cargo Building <number>
MCR	Mid-Field Cargo Building
PHG	Parking-Hourly Garage
PDA	Parking-Daily A Garage
PLA	Parking-Long Term A
PLB	Parking-Long Term B
PEX	Parking-Express Lot
PEP	Parking-Employee
PEA	Parking-Old ESP A
PEB	Parking-Old ESP B

END OF SECTION 270553-TC

271116-TC - CABINETS, RACKS, FRAMES AND ENCLOSURES FOR TELECOMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Maryland Department of Transportation/Maryland Aviation Administration Standard Provisions for Construction Contracts Volume 1, Maryland State Highway Administration, Anne Arundel County and Interim Standard Addenda; and other Division 01 Specification sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Descriptions of the products and execution requirements relating to furnishing and installing Telecommunications Cabling. Communication Equipment Room Fittings of cabinets, racks, frames and enclosures are covered under this document.

2. This section includes minimum requirements for the following:

   a. Cabinets

   b. Racks and Rack Cable Management

   c. Frames

   d. Enclosures

3. Product specifications, general design considerations, and installation guidelines are provided in this document. Quantities of telecommunications outlets, typical installation details, cable routing and outlet types will be provided as an attachment to this document.

1.3 SUBMITTALS

A. Submittal requirements shall be in accordance with Section 270000-Common Work for Telecommunications Systems.

1.4 REFERENCES

A. The following industry standards are the basis for the structured cabling system described in this document.

TIA/EIA

TIA/EIA-568-B	Commercial Building Telecommunications Cabling Standard
TIA/EIA-569-A	Commercial Building Standard for Telecom Pathways and Spaces
TIA/EIA-606	Administration Standard for the Telecommunications Infrastructure of Commercial Buildings
TIA/EIA-607	Commercial Building Grounding/Bonding Requirements

NFPA

NFPA-70	National Electric Code (NEC)-1999

ISO/IEC

ISO/IEC 11801	Generic Cabling for Customer Premises

B. Conflicts:

1. The most recent versions of all documents apply to this project. If there is a conflict between applicable documents, the order above shall dictate the order of precedence in resolving the issue unless an enforceable local or national code is in effect.

2. If the bid documents are in conflict, this specification shall take precedence. MAA/OT will assist in the design, layout and specification detail needed to clarify any ambiguity between this document and other construction documentation.

1.5 QUALITY ASSURANCE

A. The successful vendor shall meet or exceed all requirements for the cable system described in this document.

PART 2 – PRODUCTS

2.1 EQUIPMENT

A. Provide all labor, materials, tools and equipment required for the complete installation of work called for in the Construction Documents

B. Racks

1. The Cable Management System shall be used to provide a neat and efficient means for routing and protecting fiber and copper cables and patch cords on telecommunication racks and enclosures. The system shall be a complete cable management system comprised of vertical cable managers, horizontal cable manager, and cable management accessories used throughout the cabling system. The system shall protect network investment by maintaining system performance, controlling cable bend radius and providing cable strain relief.

    a. Provide rack as shown on the Drawings and as specified in this section.
    b. The Rack system shall meet all EIA requirements as defined in EIA-310-D.
    c. Provide all mounting components and accessories to securely fix racks to floor and supporting walls. Provide overhead ladder rack fixed to the top of each rack and running from the top of the rack to the telephone backboard where the feeder and distribution cables run, as shown on the drawings. Provide cable bend management fixtures to maintain the proper bend radius as the cables drop into the rack. Do not allow cables to be unsupported as they run from conduit or cable tray to equipment cabinets. Racks to be seismically braced in accordance with local seismic bracing requirements. Racks are to be braced against sway on all three axes. Horizontal cable tray or other cable support that is also rated as a seismic brace may be used to meet some of the seismic bracing requirements.
    d. Each rack shall be UL listed for a load-carrying capacity of 1000 lbs. (454 kg.).
    e. Provide patch management ring runs in each rack. Provide (1) 2U high horizontal patch management between each panel of each rack.
    f. Provide side-mounted vertical cable management with covers on both sides of each rack. The cable management shall be with cover plates and bracket kits as needed to attach to adjacent racks.
    g. Provide strain relief and cable management at the rear of each rack to ensure uniform routing of all feeder and distribution cables.
    h. Each rack to have a minimum of eight power sockets mounted on a strip at the rear of the rack. The power outlets on the connector strip shall be NEMA 5-20R compatible. The plug shall be NEMA 5-20P compatible.
    i. The rack shall be manufactured from extruded aluminum and marked with Rack Unit spacing.
    j. Provide all racks with grounding kits and wires.
    k. Provide Raised Floor Rack Supports from rack manufacturer for all equipment racks mounted on raised “access” floor in the Server Room. Racks installed on raised floors are to be bolted through the raised floor directly into the concrete flooring below.
    l. The rack system solution shall provide integral cable management including vertical channels, pass through holes and slots for additional cable management accessories.

m. Pass through holes shall be located on the front, back and side of the rack for maximum flexibility.
n. Racks are to be threaded for #12-24 threads.

Part Number	Description	Rack Spaces
	19"x 7' 0" Rack	45
	Horizontal patch management at top of rack	1

2. Vertical cable managers shall include components that aid in routing, managing and organizing cable to and from patch panels and/or equipment. Managers shall protect network equipment by controlling cable bend radius and providing cable strain relief. Managers shall be a universal design mounting to EIA 19" or 23" racks and constructed of a base with cable management fingers.

3. The fingers shall include retaining tabs to keep cables in place during cover removal. The covers shall be hinged to open in either direction allowing for quick moves, adds, and changes (MAC).

Part Number	Type	Rack Spaces	Type	Max. Side Extension (in.)
	Front and Rear	45	High Capacity	6.55
	Center mount bracket kit	-	-	-
	Side Mount Kit	-	-	-

4. Horizontal cable managers shall include components that aid in routing, managing and organizing cable to and from patch panels and/or equipment. Panels shall protect network equipment by controlling cable bend radius and providing cable strain relief. Panels shall be a universal design mounting to EIA 19" racks and constructed with cable management fingers. The fingers shall include retaining tabs to keep cables in place during cover removal. The covers shall be easily removed or hinged to allow for quick moves, adds, and changes. The cable managers shall be provided with wire retainers to retain the cables during cover removal and #12-24 English and M6 metric mounting screws.

Part Number	Type	Rack Spaces	Max. Front Extension (in.)
	Front & Rear Duct	2	3.1

C. Enclosures

1. Wall mounted fiber optic enclosures

2. Rack mounted fiber optic

PART 3 – EXECUTION

3.1 INSTALLATION

A. The Communication Equipment Room shall support a minimum of (4) 4-pair Unshielded Twisted Pair (UTP) Copper Cables to each work area outlet unless otherwise noted for specific locations. The cables shall be installed from the Work Area Outlet to the Telecommunications Room (TR) located on the same floor, and routed to the appropriate rack serving that area and terminated as specified in this document.

B. Horizontal Distribution Cable Installation

1. Shall be installed in accordance with manufacturer's recommendations and best industry practices.

2. A pull cord (nylon; 1/8" minimum) shall be co-installed with all cable installed in any conduit.

3. Cable raceways shall not be filled greater than the TIA/EIA-569-A maximum fill for the particular raceway type or 40% whichever greater.

4. Cables shall be installed in continuous lengths from origin to destination (no splices).

5. Where transition points, or consolidation points are allowed, they shall be located in accessible locations and housed in an enclosure intended and suitable for the purpose.

6. The cable's minimum bend radius and maximum pulling tension shall not be exceeded.

7. If a J-hook or trapeze system is used to support cable bundles all horizontal cables shall be supported at a maximum of 48 to 60 inch (1.2 to 1.5 meter) intervals. At no point shall cable(s) rest on acoustic ceiling grids or panels.

8. Horizontal distribution cables shall be bundled in groups of no more than 50 cables. Cable bundle quantities in excess of 50 cables may cause deformation of the bottom cables within the bundle and degrade cable performance.

9. Cable shall be installed above fire-sprinkler systems and shall not be attached to the system or any ancillary equipment or hardware. The cable system and support hardware shall be installed so that it does not obscure any valves, fire alarm conduit, boxes, or other control devices.

10. Cables shall not be attached to ceiling grid or lighting fixture wires. Where support for horizontal cable is required, the contractor shall install appropriate carriers to support the cabling.

11. Any cable damaged or exceeding recommended installation parameters during installation shall be replaced by the contractor prior to final acceptance at no cost to the Owner.

12. Cables shall be identified by a self-adhesive or heat shrink label in accordance with the System Documentation Section of this specification and ANSI/TIA/EIA-606.

13. The cable label shall be applied to the cable behind the faceplate on a section of cable that can be accessed by removing the cover plate.

14. Unshielded twisted pair cable shall be installed so that there are no bends smaller than four times the cable outside diameter at any point in the run and at the termination field.

15. Pulling tension on 4-pair UTP cables shall not exceed 25-lbf for a four-pair UTP cable.

B. Horizontal Cross Connect Installation

1. Cables shall be dressed and terminated in accordance with the recommendations made in the TIA/EIA-568-B standard, manufacturer's recommendations and best industry practices.

2. Pair untwist at the termination shall not exceed 0.5”.

3. Bend radius of the cable in the termination area shall not exceed 4 times the outside diameter of the cable.

4. Cables shall be neatly bundled with no more than 48 cables per, and dressed to their respective panels or blocks. Each panel or block shall be fed by an individual bundle separated and dressed back to the point of cable entrance into the rack or frame.

5. The cable jacket shall be maintained as close as possible to the termination point, no more than 1".

6. Each cable shall be clearly labeled on the cable jacket behind the patch panel at a location that can be viewed without removing the bundle velcro ties. Cables labeled within the bundle, where the label is obscured from view shall not be acceptable.

C. Racks

1. Racks shall be securely attached to the concrete floor using minimum 3/8" hardware or as required by local codes.

2. Racks shall be placed with a 36-inch (minimum) clearance from the walls on all sides of the rack. When mounted in a row, maintain a minimum of 36 inches from the wall behind and in front of the row of racks and from the wall at each end of the row.

3. All racks shall be grounded to the telecommunications ground bus bar in accordance with Section Ground and Bonding for Communications Systems of this document.

4. Rack mount screws not used for installing patch panels and other hardware shall be bagged and left with the rack upon completion of the installation.

5. Wall mounted termination block fields shall be mounted on 4' x 8' x .75" void free fire treated plywood. The plywood shall be mounted vertically 24" above the finished floor.

END OF SECTION 27116-TC

271119-TC - TERMINATION BLOCKS AND PATCH PANELS FOR TELECOMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Maryland Department of Transportation/Maryland Aviation Administration Standard Provisions for Construction Contracts Volume 1, Maryland State Highway Administration, Anne Arundel County and Interim Standard Addenda; and other Division 01 Specification sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Descriptions of the products and execution requirements relating to furnishing and installing Telecommunications Cabling. Termination blocks and patch panels are covered under this document.

2. This section includes minimum requirements for the following:

   a. Termination blocks

   b. Patch panels

3. Product specifications, general design considerations, and installation guidelines are provided in this document. Quantities of telecommunications outlets, typical installation details, cable routing and outlet types will be provided as an attachment to this document.

1.3 SUBMITTALS

A. Submittal requirements shall be in accordance with Section 270000 – Common Work for Telecommunications Systems.

B. All cables and related terminations, support and grounding hardware shall be furnished, installed, wired, tested, labeled, and documented by the telecommunications contractor as detailed in this document.

C. Upon completion of the installation, the telecommunications contractor shall provide three (3) full documentation sets to the Engineer for approval. Documentation shall include the items detailed in the sub-sections below.

D. Documentation shall be submitted within ten (10) working days of the completion of each testing phase. This is inclusive of all test results and draft as-built drawings. Draft drawings may include annotations done by hand. Machine generated (final) copies of all drawings shall be submitted within 30 working days of the completion of each testing phase. At the request of the Engineer, the telecommunications contractor shall provide copies of the original test results.

E. Testing:

1. Maryland Aviation Administration Office of Technology (MAA/OT) may do a 10% random field re-test be conducted on the cable system to verify documented findings. Tests shall be a repeat of those defined above. If findings contradict the documentation submitted by the telecommunications contractor, additional testing can be requested to the extent determined necessary by the Engineer, including a 100% re-test. This re-test shall be at no additional cost to the Owner.

2. Test Results documentation shall be provided on disk within three weeks after the completion of the project. The disk shall be clearly marked on the outside front cover with the words "Project Test Documentation", the project name, and the date of completion (month and year). The results shall include a record of test frequencies, cable type, conductor pair and cable (or outlet) I.D., measurement direction, reference setup, and crew member name(s). The test equipment name, manufacturer, model number, serial number, software version and last calibration date will also be provided at the end of the document. Unless the manufacturer specifies a more frequent calibration cycle, an annual calibration cycle is anticipated on all test equipment used for this installation. The test document shall detail the test method used and the specific settings of the equipment during the test as well as the software version being used in the field test equipment.

3. The field test equipment shall meet the requirements of ANSI/TIA/EIA-568-B including applicable TSB's and amendments. The appropriate level IV tester shall be used to verify Category 6 cabling systems. The appropriate level III tester shall be used to verify Category 6 cabling systems.

4. Printouts generated for each cable by the wire (or fiber) test instrument shall be submitted as part of the documentation package. Alternately, the telecommunications contractor may furnish this information in electronic form (compact disc). These discs shall contain the electronic equivalent of the test results as defined by the bid specification and be of a format readable from Microsoft Word or Microsoft Excel.

5. When repairs and re-tests are performed, the problem found and corrective action taken shall be noted, and both the failed and passed test data shall be documented.

F. The As-Built drawings are to include cable routes and outlet locations. Their sequential number as defined elsewhere in this document shall identify outlet locations.

Numbering, icons, and drawing conventions used shall be consistent throughout all documentation provided. The Owner will provide floor plans in paper and electronic (DWG, AutoCAD) formats on which as-built construction information can be added. These documents will be modified accordingly by the telecommunications contractor to denote as-built information as defined above and returned to the Owner. Numbering, icons, pathways and other drawing conventions are to be assigned their own individual AutoCAD layer.

G. The Contractors shall annotate the base drawings and return a hard copy (same plot size as originals) and electronic (AutoCAD or as agreed to by MAA/OT) form.

1.4 REFERENCES

A. The following industry standards are the basis for the structured cabling system described in this document.

TIA/EIA

TIA/EIA-568-B	Commercial Building Telecommunications Cabling Standard
TIA/EIA-569-A	Commercial Building Standard for Telecom Pathways and Spaces
TIA/EIA-606	Administration Standard for the Telecommunications Infrastructure of Commercial Buildings
TIA/EIA-607	Commercial Building Grounding/Bonding Requirements

NFPA

NFPA-70	National Electric Code (NEC)-1999

ISO/IEC

ISO/IEC 11801	Generic Cabling for Customer Premises

B. Conflicts:

1. If the bid documents are in conflict, this specification shall take precedence.

2. The most recent versions of all documents apply to this project. If there is a conflict between applicable documents, the order above shall dictate the order of precedence in resolving the issue unless an enforceable local or national code is in effect.

1.5 QUALITY ASSURANCE

A. The successful vendor shall meet or exceed all requirements for the cable system described in this document.

PART 2 – PRODUCTS

2.1 EQUIPMENT

A. Cable Termination Hardware – Category 6

1. Products shall provide labeling options that comply with the TIA/EIA-606-A Standard. All products shall be clearly identified with the use of a thermal transfer printer, hand-printed labels are not acceptable and will be rejected. Products shall include faceplates, surface mount boxes, patch panels, marker ties, printers and accessories. All label heights shall be the same to allow for consistent labeling. Panels shall be available in flat and angled versions.

2. Modular Patch Panels shall be of a metal design with 48 ports. Patch panels shall be available with and without labels.

Part Number	Number of Ports	Ports Per Faceplate	Rack Spaces
	48	2	2

3. Four-pair Category 6 UTP cabling: Patch panels shall be universal for T658A and T568B wiring configurations. Integral cable tie mounts shall be included in the panel for cable management on the back of the panel. Port and panels shall be easy to identify with write-on areas and optional label holder for color-coded labels. Rack mountable patch panels shall mount to standard EIA 19" and 23"racks.

Part Number	Number of Ports	Wiring Configuration	Rack Spaces
	48	Universal	2

PART 3 – EXECUTION

3.1 INSTALLATION

A. The Communication Equipment Room shall support a minimum of (4) 4-pair Unshielded Twisted Pair (UTP) Copper Cables to each work area outlet unless otherwise noted for specific locations. The cables shall be installed from the Work Area Outlet to the Telecommunications Room (TR) located on the same floor, and routed to the appropriate rack serving that area and terminated as specified in this document.

B. Cable Termination Hardware – Category 6

1. Each horizontal or backbone cabling run will be terminated using appropriate connectors or connecting blocks depending upon the cable type. Matching patch cords will be used to perform cross-connect activities or to connect into the networking/voice hardware.

2. Category 6 Unshielded Twisted Pair UTP. Four-pair Category 6 cabling shall be terminated onto modular patch panels, punch down style patch panels or punch down style connecting blocks where specified in the plans.

3. Four-pair Category 6 UTP cabling shall be terminated onto a four-pair Category 6 module. All modules shall be terminated using the T568B wiring scheme. The eight-position module shall exceed the connector requirements of the TIA/EIA Category 6 standard.

4. Four-pair Category 6 cabling shall be terminated onto modular patch panels ('110 style patch panels punch down style connecting bases and connectors) for specific applications as outlined in this specification.

5. Patch Panels - Four-pair Category 6 UTP cabling shall be terminated onto four-pair punch down style connecting hardware mounted to the rear of integral patch panels and routed to Category 6 modules on the front face of the patch panel.

C. Horizontal Cross Connect Installation

1. Cables shall be dressed and terminated in accordance with the recommendations made in the TIA/EIA-568-B standard, manufacturer's recommendations and best industry practices.

2. Pair untwist at the termination shall not exceed 0.5”.

3. Bend radius of the cable in the termination area shall not exceed 4 times the outside diameter of the cable.

4. Cables shall be neatly bundled groups of 48 max and dressed to their respective panels or blocks. Each panel or block shall be fed by an individual bundle separated and dressed back to the point of cable entrance into the rack or frame.

5. The cable jacket shall be maintained as close as possible to the termination point.

6. Each cable shall be clearly labeled on the cable jacket behind the patch panel at a location that can be viewed without removing the bundle support ties. Cables labeled within the bundle, where the label is obscured from view shall not be acceptable.

D. Copper Termination Hardware

1. Cables shall be dressed and terminated in accordance with the recommendations made in the ANSI/TIA/EIA-568-B standard, manufacturer's recommendations and best industry practice.

2. Pair untwist at the termination shall not exceed 0.5”.

3. Bend radius of the cable in the termination area shall not exceed 4 times the outside diameter of the cable.

4. Cables shall be neatly bundled in groups of 48 max and dressed to their respective panels or blocks. Each panel or block shall be fed by an individual bundle separated and dressed back to the point of cable entrance into the rack or frame.

5. The cable jacket shall be maintained to within 25 mm (one inch) of the termination point.

6. Each cable shall be clearly labeled on the cable jacket behind the patch panel at a location that can be viewed without removing the bundle support ties. Cables labeled within the bundle, where the label is obscured from view shall not be acceptable.

3.2 TESTING

A. All cables shall be labeled prior to testing. All cables and termination hardware shall be 100% tested for defects in installation and to verify cabling system performance under installed conditions according to the requirements of ANSI/TIA/EIA-568-A. All pairs of each installed cable shall be verified prior to system acceptance. Any defect in the cabling system installation including but not limited to cable, connectors, feed through couplers, patch panels, and connector blocks shall be repaired or replaced in order to ensure 100% useable conductors in all cables installed.

B. All cables shall be tested in accordance with this document, the ANSI/TIA/EIA standards and best industry practice. If any of these are in conflict, the Contractor shall bring any discrepancies to the attention of the project team for clarification and resolution.

C. Copper Channel Testing:

1. All twisted-pair copper cable links shall be tested for continuity, pair reversals, shorts, opens and performance as indicated below. Additional testing is required to verify Category performance. Horizontal cabling shall be tested using a level IIe or level III test unit for category 6 or category 6 performance compliance, respectively.

2. Continuity - Each pair of each installed cable shall be tested using a test unit that shows opens, shorts, polarity and pair-reversals, crossed pairs and split pairs. Shielded/screened cables shall be tested with a device that verifies shield continuity in addition to the above stated tests. The test shall be recorded as pass/fail as indicated by the test unit in accordance with the manufacturers' recommended procedures, and referenced to the appropriate cable identification number and circuit or pair number. Any faults in the wiring shall be corrected and the cable re-tested prior to final acceptance.

3. Length - Each installed cable link shall be tested for installed length using a TDR type device. The cables shall be tested from patch panel to patch panel, block to block, patch panel to outlet or block to outlet as appropriate. The cable length shall conform to the maximum distances set forth in the ANSI/TIA/EIA-568-B Standard. Cable lengths shall be recorded, referencing the cable identification number and circuit or pair number. For multi-pair cables, the shortest pair length shall be recorded as the length for the cable.

D. Category 6 & 6 Performance

1. Follow the Standards requirements established in ANSI/TIA/EIA-568-B -TSB-155.

2. A level IV or better test unit is required to verify category 6 performances and must be updated to include the requirements of TSB-155. A level IV test unit is required to verify category 6 performances. Refer to section on test equipment for additional requirements.

E. The four basic tests required in TSB-67 are:

1. Wire Map
2. Length
3. Attenuation
4. NEXT (Near end crosstalk)

F. Four additional tests are required per TSB-155:

1. Return Loss
2. ELFEXT Loss
3. Propagation Delay
4. Delay skew

G. Two additional tests are required:

1. PSNEXT (Power sum near-end crosstalk loss)
2. PSELFEXT (Power sum equal level far-end crosstalk loss)

END OF SECTION 271119-TC

271313-TC - CABLE SPLICING AND TERMINATION FOR TELECOMMUNICATIONS SYSTEMS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Maryland Department of Transportation/Maryland Aviation Administration Standard Provisions for Construction Contracts Volume 1, Maryland State Highway Administration, Anne Arundel County and Interim Standard Addenda; and other Division 01 Specification sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Descriptions of the products and execution requirements relating to furnishing and installing Telecommunications Cabling. Copper backbone cabling (copper cabling splicing and terminations) is covered under this document.

2. Minimum requirements for the Copper Backbone Cabling System.

3. Product specifications, general design considerations, and installation guidelines are provided in this document. Quantities of telecommunications outlets, typical installation details, cable routing and outlet types will be provided as an attachment to this document.

1.3 DEFINITIONS

A. Backbone Cabling System

1. The Backbone Cable Subsystem in a building is the part of the premises distribution system that provides connection between equipment rooms, telecommunication rooms, and telecommunications service entrance facilities. A backbone subsystem provides either intra-building connections between floors in multi-story buildings or inter-building connections in campus-like environments.

1.4 SUBMITTALS

A. Submittal requirements shall be in accordance with Section 270000-Common Work for Telecommunications Systems.

1.5 REFERENCES

A. The following industry standards are the basis for the structured cabling system described in this document.

TIA/EIA

TIA/EIA-568-B	Commercial Building Telecommunications Cabling Standard
TIA/EIA-569-A	Commercial Building Standard for Telecom Pathways and Spaces
TIA/EIA-606	Administration Standard for the Telecommunications Infrastructure of Commercial Buildings
TIA/EIA-607	Commercial Building Grounding/Bonding Requirements

NFPA

NFPA-70	National Electric Code (NEC)-1999

ISO/IEC

ISO/IEC 11801	Generic Cabling for Customer Premises

B. Conflicts:

1. The most recent versions of all documents apply to this project. If there is a conflict between applicable documents, the order above shall dictate the order of precedence in resolving the issue unless an enforceable local or national code is in effect.

2. If the bid documents are in conflict, this specification shall take precedence.

1.6 QUALITY ASSURANCE

A. The successful vendor shall meet or exceed all requirements for the cable system described in this document.

PART 2 -PRODUCTS

2.1 EQUIPMENT

A. Provide all labor, materials, tools and equipment required for the complete installation of work called for in the Construction Documents

B. All cables and related terminations, support and grounding hardware shall be furnished, installed, wired, tested, labeled, and documented by the telecommunications contractor as detailed in this document.

PART 3 – EXECUTION

3.1 INSTALLATION

A. The Communication Equipment Room shall support a minimum of (4) 4-pair Unshielded Twisted Pair (UTP) Copper Cables to each work area outlet unless otherwise noted for specific locations. The cables shall be installed from the Work Area Outlet to the Telecommunications Room (TR) located on the same floor, and routed to the appropriate rack serving that area and terminated as specified in this document.

B. The successful vendor shall meet or exceed all requirements for the cable system described in this document.

C. There shall be no splices to fiber optic cable plants or copper cable plants providing service to the building or within the building.

END OF SECTION 271313-TC

271323-TC- OPTICAL FIBER SPLICING AND TERMINATIONS FOR TELECOMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Maryland Department of Transportation/Maryland Aviation Administration Standard Provisions for Construction Contracts Volume 1, Maryland State Highway Administration, Anne Arundel County and Interim Standard Addenda; and other Division 01 Specification sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. This document describes the products and execution requirements relating to furnishing and installing Telecommunications Cabling. Optical fiber backbone cabling (optical fiber splicing and terminations) is covered under this document.

2. Minimum requirements for the optical Fiber Backbone Cabling System.

3. Product specifications, general design considerations, and installation guidelines are provided in this document. Quantities of telecommunications outlets, typical installation details, cable routing and outlet types will be provided as an attachment to this document.

1.3 DEFINITIONS

A. Backbone Cabling System

1. The Backbone Cable Subsystem in a building is the part of the premises distribution system that provides connection between equipment rooms, telecommunication rooms, and telecommunications service entrance facilities. A backbone subsystem provides either intra-building connections between floors in multi-story buildings or inter-building connections in campus-like environments.

1.4 REFERENCES

A. The following industry standards are the basis for the structured cabling system described in this document.

TIA/EIA

TIA/EIA-568-B	Commercial Building Telecommunications Cabling Standard
TIA/EIA-569-A	Commercial Building Standard for Telecom Pathways and Spaces
TIA/EIA-606	Administration Standard for the Telecommunications Infrastructure of Commercial Buildings
TIA/EIA-607	Commercial Building Grounding/Bonding Requirements

NFPA

NFPA-70	National Electric Code (NEC)-1999

ISO/IEC

ISO/IEC 11801	Generic Cabling for Customer Premises

B. Conflicts:

1. The most recent versions of all documents apply to this project. If there is a conflict between applicable documents, the order above shall dictate the order of precedence in resolving the issue unless an enforceable local or national code is in effect.

2. If the bid documents are in conflict, this specification shall take precedence.

1.5 SUBMITTALS

A. Submittal requirements shall be in accordance with Section 270000 – Common Work for Telecommunications Systems.

B. Upon completion of the installation, the telecommunications contractor shall provide three (3) full documentation sets to the Engineer for approval. Documentation shall include the items detailed in the sub-sections below.

C. Documentation shall be submitted within ten (10) working days of the completion of each testing phase. This is inclusive of all test results and draft as-built drawings. Draft drawings may include annotations done by hand. Machine generated (final) copies of all drawings shall be submitted within 30 working days of the completion of each testing phase. At the request of the Engineer, the telecommunications contractor shall provide copies of the original test results.

D. Maryland Aviation Administration Office of Technology may test 10% random field re-test be conducted on the cable system, at no additional cost, to verify documented findings. Tests shall be a repeat of those defined above. If findings contradict the

documentation submitted by the telecommunications contractor, additional testing can be requested to the extent determined necessary by the Engineer, including a 100% re-test. This re-test shall be at no additional cost to the Owner.

E. Test Results documentation shall be provided on disk within three weeks after the completion of the project. The disk shall be clearly marked on the outside front cover with the words "Project Test Documentation", the project name, and the date of completion (month and year). The results shall include a record of test frequencies, cable type, conductor pair and cable (or outlet) I.D., measurement direction, reference setup, and crew member name(s). The test equipment name, manufacturer, model number, serial number, software version and last calibration date will also be provided at the end of the document. Unless the manufacturer specifies a more frequent calibration cycle, an annual calibration cycle is anticipated on all test equipment used for this installation. The test document shall detail the test method used and the specific settings of the equipment during the test as well as the software version being used in the field test equipment.

F. The field test equipment shall meet the requirements of ANSI/TIA/EIA-568-B including applicable TSB's and amendments. The appropriate level IV tester shall be used to verify Category 6 cabling systems. The appropriate level III tester shall be used to verify Category 6 cabling systems.

G. Printouts generated for each cable by the wire (or fiber) test instrument shall be submitted as part of the documentation package. Alternately, the telecommunications contractor may furnish this information in electronic form (compact disc). These discs shall contain the electronic equivalent of the test results as defined by the bid specification and be of a format readable from Microsoft Word or Microsoft Excel.

H. When repairs and re-tests are performed, the problem found and corrective action taken shall be noted, and both the failed and passed test data shall be documented.

I. The As-Built drawings are to include cable routes and outlet locations. Their sequential number as defined elsewhere in this document shall identify outlet locations. Numbering, icons, and drawing conventions used shall be consistent throughout all documentation provided. The Owner will provide floor plans in paper and electronic (DWG, AutoCAD rel. 14) formats on which as-built construction information can be added. These documents will be modified accordingly by the telecommunications contractor to denote as-built information as defined above and returned to the Owner. Numbering, icons, pathways and other drawing conventions are to be assigned their own individual AutoCAD layer.

J. The Contractors shall annotate the base drawings and return a hard copy (same plot size as originals) and electronic (AutoCAD rel. 14 or as agreed to by MAA/OT) form.

1.6 QUALITY ASSURANCE

A. The successful vendor shall meet or exceed all requirements for the cable system described in this document.

PART 2 – PRODUCTS

2.1 EQUIPMENT

A. Provide all labor, materials, tools and equipment required for the complete installation of work called for in the Construction Documents.

B. All cables and related terminations, support and grounding hardware shall be furnished, installed, wired, tested, labeled, and documented by the telecommunications contractor as detailed in this document.

C. The type of backbone copper cable shall be 100Ω unshielded twisted pair (UTP), multi-pair cable. The type of backbone fiber cable shall be 50/125 μm multimode fiber cable or 8.3/125 μm singlemode fiber cable. The bending radius and maximum pulling tension of the cable shall be adhered to during handling and installation.

D. Data Cable: All backbone fiber optic cable shall be 50/125μm tight buffered or 8.3/125 μm jacketed fiber optic cable. Fiber cable shall be riser (OFNR) or plenum (OFNP) listed where applicable.

E. Optical Fiber Cables

1. Multimode Cable Elements.

a. Multimode cable to be 62.5 micron core.
b. Fiber shall have a maximum Attenuation of 3.5dB/km @ 850nm and 1.5 dB/km @ 1300nm.
c. Fiber shall have a minimum LED Bandwidth 1500 MHz•km @ 850nm and 500 MHz•km @ 1300nm.
d. Fiber shall have a minimum Effective Modal Bandwidth 2000 (MHz•km) @ 850nm.
e. Fiber shall have a serial Gigabit Ethernet Distance Guarantee 1000m @ 850nm and 600m @ 1300nm.
f. Fiber shall have a serial 10 Gigabit Ethernet Distance 300m @ 850nm.
g. Fiber shall have a minimum tensile load strength of 2700 Newtons.
h. Fiber shall conform to RUS 7 CFR 1755.900 and ANSO/ICEA S-87-640
i. Fiber shall have 3.0mm buffer tube size.

j. Fiber shall have SZ-stranded, loose tube design to isolate fibers from installation and environmental elements.
k. Fiber shall have a jacket made of medium density polyethylene.
l. Fiber cable construction shall be of all-dielectric construction.
m. Fiber shall be plenum rated.

F. Optical fiber Cables

1. Singlemode Cable Elements.

a. Singlemode cable to be 8.3 micron core.
b. Fiber shall have a maximum Attenuation of 0.4 dB/km @ 1310 nm and 0.3 dB/km @ 1510 nm
c. Fiber shall have a serial Gigabit Ethernet Distance Guarantee of 5000 m @ 1310 nm.
d. Fiber shall have a serial 10 Gigabit Ethernet Distance of 10000 m @ 1310 nm and 40000 m @ 1510 nm.
e. Fiber shall have a minimum tensile load strength of 2700 Newtons.
f. Fiber shall conform to RUS 7 CFR 1755.900 and ANSO/ICEA S-87-640
g. Fiber shall have 3.0mm buffer tube size.
h. Fiber shall have SZ-stranded, loose tube design to isolate fibers from installation and environmental elements.
i. Fiber shall have a jacket made of medium density polyethylene.
j. Fiber cable construction shall be of all-dielectric construction.
k. Fiber shall be plenum rated.
l. Cable shall be capable of supporting 1470, 1490, 1510, 1530, 1550, 1570, 1590 and 1610 nm wavelengths.

G. Backbone Cable (the following fiber counts are subject to job specific needs)

1. Provide internal use riser rated optical fiber cable with 144 strands of single mode optical fiber cable and 72 strands of multimode optical fiber cable .The cable shall be riser rated (CMR) for use as an internal cable in a non-plenum / plenum environment.
2. Provide printed length markings on the cable jacket every two feet.
3. All fiber will be installed in a 1.5 inch inner duct within the conduit.

H. External Cable (the following fiber counts are subject to job specific needs)

1. Provide external optical fiber cable with 144 strands of single mode optical fiber and 72 strands of multimode optical fiber cable.
2. The cable shall be recommended by the manufacturer for use as an external cable suitable for installation in an underground duct or conduit system.
3. Provide printed length markings on the cable jacket every two feet.

4. Optical fibers will be contained within loose buffer tubes utilizing water blocking tapes or compounds surrounding these tubes. The cable will be an all-dielectric construction, with a central strength member.

I. Rack Mounted Optical Fiber Patch Panel.

1. Conforming to the following specification:

a. Each panel shall be suitable for installation in EIA 19" mounting frame.
b. Patch panels shall be capable of holding 6 coupler (bulk head) adapters.
c. Each panel shall provide either compression glands or internal clips and entrapment of yarn based impact resistance to provide strain relief.
d. Each panel shall provide fiber handling for fiber strands, including 20" fiber reserve (service loop) inside the patch panel with no bends sharper than 2" bend radius.
e. Each patch panel shall be fitted with bulkhead simplex adapters (with ceramic alignment sleeves for 6 ST or SC Connectors. Provide sufficient quantity of adapters to support all terminated fibers. Bulkhead adapters to be sourced from the same manufacturer as the connectors provided as a part of this project, or they are to be recommended by the manufacturer for use with the connector.
f. Provide adapter plates to house bulkhead adapters and provide blanking adapter plates to cover all unused spaces as necessary.
g. Each patch panel shall allow any individual element to be terminated or otherwise handled without disturbing or damaging other strands.

J. Optical Fiber connectors

1. Multimode Optical Fiber Connectors. Provide multimode Corning optical fiber connectors ST conforming to the following specification.

a. Optical fiber connectors must be part of cable manufacturer's approved extended warranted end to end cabling solution.
b. Maximum insertion loss, of mated pair, less than 0.75 dB at acceptance
c. Optimally keyed, allowing reproducible mating conditions each time a connection is made between connector and coupler.
d. Fitted with color coded strain relief boots to ensure durable and robust connections
e. Durability better than 500 matings, with a maximum increase in insertion loss of not more than 0.2 dB.
f. Fitted with a tight polymer cap, until the connector is fitted to a bulkhead adapter, over the connector to prevent ingress of dirt and dust, until the connector is fitted to a coupler.
g. Having (6) ST connectors per mounting panel (bulk head adapter).

K. Singlemode Optical Fiber Connectors. Provide Corning singlemode optical fiber connectors SC, conforming to the following specification.

1. Optical fiber connectors must be part of cable manufacturer's approved extended warranted end to end cabling solution.
2. Insertion loss of mated pair at 1310 nm to be less than 0.5 dB at acceptance for every duplex connector.
3. Minimum return loss of 36dB at 1310 nm
4. Optimally keyed, allowing reproducible mating conditions each time a connection is made between connector and coupler.
5. Fitted with strain relief boots to ensure durable and robust connections
6. Durability better than 500 matings, with a maximum increase in insertion loss of not more than 0.2 dB.
7. Fitted with a tight polymer cap over the connector to prevent ingress of dirt and dust, until the connector is fitted to a coupler.
8. Having (6) SC connectors per mounting panel (bulk head adapter).

L. Fiber Optic Equipment Trays/Drawers/Enclosures

1. The Fiber Optic Trays shall be used to provide rack mounted fiber optic trays that manage and protect optical fiber terminations and splices. The trays shall be used with 24 or 48 port *MINI-COM* ® modular patch panels or approved equal or fiber adapter patch panels. The trays shall include a removable cover. They shall mount to EIA standard 19" and 23" (with extender bracket) racks or cabinets, include multiple cable entry points and include a fiber optic cable routing accessory kit.

2. Wall mounted fiber optic enclosures shall be constructed of steel material. Enclosures shall provide patch cable protection without the installation of an additional attachment. Enclosures shall maintain discrete locking capability between installer and end user segments.

3. Rack mounted fiber optic enclosures shall be designed to manage and organize fiber optic cable to and from the equipment or cabling plant. Enclosures shall protect fiber optic connections for patching or splicing requirements. Enclosures shall accommodate up to 36 fibers (with Fiber Jack, SC, or SC) per rack space and shall be constructed of steel material. Enclosures shall have removable front and rear covers and top and bottom pass through holes.

Part Number	**Rack Spaces**	**Number of Fibers**
	1	36 with Fiber Jack
	2	72 with Fiber Jack
	3	96 with Fiber Jack
	4	144 with Fiber Jack

PART 3 – EXECUTION

3.1 INSTALLATION

A. The Communication Equipment Room shall support a minimum of (4) 4-pair Unshielded Twisted Pair (UTP) Copper Cables to each work area outlet unless otherwise noted for specific locations. The cables shall be installed from the Work Area Outlet to the Telecommunications Room (TR) located on the same floor, and routed to the appropriate rack serving that area and terminated as specified in this document.

B. All cables shall be run using a star topology (home run) from the Main Cross-Connect (MC) to each Horizontal Cross-Connect (HC) within the telecommunications room. One additional Intermediate Cross-Connect (IC) may be implemented between the MC and HC if so required. The length of each individual run of backbone fiber cable shall not exceed 2000 meters for multimode and 3000 meters for singlemode and the length of each UTP cable run for voice applications is not to exceed 800 meters (90 meters for data) as specified under TIA/EIA-568-B. The length of the media between the IC and HC shall not exceed 300 meters.

C. Optical Fiber Termination Hardware

1. Fiber slack shall be neatly coiled within the fiber splice tray or enclosure. No slack loops shall be allowed external to the fiber panel.

2. Each cable shall be individually attached to the respective fiber enclosure by mechanical means. The cables strength member shall be securely attached the cable strain relief bracket in the enclosure.

3. Each fiber bundle shall be stripped upon entering the splice tray and the individual fibers routed in the splice tray.

4. Each cable shall be clearly labeled at the entrance to the splice enclosure. Cables labeled within the bundle shall not be acceptable.

5. A maximum of 12 strands of fiber shall be spliced in each tray

6. All spare strands shall be installed into spare splice trays.

3.2 TESTING

A. General

1. All cables and termination hardware shall be 100% tested for defects in installation and to verify cabling system performance under installed conditions according to the requirements of ANSI/TIA/EIA-568-B, TSB-67 and TSB-155. All strands of each installed cable shall be verified prior to system acceptance. Any defect in the cabling system installation including but not limited to cable, connectors, feed through couplers, patch panels, and connector blocks shall be repaired or replaced in order to ensure 100% useable conductors in all cables installed.

2. All cables shall be tested in accordance with this document, the ANSI/TIA/EIA standards If any of these are in conflict, the Contractor shall bring any discrepancies to the attention of the project team for clarification and resolution.

B. Optical Fiber Cable & Connectors

1. Test each optical fiber cable element and its associated connectors. Carry out the following test on every element of every optical fiber cable.

2. Visually check optical connectors using microscope (minimal magnification x200) to ensure that no physical damage has occurred during the installation process. There are to be no scratches on the core of the fiber or pits on the core or cladding. If any defect cannot be rectified with polishing, the connector is to be replaced.

3. Carry out OTDR tests on all strands at 1300nm wavelength for multimode cable runs and at 1310 nm for singlemode. These tests shall be carried out from both ends using a near end launch lead and a far end drop lead.

4. The number of samples (averages) for each OTDR test shall be such that the noise amplitude is significantly less than the smallest loss of any component under test. This may vary for different cable runs, for shorter runs and fusion splices etc.; it may be necessary to run many samples.

5. Verify the labeling of the cable and connectors is correct.

6. If any strand has an excessive attenuation coefficient, a sudden step in attenuation coefficient (greater than 0.2 dB) or back scatter, losses due to micro bending or macro bending or has any other fault then the fault on that element shall be rectified.

7. The following table lists the pass/fail criteria for all connectors and fusion splices under test. Any component that does not pass these figures shall be re-worked or replaced.

Fiber Type	Maximum attenuation across mated connector pair (dB) – outward test	Maximum Attenuation across fusion splice – averaged over both directions(dB)
MM	**0.75**	**0.1**
SM	**0.5**	**0.1**

8. The attenuation of each mode connector shall be measured in both directions.

9. Each fusion splice shall be tested in both directions for both multimode and single mode strands. The measurements for each direction shall be averaged for the final attenuation figure for each fusion splice.

10. The return loss must be measured in both directions for single mode connectors. The return loss shall be greater or equal to the value shown in the table above.

11. Any failures shall be recorded and the results obtained after rectification of the fault shall be recorded.

12. Graphical printouts shall be taken of OTDR tests for each element. These printouts shall be printed 11" x 8.5" size sheets. They shall be printed at an appropriate scale, such as 0.5 dB per division for the attenuation axis. Provide diskette copies of the OTDR traces to the Owner on completion of the testing. Provide a copy of the emulation software and the appropriate license to the client.

13. All fiber testing shall be performed on all fibers in the completed end-to-end system. There shall be no splices unless clearly defined in an RFP. Testing shall consist of an end-to-end power meter test performed per TIA/EIA-455-53A. The system loss measurements shall be provided at 850 and/or 1300 nanometers for multimode fibers and 1310 and/or 1550 nanometers for single mode fibers. These tests also include continuity checking of each fiber.
14. For horizontal cabling system using multimode optical fiber, attenuation shall be measured in one direction 850 nanometer (nm) or 1300 nm using an LED light source and power meter.

15. Backbone multimode fiber cabling shall be tested at both 850 nm and 1300 nm (or 1310 and 1550 nm for single mode) in one direction.

16. Test set-up and performance shall be conducted in accordance with ANSI/TIA/EIA-526-14 Standard, Method B.

17. Where links are combined to complete a circuit between devices, the Contractor shall test each link from end to end to ensure the performance of the system. ONLY BASIC LINK TEST IS REQUIRED. The contractor can optionally install patch cords to complete the circuit and then test the entire channel. The test method shall be the same used for the test described above. The values for calculating loss shall be those defined in the ANSI/TIA/EIA Standard.

18. Attenuation testing shall be performed with a stable launch condition using two-meter jumpers to attach the test equipment to the cable plant. The light source shall be left in place after calibration and the power meter moved to the far end to take measurements.

END OF SECTION 271323-TC

271343-TC - COMMUNICATIONS SERVICES CABLING FOR TELECOMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Maryland Department of Transportation/Maryland Aviation Administration Standard Provisions for Construction Contracts Volume 1, Maryland State Highway Administration, Anne Arundel County and Interim Standard Addenda; and other Division 01 Specification sections, apply to this Section.

1.2 SUMMARY

A. Section includes communications services cabling equipment coordination and installation requirements.

1.3 SUBMITTALS

A. Submittal requirements shall be in accordance with Section 270000-Common Work for Telecommunications Systems.

PART 2 - PRODUCTS

2.1 Telephone System Backbone Cabling

A. Provide General Cable or listed cables. Each cable shall have unshielded twisted pair 24 AWG solid copper conductors and meet or exceed the electrical specifications for Category 3 cables detailed in the ANSI-EIA/TIA 568B.

B. Commercial Building Telecommunications Wiring Standard for premises wiring. The cable shall be riser rated.

2.2 Telephone System External Cabling – To be provided by Maryland Aviation Administration Office of Technology.

A. External Air Core Cable. Provide General Cable or listed cable air core telephone cable suitable for direct-burial or conduit applications. The cable shall have 22 AWG solid annealed copper conductors. The sheath shall consist of a 0.008" corrugated aluminum shield, with a 0.006" corrugated steel shield and a black polyethylene jacket. The jacket shall be sequentially printed with a footage marker at regular intervals. A flooding compound shall be applied over the core and to all surfaces of the aluminum and steel shields to resist moisture entry and to inhibit corrosion. Terminate both ends of this cable on Krone blocks bracket fixed to the Telephone Termination Backboard or rack.

2.3 Telephone System Termination Frames

A. Rack-mounted Termination Patch Panel. Provide a RJ-45 Patch Panel with individual RJ-45 connectors to terminate the telephone backbone cable pairs. All pairs will be terminated on each RJ-45 connector using 568B termination scheme. Each patch panel shall be suitable for rack mounting in a 19" rack. Provide Data-Patch Category 6 Patch Panels which utilize 110 style terminations on the back.

2.4 Feeder Telephone Cabling

A. Provide telephone feeder cables running from the Main Distribution Frame to wall-mounted Intermediate Distribution Frames (IDFs) in each of the Communications Rooms. Refer to drawing for cable quantities and routing information.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Label each block with all building, room and pair counts.

B. Terminate the Main Distribution Frame end of each feeder cable on Krone blocks fitted to Termination Backboard in the MDF. Terminate all pairs of each feeder cable.

C. Terminate the Intermediate Distribution Frame end of each feeder cable on Krone blocks fitted to the wall of each Communications Room. Terminate all pairs of each feeder cable.

E. Telephone System External and Backbone Cabling Testing

1. Test each Telephone System Backbone and External Cable and its associated patch frame connectors. Carry out the following tests on every pair of every telephone system feeder and external cable:

a. Conductor Continuity

b. Conductor Separation

c. Conductor Polarity

END OF SECTION 271343-TC

271519-TC - HORIZONTAL CABLING FOR TELECOMMUNICATIONS SYSTEMS

PART I – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Maryland Department of Transportation/Maryland Aviation Administration Standard Provisions for Construction Contracts Volume 1, Maryland State Highway Administration, Anne Arundel County and Interim Standard Addenda; and other Division 01 Specification sections, apply to this Section.

1.2 SUMMARY

A. Section includes:

1. Descriptions of the products and execution requirements relating to furnishing and installing Horizontal Cabling. Data Communications Horizontal Cabling is covered under this document.

2. Minimum requirements for the following:

   a. Copper UTP Cable
   b. Fiber Cable

3. Product specifications, general design considerations, and installation guidelines are provided in this document. Quantities of telecommunications outlets, typical installation details, cable routing and outlet types will be provided as an attachment to this document.

1.3 REFERENCES

A. The following industry standards are the basis for the structured cabling system described in this document.

TIA/EIA	
TIA/EIA-568-B	Commercial Building Telecommunications Cabling Standard
TIA/EIA-569-A	Commercial Building Standard for Telecom Pathways and Spaces
TIA/EIA-606	Administration Standard for the Telecommunications Infrastructure of Commercial Buildings
TIA/EIA-607	Commercial Building Grounding/Bonding Requirements

NFPA

NFPA-70	National Electric Code (NEC)-1999

ISO/IEC

ISO/IEC 11801	Generic Cabling for Customer Premises

B. Conflicts:

1. The most recent versions of all documents apply to this project. If there is a conflict between applicable documents, the order above shall dictate the order of precedence in resolving the issue unless an enforceable local or national code is in effect.

2. If the bid documents are in conflict, this specification shall take precedence.

1.4 SUBMITTALS

A. Submittal requirements shall be in accordance with Section 270000-Common Work for Telecommunications Systems.

B. Upon completion of the installation, the telecommunications contractor shall provide three (3) full documentation sets to the Engineer for approval. Documentation shall include the items detailed in the sub-sections below.

C. Documentation shall be submitted within ten (10) working days of the completion of each testing phase. This is inclusive of all test results and draft as-built drawings. Draft drawings may include annotations done by hand. Machine generated (final) copies of all drawings shall be submitted within 30 working days of the completion of each testing phase. At the request of the Engineer, the telecommunications contractor shall provide copies of the original test results.

D. Maryland Aviation Administration Office of Technology may do a 10% random field re-test be conducted on the cable system, at no additional cost, to verify documented findings. Tests shall be a repeat of those defined above. If findings contradict the documentation submitted by the telecommunications contractor, additional testing can be requested to the extent determined necessary by the Engineer, including a 100% re-test. This re-test shall be at no additional cost to the Owner.

E. Test Results documentation shall be provided on disk within three weeks after the completion of the project. The disk shall be clearly marked on the outside front cover with the words “Project Test Documentation”, the project name, and the date of completion (month and year). The results shall include a record of test frequencies, cable type, conductor pair and cable (or outlet) I.D., measurement direction, reference setup, and crew member name(s). The test equipment name, manufacturer, model number, serial number, software version and last calibration date will also be provided

at the end of the document. Unless the manufacturer specifies a more frequent calibration cycle, an annual calibration cycle is anticipated on all test equipment used for this installation. The test document shall detail the test method used and the specific settings of the equipment during the test as well as the software version being used in the field test equipment.

F. The field test equipment shall meet the requirements of ANSI/TIA/EIA-568-B including applicable TSB's and amendments. The appropriate level IV tester shall be used to verify Category 6 cabling systems.

G. Printouts generated for each cable by the wire (or fiber) test instrument shall be submitted as part of the documentation package. Alternately, the telecommunications contractor may furnish this information in electronic form (compact disc). These discs shall contain the electronic equivalent of the test results as defined by the bid specification and be of a format readable from Microsoft Word or Microsoft Excel.

H. When repairs and re-tests are performed, the problem found and corrective action taken shall be noted, and both the failed and passed test data shall be documented.

I. The As-Built drawings are to include cable routes and outlet locations. Their sequential number as defined elsewhere in this document shall identify outlet locations. Numbering, icons, and drawing conventions used shall be consistent throughout all documentation provided. The Owner will provide floor plans in paper and electronic (DWG, AutoCAD) formats on which as-built construction information can be added. These documents will be modified accordingly by the telecommunications contractor to denote as-built information as defined above and returned to the Owner. Numbering, icons, pathways and other drawing conventions are to be assigned their own individual AutoCAD layer.

J. The Contractors shall annotate the base drawings and return a hard copy (same plot size as originals) and electronic (AutoCAD) form. In addition, for all cable runs that pass in or thru a manhole or hand hole, the contractor will provide digital photos of the attached label and entrance in and out of the duct system.

1.5 QUALITY ASSURANCE

A. The successful vendor shall meet or exceed all requirements for the cable system described in this document.

PART 2 – PRODUCTS

2.1 EQUIPMENT

A. Provide all labor, materials, tools and equipment required for the complete installation of work called for in the Construction Documents.

B. All cables and related terminations, support and grounding hardware shall be furnished, installed, wired, tested, labeled, and documented by the telecommunications contractor as detailed in this document.

C. Copper UTP Cable

1. Recommended design shall include:

a. Minimum 2 Four-pair 100 ohm 24 AWG, UTP cable—Category 6 for voice
b. Minimum 2 Four-pair 100 ohm, 24/23 AWG, UTP cable—Category 6 for data
c. Maximum cable length is 90 meters
d. All cable shall meet or exceed the following specifications

2. The Copper Cable shall be used for the horizontal cabling subsystem. These requirements are for cables of unshielded 24 AWG bare copper conductors, insulated with thermoplastic, twisted into pairs and enclosed in a thermoplastic jacket. The finished cable shall meet or exceed the following requirements of ANSI/EIA/TIA-568-B.

3. All cable shall conform to the requirements for communications circuits defined by the National Electrical Code (Article 800) and the Canadian Building Code. Cable listed to NEC Article 800-51(a) will be used for “Plenum” installations and carry labeling of CMP. Cable listed to NEC Article 800-51(b) shall be installed in vertical runs penetrating more than one floor and carry the labeling of CMR.

4. These specifications are for cable that will meet or exceed the requirements of ANSI/TIA/EIA Category 6 Cabling.

5. All cable shall conform to the requirements for communications circuits defined by the National Electrical Code (Article 800) and the Canadian Building Code. Cable listed to NEC Article 800-51(a) will be used for “Plenum” installations and carry labeling of CMP. Cable listed to NEC Article 800-51(b) shall be installed in vertical runs penetrating more than one floor and carry the labeling of CMR.

D. Fiber Cable

1. When using optical fiber cables, any length of horizontal cables, work area cables, patch cords, and equipment cables is acceptable so long as the total of the combined lengths does not exceed 100m (328 ft). When installing per TSB72, the maximum centralized cable length may not exceed 300m (984 ft.).

2. ANSI/TIA/EIA-568-B.3 Horizontal fiber cable distribution systems:
   a. The optical fiber cable shall consist of a minimum of two 62.5/125µm optical fibers enclosed by a protective sheath
   b. The cable will be capable of supporting applications using a bandwidth in excess of 1 GHz over the 85 m specified for horizontal cabling
   c. The optical fiber shall be multimode, graded-index with a nominal 62.5/125µm core/cladding diameter
   d. The mechanical and environmental specification for the optical fiber cable will be in accordance with ANSI/ICEA-S-83-596

62.5/125µm optical fiber

Wavelength (nm)	Maximum Attenuation (dB/km)	Minimum Information Transmission Capacity (MHz•km)
850	3.5	500
1300	1.5	500

PART 3 – EXECUTION

3.1 INSTALLATION

A. The Communication Equipment Room shall support a minimum of (4) 4-pair Unshielded Twisted Pair (UTP) Copper Cables to each work area outlet unless otherwise noted for specific locations. The cables shall be installed from the Work Area Outlet to the Telecommunications Room (TR) located on the same floor, and routed to the appropriate rack serving that area and terminated as specified in this document.

B. Horizontal Distribution Cable Installation

1. Cable shall be installed in accordance with manufacturer's recommendations and best industry practices.

2. A pull cord (nylon; 1/8" minimum) shall be co-installed with all cable installed in any conduit.

3. Cable raceways shall not be filled greater than the TIA/EIA-569-A maximum fill for the particular raceway type or 40%.

4. Cables shall be installed in continuous lengths from origin to destination (no splices) except for transition points, or consolidation points.

5. Where transition points or consolidation points are allowed, they shall be located in accessible locations and housed in an enclosure intended and suitable for the purpose.

6. The cable's minimum bend radius and maximum pulling tension shall not be exceeded.

7. If a J-hook or trapeze system is used to support cable bundles all horizontal cables shall be supported at a maximum of 48 to 60 inch (1.2 to 1.5 meter) intervals. At no point shall cable(s) rest on acoustic ceiling grids or panels.

8. Horizontal distribution cables shall be bundled in groups of no more than 50 cables. Cable bundle quantities in excess of 50 cables may cause deformation of the bottom cables within the bundle and degrade cable performance.

9. Cable shall be installed above fire-sprinkler systems and shall not be attached to the system or any ancillary equipment or hardware. The cable system and support hardware shall be installed so that it does not obscure any valves, fire alarm conduit, boxes, or other control devices.

10. Cables shall not be attached to ceiling grid or lighting fixture wires. Where support for horizontal cable is required, the contractor shall install appropriate carriers to support the cabling.

11. Any cable damaged or exceeding recommended installation parameters during installation shall be replaced by the contractor prior to final acceptance at no cost to the Owner.

12. Cables shall be identified by a self-adhesive label in accordance with the System Documentation Section of this specification and ANSI/TIA/EIA-606. The cable label shall be applied to the cable behind the faceplate on a section of cable that can be accessed by removing the cover plate.

13. Unshielded twisted pair cable shall be installed so that there are no bends smaller than four times the cable outside diameter at any point in the run and at the termination field.

14. Pulling tension on 4-pair UTP cables shall not exceed 25-lbf for a four-pair UTP cable.

C. Horizontal Cross Connect Installation

1. Cables shall be dressed and terminated in accordance with the recommendations made in the TIA/EIA-568-B standard, manufacturer's recommendations and best industry practices.

2. Pair untwist at the termination shall not exceed 0.5 inch).

3. Bend radius of the cable in the termination area shall not exceed 4 times the outside diameter of the cable.

4. Cables shall be neatly bundled not more than 48 cables per and dressed to their respective panels or blocks. Each panel or block shall be fed by an individual bundle separated and dressed back to the point of cable entrance into the rack or frame.

5. The cable jacket shall be maintained as close as possible to the termination point.

6. Each cable shall be clearly labeled on the cable jacket behind the patch panel at a location that can be viewed without removing the bundle support ties. Cables labeled within the bundle, where the label is obscured from view shall not be acceptable.

D. Optical Fiber Termination Hardware

1. Fiber slack shall be neatly coiled within the fiber splice tray or enclosure. No slack loops shall be allowed external to the fiber panel.

2. Each cable shall be individually attached to the respective fiber enclosure by mechanical means. The cables strength member shall be securely attached the cable strain relief bracket in the enclosure.

3. Each fiber bundle not more than 48 cables per shall be stripped upon entering the splice tray and the individual fibers routed in the splice tray.

4. Each cable shall be clearly labeled at the entrance to the splice enclosure. Cables labeled within the bundle shall not be acceptable.

5. A maximum of 12 strands of fiber shall be spliced in each tray

6. All spare strands shall be installed into spare splice trays.

E. Copper Termination Hardware

1. Cables shall be dressed and terminated in accordance with the recommendations made in the ANSI/TIA/EIA-568-B standard, manufacturer's recommendations and best industry practice.

2. Pair untwist at the termination shall not exceed 3.18mm 0.5 inch).

3. Bend radius of the cable in the termination area shall not exceed 4 times the outside diameter of the cable.

4. Cables shall be neatly bundled and dressed to their respective panels or blocks. Each panel or block shall be fed by an individual bundle separated and dressed back to the point of cable entrance into the rack or frame.

5. The cable jacket shall be maintained to within 25 mm (one inch) of the termination point.

6. Each cable shall be clearly labeled on the cable jacket behind the patch panel at a location that can be viewed without removing the bundle support Velcro ties. Cables labeled within the bundle, where the label is obscured from view shall not be acceptable.

3.2 TESTING

A. General

1. All cables and termination hardware shall be 100% tested for defects in installation and to verify cabling system performance under installed conditions according to the requirements of ANSI/TIA/EIA-568-B, TSB-67 and TSB-155. All pairs of each installed cable shall be verified prior to system acceptance. Any defect in the cabling system installation including but not limited to cable, connectors, feed through couplers, patch panels, and connector blocks shall be repaired or replaced in order to ensure 100% useable conductors in all cables installed.

2. All cables shall be tested in accordance with this document, the ANSI/TIA/EIA standards.

B. Copper Link Testing

1. All twisted-pair copper cable links shall be tested for continuity, pair reversals, shorts, opens and performance as indicated below. Additional testing is required to verify Category performance. Horizontal cabling shall be tested using a level IV test unit for category 6 or category 6 performance compliance, respectively.

2. Continuity - Each pair of each installed cable shall be tested using a test unit that shows opens, shorts, polarity and pair-reversals, crossed pairs and split pairs. Shielded/screened cables shall be tested with a device that verifies shield continuity in addition to the above stated tests. The test shall be recorded as pass/fail as indicated by the test unit in accordance with the manufacturers' recommended procedures, and referenced to the appropriate cable identification number and circuit or pair number. Any faults in the wiring shall be corrected and the cable re-tested prior to final acceptance.

3. Length - Each installed cable link shall be tested for installed length using a TDR type device. The cables shall be tested from patch panel to patch panel, block to block, patch panel to outlet or block to outlet as appropriate. The cable length shall conform to the maximum distances set forth in the ANSI/TIA/EIA-568-B Standard. Cable lengths shall be recorded, referencing the cable identification number and circuit or pair number. For multi-pair cables, the shortest pair length shall be recorded as the length for the cable.

4. A level IV or a better test unit is required to verify category 6 performance and must be updated to include the requirements of TSB-155.

5. The four basic tests required in TSB-67 are:

    a. Wire Map
    b. Length
    c. Attenuation
    d. NEXT (Near end crosstalk)

6. Four additional tests are required per TSB-95:

    a. Return Loss
    b. ELFEXT Loss
    c. Propagation Delay
    d. Delay skew

7. Two additional tests are required:
    a. PSNEXT (Power sum near-end crosstalk loss)
    b. PSELFEXT (Power sum equal level far-end crosstalk loss)

C. Fiber Testing

1. All fiber testing shall be performed on all fibers in the completed end-to-end system. There shall be no splices unless clearly defined in an RFP. Testing shall consist of an end-to-end power meter test performed per TIA/EIA-455-53A. The system loss measurements shall be provided at 850 and/or 1300 nanometers for multimode fibers and 1310 and/or 1550 nanometers for single mode fibers. These tests also include continuity checking of each fiber.

2. For horizontal cabling system using multimode optical fiber, attenuation shall be measured in one direction at either 850 nanometer (nm) or 1300 nm using an LED light source and power meter.

3. Backbone multimode fiber cabling shall be tested at both 850 nm and 1300 nm (or 1310 and 1550 nm for singlemode) in both directions.

4. Test set-up and performance shall be conducted in accordance with ANSI/TIA/EIA-526-14 Standard, Method B.

5. Where links are combined to complete a circuit between devices, the Contractor shall test each link from end to end to ensure the performance of the system. ONLY BASIC LINK TEST IS REQUIRED. The contractor can optionally install patch cords to complete the circuit and then test the entire channel. The test method shall be the same used for the test described above. The values for calculating loss shall be those defined in the ANSI/TIA/EIA Standard.

6. Attenuation testing shall be performed with a stable launch condition using two-meter jumpers to attach the test equipment to the cable plant. The light source shall be left in place after calibration and the power meter moved to the far end to take measurements.

END OF SECTION 271519-TC

271543 - FACEPLATES AND CONNECTORS FOR TELECOMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Maryland Department of Transportation/Maryland Aviation Administration Standard Provisions for Construction Contracts Volume 1, Maryland State Highway Administration, Anne Arundel County and Interim Standard Addenda; and other Division 01 Specification sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Descriptions of the products and execution requirements relating to furnishing and installing faceplates and connectors. Communications faceplates and connectors are covered under this document

2. This section includes minimum requirements for the following:

   a. Faceplates
   b. Copper patch cords and modular connectors
   c. Fiber optic patch cords and modular connectors

3. Product specifications, general design considerations, and installation guidelines are provided in this document. Quantities of telecommunications outlets, typical installation details, cable routing and outlet types will be provided as an attachment to this document.

1.3 SUBMITTALS

A. Submittal requirements shall be in accordance with section 270000-Common Work for Telecommunications Systems.

B. Upon completion of the installation, the telecommunications contractor shall provide documentation sets to the Maryland Aviation Administration Office of Technology (MAA/OT) for approval. Documentation shall include the items detailed in the sub-sections below.

C. Documentation shall be submitted within ten (10) working days of the completion of each testing phase. This is inclusive of all test results and draft as-built drawings. Draft drawings may include annotations done by hand. Machine generated (final) copies of all drawings shall be submitted within 30 working days of the completion of each

testing phase. At the request of the Engineer, the telecommunications contractor shall provide copies of the original test results.

D. MAA/OT may do a 10% random field re-test be conducted on the cable system, at no additional cost, to verify documented findings. Tests shall be a repeat of those defined above. If findings contradict the documentation submitted by the telecommunications contractor, additional testing can be requested to the extent determined necessary by the Engineer, including a 100% re-test. This re-test shall be at no additional cost to the Owner.

E. Testing:

1. Test Results documentation shall be provided on disk within three weeks after the completion of the project. The disk shall be clearly marked on the outside front cover with the words "Project Test Documentation", the project name, and the date of completion (month and year). The results shall include a record of test frequencies, cable type, conductor pair and cable (or outlet) I.D., measurement direction, reference setup, and crew member name(s). The test equipment name, manufacturer, model number, serial number, software version and last calibration date will also be provided at the end of the document. Unless the manufacturer specifies a more frequent calibration cycle, an annual calibration cycle is anticipated on all test equipment used for this installation. The test document shall detail the test method used and the specific settings of the equipment during the test as well as the software version being used in the field test equipment.

2. The field test equipment shall meet the requirements of ANSI/TIA/EIA-568-B including applicable TSB's and amendments. The appropriate level IV tester shall be used to verify Category 6 cabling systems.

3. Printouts generated for each cable by the wire (or fiber) test instrument shall be submitted as part of the documentation package. Alternately, the telecommunications contractor may furnish this information in electronic form (compact disc). These discs shall contain the electronic equivalent of the test results as defined by the bid specification and be of a format readable from Microsoft Word or Microsoft Excel.

4. When repairs and re-tests are performed, the problem found and corrective action taken shall be noted, and both the failed and passed test data shall be documented.

E. The As-Built drawings are to include cable routes and outlet locations. Their sequential number as defined elsewhere in this document shall identify outlet locations. Numbering, icons, and drawing conventions used shall be consistent throughout all documentation provided. The Owner will provide floor plans in paper and electronic (DWG, AutoCAD) formats on which as-built construction information can be added. These documents will be modified accordingly by the telecommunications contractor to denote as-built information as defined above and

returned to the Owner. Numbering, icons, pathways and other drawing conventions are to be assigned their own individual AutoCAD layer.

1.4 REFERENCES

A. The following industry standards are the basis for the structured cabling system described in this document.

TIA/EIA

TIA/EIA-568-B	Commercial Building Telecommunications Cabling Standard
TIA/EIA-569-A	Commercial Building Standard for Telcom Pathways
TIA/EIA-606	Administration Standard for the Telecommunications Infrastructure of Commercial Buildings
TIA/EIA-607	Commercial Building Grounding/Bonding Requirements

NFPA

NFPA-70	National Electric Code (NEC)-1999

ISO/IEC

ISO/IEC 11801	Generic Cabling for Customer Premises

B. Conflicts:

1. The most recent versions of all documents apply to this project. If there is a conflict between applicable documents, the order above shall dictate the order of precedence in resolving the issue unless an enforceable local or national code is in effect.

1.5 QUALITY ASSURANCE

A. The successful vendor shall meet or exceed all requirements for the cable system described in this document.

PART 2 - PRODUCTS

2.1 EQUIPMENT

A. Provide all labor, materials, tools and equipment required for the complete installation of work called for in the Construction Documents

B. All cables and related terminations, support and grounding hardware shall be furnished, installed, wired, tested, labeled, and documented by the telecommunications contractor as detailed in this document.

C. Equivalent Products

1. All outlets shall utilize fully the interchangeable and individual connector modules that mount side by side to facilitate quick and easy moves, adds and changes. All outlets and surface mount boxes shall be available in four colors including Off White (IW),

D Faceplates

1. Faceplates shall be one, two, and four single gang faceplates with combination head screws, screw covers, labels, label covers. The faceplates shall mount to standard U.S. NEMA boxes and adapters with screw-to-screw dimensions of 3.28" (83.3mm).

2. Patch Cords and Modular Connectors - Copper

a. Patch cables are to be provided by contractor, color specified by OT.

3. Patch Cords and Modular Connectors – Fiber Optic

a. Patch cables are to be provided by contractor, color specified by OT.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The Communication Equipment Room shall support a minimum of (4) 4-pair Unshielded Twisted Pair (UTP) Copper Cables to each work area outlet unless otherwise noted for specific locations. The cables shall be installed from the Work Area Outlet to the Telecommunications Room (TR) located on the same floor, and routed to the appropriate rack serving that area and terminated as specified in this document.

B. Faceplate Configurations

1. Faceplates are to be a four position unless a requirement for more than four positions is needed. Color of faceplate is to match color specified by MAA/OT for specific location.
2. Wall phone Faceplate. Provide a wall-mounted flush modular faceplate to house a single work area jack. The faceplate shall fit over a standard NEMA dual gang electrical outlet box fitted with a single gang plaster ring cover and shall be stainless steel. The faceplate shall be capable of having a wall-mounted telephone fitted directly over it.
3. Furniture Faceplate. Provide a flush-mounted modular faceplate to house work area jacks, capable of housing a minimum of two jacks. The faceplate shall fit into a modular furniture raceway.

    a. Provide (4) Category 6. Two (2) blue jacket for Data, and two (2) white for Voice distribution cables running from each outlet back to the specified patch panel in the Communications Room (Distribution Frame) using the cable tray and conduit infrastructure.

    b. Terminate each Category 6 (Cat-6) distribution cable at each end on specified jack using the 568B wiring scheme.

    c. Face plates, jacks, labels and icons should be Ortronics Clarity series Cat 6 or approved equal. Primary voice jack should be Gray (-78) secondary jack should be Black (-00), faceplate should be Fog White. Primary data jack should be Red (-42) secondary jack should be Yellow (-44) faceplate should be Fog White.

C. Horizontal Distribution Cable Installation

1. Cable shall be installed in accordance with manufacturer’s recommendations and best industry practices.

2. A pull cord (nylon; 1/8" minimum) shall be co-installed with all cable installed in any conduit.

3. Cable raceways shall not be filled greater than the TIA/EIA-569-A maximum fill for the particular raceway type or 40% whichever is greater.

4. Cables shall be installed in continuous lengths from origin to destination (no splices) except for transition points, or consolidation points.

5. Where transition points or consolidation points are allowed, they shall be located in accessible locations and housed in an enclosure intended and suitable for the purpose.

6. The cable's minimum bend radius and maximum pulling tension shall not be exceeded.

7. If a J-hook or trapeze system is used to support cable bundles all horizontal cables shall be supported at a maximum of 48 to 60 inch (1.2 to 1.5 meter) intervals. At no point shall cable(s) rest on acoustic ceiling grids or panels.

8. Horizontal distribution cables shall be bundled in groups of no more than 50 cables. Cable bundle quantities in excess of 50 cables may cause deformation of the bottom cables within the bundle and degrade cable performance.

9. Cable shall be installed above fire-sprinkler systems and shall not be attached to the system or any ancillary equipment or hardware. The cable system and support hardware shall be installed so that it does not obscure any valves, fire alarm conduit, boxes, or other control devices.

10. Cables shall not be attached to ceiling grid or lighting fixture wires. Where support for horizontal cable is required, the contractor shall install appropriate carriers to support the cabling.

11. Any cable damaged or exceeding recommended installation parameters during installation shall be replaced by the contractor prior to final acceptance at no cost to the Owner.

12. Cables shall be identified by a self-adhesive label in accordance with the System Documentation Section of this specification and ANSI/TIA/EIA-606. The cable label shall be applied to the cable behind the faceplate on a section of cable that can be accessed by removing the cover plate.

13. Unshielded twisted pair cable shall be installed so that there are no bends smaller than four times the cable outside diameter at any point in the run and at the termination field.

14. Pulling tension on 4-pair UTP cables shall not exceed 25-lbf for a four-pair UTP cable.

D. Horizontal Cross Connect Installation

1. Cables shall be dressed and terminated in accordance with the recommendations made in the TIA/EIA-568-B standard, manufacturer's recommendations and best industry practices.

2. Pair untwist at the termination shall not exceed 3.18 mm (0.5 inch).

3. Bend radius of the cable in the termination area shall not exceed 4 times the outside diameter of the cable.

4. Cables shall be neatly bundled and dressed to their respective panels or blocks. Each panel or block shall be fed by an individual bundle separated and dressed back to the point of cable entrance into the rack or frame.

5. The cable jacket shall be maintained as close as possible to the termination point.

6. Each cable shall be clearly labeled on the cable jacket behind the patch panel at a location that can be viewed without removing the bundle support ties. Cables labeled within the bundle, where the label is obscured from view shall not be acceptable.

E. Optical Fiber Termination Hardware

1. Fiber slack shall be neatly coiled within the fiber splice tray or enclosure. No slack loops shall be allowed external to the fiber panel.

2. Each cable shall be individually attached to the respective fiber enclosure by mechanical means. The cables strength member shall be securely attached the cable strain relief bracket in the enclosure.

3. Each fiber bundle shall be stripped upon entering the splice tray and the individual fibers routed in the splice tray.

4. Each cable shall be clearly labeled at the entrance to the splice enclosure. Cables labeled within the bundle shall not be acceptable.

5. A maximum of 12 strands of fiber shall be spliced in each tray

6. All spare strands shall be installed into spare splice trays.

F. Copper Termination Hardware

1. Cables shall be dressed and terminated in accordance with the recommendations made in the ANSI/TIA/EIA-568-B standard, manufacturer's recommendations and best industry practice.

2. Pair untwist at the termination shall not exceed 3.18mm (0.5 inch).

3. Bend radius of the cable in the termination area shall not exceed 4 times the outside diameter of the cable.

4. Cables shall be neatly bundled and dressed to their respective panels or blocks. Each panel or block shall be fed by an individual bundle separated and dressed back to the point of cable entrance into the rack or frame.

5. The cable jacket shall be maintained to within 25 mm (one inch) of the termination point.

6. Each cable shall be clearly labeled on the cable jacket behind the patch panel at a location that can be viewed without removing the bundle support ties. Cables labeled within the bundle, where the label is obscured from view shall not be acceptable.

G. Identification and Labeling

1. The contractor shall develop and submit for approval a labeling system for the cable installation. The Owner will negotiate an appropriate labeling scheme with the successful contractor. At a minimum, the labeling system shall clearly identify all components of the system: racks, cables, panels and outlets. The labeling system shall designate the cables origin and destination and a unique identifier for the cable within the system. Racks and patch panels shall be labeled to identify the location within the cable system infrastructure. All labeling information shall be recorded on the as-built drawings and all test documents shall reflect the appropriate labeling scheme.

2. All label printing will be machine generated. Self-laminating labels will be used on cable jackets, appropriately sized to the OD of the cable, and placed within view at the termination point on each end. Outlet, patch panel and wiring block labels shall be installed on, or in, the space provided on the device.

3.2 TESTING

A. General

1. All cables and termination hardware shall be 100% tested for defects in installation and to verify cabling system performance under installed conditions according to the requirements of ANSI/TIA/EIA-568-B, TSB-67 and TSB-155. All pairs of each installed cable shall be verified prior to system acceptance. Any defect in the cabling system installation including but not limited to cable, connectors, feed through couplers, patch panels, and connector blocks shall be repaired or replaced in order to ensure 100% useable conductors in all cables installed.

2. All cables shall be tested in accordance with this document, the ANSI/TIA/EIA standards. If any of these are in conflict, the Contractor shall bring any discrepancies to the attention of the project team for clarification and resolution.

B. Copper Channel Testing

1. All twisted-pair copper cable links shall be tested for continuity, pair reversals, shorts, opens and performance as indicated below. Additional testing is required

to verify Category performance. Horizontal cabling shall be tested using a level IV test unit for category 6 or category 6 performance compliance, respectively.

2. Continuity - Each pair of each installed cable shall be tested using a test unit that shows opens, shorts, polarity and pair-reversals, crossed pairs and split pairs. Shielded/screened cables shall be tested with a device that verifies shield continuity in addition to the above stated tests. The test shall be recorded as pass/fail as indicated by the test unit in accordance with the manufacturers' recommended procedures, and referenced to the appropriate cable identification number and circuit or pair number. Any faults in the wiring shall be corrected and the cable re-tested prior to final acceptance.

3. Length - Each installed cable link shall be tested for installed length using a TDR type device. The cables shall be tested from patch panel to patch panel, block to block, patch panel to outlet or block to outlet as appropriate. The cable length shall conform to the maximum distances set forth in the ANSI/TIA/EIA-568-A Standard. Cable lengths shall be recorded, referencing the cable identification number and circuit or pair number. For multi-pair cables, the shortest pair length shall be recorded as the length for the cable.

4. The four basic tests required in TSB-67 are:

    a. Wire Map
    b. Length
    c. Attenuation
    d. NEXT (Near end crosstalk)

5. Four additional tests are required per TSB-155:

    a. Return Loss
    b. ELFEXT Loss
    c. Propagation Delay
    d. Delay skew

6. In Amendment 5, two additional tests are required:

    a. PSNEXT (Power sum near-end crosstalk loss)
    b. PSELFEXT (Power sum equal level far-end crosstalk loss)

C. Fiber Testing

1. All fiber testing shall be performed on all fibers in the completed end-to-end system. There shall be no splices unless clearly defined in an RFP. Testing shall consist of an end-to-end power meter test performed per TIA/EIA-455-53A. The system loss measurements shall be provided at 850 and/or 1300 nanometers for

multimode fibers and 1310 and/or 1550 nanometers for single mode fibers. These tests also include continuity checking of each fiber.

2. For horizontal cabling system using multimode optical fiber, attenuation shall be measured in one direction at either 850 nanometer (nm) or 1300 nm using an LED light source and power meter.

3. Backbone multimode fiber cabling shall be tested at both 850 nm and 1300 nm (or 1310 and 1550 nm for single mode) in one direction.

4. Test set-up and performance shall be conducted in accordance with ANSI/TIA/EIA-526-14 Standard, Method B.

5. Where links are combined to complete a circuit between devices, the Contractor shall test each link from end to end to ensure the performance of the system. ONLY BASIC LINK TEST IS REQUIRED. The contractor can optionally install patch cords to complete the circuit and then test the entire channel. The test method shall be the same used for the test described above. The values for calculating loss shall be those defined in the ANSI/TIA/EIA Standard.

6. Attenuation testing shall be performed with a stable launch condition using two-meter jumpers to attach the test equipment to the cable plant. The light source shall be left in place after calibration and the power meter moved to the far end to take measurements.

END OF SECTION 271543-TC

275116-TC PA AND EMERGENCY TENANT PAGING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Maryland Department of Transportation/Maryland Aviation Administration Standard Provisions for Construction Contracts Volume 1, December 1993; Interim Standard Provisions Addendum (ISPA) dated February 2004; Errata for ISPA; and other Division 1 Specifications Sections, apply to this Section.

1.2 SUMMARY

A. This section includes general requirements for modifications to the existing Public Address (PA) system and to the Emergency Tenant Paging System.

1.3 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings:

1. Dimensioned plans and sections or elevation layouts.

2. Wiring Diagrams: Power, signal, and control wiring specific to this Project. Identify terminals and wiring designations and color codes to facilitate installation, operation, and maintenance. Indicate recommended types, wire sizes, and circuiting arrangements for field-installed wiring, and show circuit protection features.

3. Speaker locations, placement of ambient microphones and zone boundaries must be approved by OT Engineer.

4. General design guidance for speaker placement is every 12 feet.

1.4 QUALITY ASSURANCE

A. All equipment and installation methods shall be in accordance with recommendations from Washington Professional Systems (WPS), who is the current sole source PA system provider. The local WPS contact is Dave Leister at 301-370-4746.

davel@wpsworld.com. The Contractor is responsible for contacting this organization and including all associated cost in the bid price.

B. A copy of all correspondence, task orders, work orders with WPS shall be also provided to the OT Engineer.

C. OT Engineer shall approve all work prior to work being performed.

D. Additional system design shall be performed by WPS.

1.5 PROJECT CONDITIONS

A. Interruption of Existing Service: Do not interrupt PA system service to facilities occupied by Owner or others unless permitted under the following conditions:

1. Notify the OT Engineer no fewer than two weeks in advance of proposed interruption of PA system service.

2. Do not proceed with interruption of PA system service without written permission.

B. Emergency Evacuation Paging must remain operational at all times.

If service disruption is required notify the Fire Marshall and the OT Engineer. Approval must be in writing.

1.6 COORDINATION

A. Coordinate all PA system work with the OT Engineer and WPS.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. The existing Public Address System is manufactured by Innovated Electronics Designs, Inc.; therefore, all PA system equipment shall be exclusively by Innovated Electronics Design, Inc., only, unless noted otherwise. There will be “No Exceptions Allowed”. All other substituted products shall be submitted and approved by the OT Engineer with input from WPS.

2.2 EQUIPMENT

A. All equipment shall be in accordance with recommendations from WPS. Refer to the Drawings for equipment supplier and installation requirements.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Conductors

1. Wire and cabling shall be as recommended by WPS and all wire and cabling shall be installed in an enclosed conduit and raceway system.

2. Microphone and speaker wire shall not be run in the same conduit

3. After installation and before termination, all wiring and cabling shall be checked and tested to insure there are no grounds, opens or shorts on any conductors or shields.

4. Visually inspect wire for faulty insulation prior to installation. Protect cable ends at all times with acceptable end caps except during termination.

5. Connection of new work to existing work or equipment must be performed by WPS.

6. During construction if existing work must be removed/disconnected this work shall be performed by WPS

7. Installation of conductors shall comply with any of the methods listed in NFPA 72 Chapters 6.9.10.4.1, 4.2 and 4.3 for survivability. Coordination with WPS is essential to insure conductor compatibility with system components.

B. Field Quality Control

1. Coordinate all final terminations to PA system equipment with WPS.

2. Perform all tests on new conductors prior to contacting WPS.

3. Coordinate all final equipment and system testing and demonstration with WPS, OT Engineer and the Fire Marshall.

4. All connection points to the PA system shall be at existing Paging Access Points (PAP). If insufficient facilities exist, the current facilities shall be expanded to accommodate new work or the creation of a new PAP shall be created at the sole discretion of the OT Engineer.

3.2 START UP SERVICE

A. Engage WPS to perform all equipment startup and system programming. Contractor shall coordinate and be on-site for all startup functions.

3.3 DEMONSTRATION

A. Engage WPS to demonstrate proper operation of all PA system equipment.

END OF SECTION 275116-TC

SENSITIVE SECURITY INFORMATION (SSI) SPECIFICATION

MARTIN STATE AIRPORT

BALTIMORE/WASHINGTON INTERNATIONAL Thurgood Marshall AIRPORT

ITEM X-2 – SENSITIVE SECURITY INFORMATION (SSI) SYSTEM REQUIREMENTS DURING CONSTRUCTION

DESCRIPTION

2-1.1 DESCRIPTION. This item shall consist of all labor, materials and effort necessary to prepare and execute a Contractor's Sensitive Security Information (SSI) Management Plan for the project. The management plan shall be completed in accordance with these specifications.

2-1.2 RELATED DOCUMENTS. Drawings and general provisions of the Contract, including Maryland Department of Transportation/Maryland Aviation Administration Standard Provisions for Construction Contract, Volume I, December 1993, and Interim Standards Provision Addendum (ISPA) dated February 2004 for Construction Contracts; and other Technical Specification Sections, apply to this Section.

2-1.3 SSI REQUIREMENTS DOCUMENTATION. It is the Contractor's responsibility to become thoroughly familiar with the various aspects of 49 CFR 1542, *Transportation Security Administration, Department of Transportation, Airport Security* and the Maryland Aviation Administration (MAA) Design Standard for the Management of SSI. Any violation by the Contractor or his Subcontractors and any subsequent fines or civil penalties imposed due to a violation of these requirements will be the responsibility of the Contractor.

2.1.4 AFFECTED SECURITY SYSTEMS. Design and information concerning the following security systems and their components in use at Baltimore/Washington International Thurgood Marshall Airport (BWI Marshall) and Martin State Airport (MTN) constitute SSI:

a. **CAD**. The Computer Aided Dispatch (CAD) System is an automated point of entry which provides an integrated information gathering function from multiple call, alarm, and signaling sources and distributes that information to appropriate emergency response units for public safety purposes. Basic functions provided by CAD include resource management, call taking, location verification, dispatching, unit status management, and call disposition. Interface with mobile data computers and other external safety and security systems, along with local, state and federal information systems benefit timely and effective response to emergency situations.

b. **CASS.** The Controlled Access Security System (CASS) provides a means of opening and closing doors to secure areas through the use of a card reader and data contained on an access card (MAA Security Badge). The system produces an automated log of all activity and interfaces with other security systems.

Additionally, there are subsystems which use the same components for limited, related applications.

c. **CCTV.** The Closed Circuit Television (CCTV) System provides a means of viewing activity at various locations throughout the BWI Marshall campus through the use of a series of cameras and monitors. The system includes the capability to record video images viewed through the remote camera. The system is integrated and can be controlled remotely. Additionally, there are subsystems which use the same components for limited, related applications (such as the Exit Lane Breach Detection System).

d. **Flex Response.** The Flex Response System is a standalone audible and visual alarm system that provides a means of alerting law enforcement and airline gate personnel of a security concern arising from personnel activity or carry-on baggage screening at pier security checkpoints. There are two alert levels: amber and red. Additionally, the system can be activated by opening a door to an Automated External Defibrillator (AED) cabinet.

Each of these security systems is maintained and/or operated by a sole source system contractor with whom the Contractor shall coordinate during bidding and construction.

2.1.5 DEFINITIONS.

a. *Airport Security Coordinator*. The Director of Airport Security (DOAS) who is an MAA employee serving as the primary contact for all security-related activities and communications with the Transportation Security Administration (TSA).

b. *Construction Manager*. The consultant who is formally retained by MAA for the purpose of construction administration of a construction project containing SSI. The Construction Manager is responsible for the safeguarding and management of SSI by all construction management team members in his charge throughout the entire duration of the project.

c. *Contractor*. The entity that has been awarded a contract by MAA and will construct the SSI project using his employees and/or those of a subcontractor he subsequently employs. The Contractor is responsible for the safeguarding and management of SSI by all employees and subcontractors in his charge throughout the entire duration of the project.

d. *Covered Person.* An individual or entity with transportation security or transportation security-related responsibilities. Covered persons include appropriate MAA employees, consultants, contractors (and their sub-contractors),

as well as stakeholders and industry partners. A list of covered persons is contained in 49 CFR 1520.7.

e. *Freedom of Information Act (FOIA).* The Federal Law ensuring public access to U.S. government records. FOIA carries a presumption of disclosure; the burden is on the government to substantiate why information may not be released. Upon written request, agencies of the United States government are required to disclose those records, unless they can be lawfully withheld from disclosure under one of nine specific exemptions in the FOIA. This right of access is ultimately enforceable in federal court. SSI is exempt from the provisions of FOIA.

f. *MAA Project Manager (Construction).* The MAA Facilities Development and Engineering or Information Technology (IT) staff member designated to direct and to manage the construction of projects involving SSI. The MAA Project Manager (Construction) bears responsibility for the safeguarding and management of SSI by all construction management team members in his charge throughout the entire duration of the project.

g. *Maryland's Public Information Act (PIA).* Maryland State Government Article Section 10-611 et seq., grants the public a broad right of access to records that are in the possession of State and local government agencies. It has been a part of the Annotated Code of Maryland since its enactment as Chapter 698 of the Laws of Maryland 1970 and is similar in purpose to the federal Freedom of Information Act ("FOIA"), 5 USC. §552, and the public information and open records acts of other states. SSI is exempt from the provisions of PIA.

h. *Need to Know.* A designation made by a responsible MAA Project Manager which is limited to persons who carry out, supervise, or are in training for transportation security activities, if necessary, for the performance of their job.

i. *Project SSI Coordinator.* The individual designated by the Contractor who is responsible for ensuring compliance by all Contractor and Subcontractor personnel for SSI safeguarding and management. An alternate shall be designated as a secondary contact, but SSI responsibility remains with the Project SSI Coordinator. The Project SSI Coordinator and the designated alternate shall undergo MAA SSI training and obtain an MAA Security (Red) Badge.

j. *Project SSI Management Plan.* A plan, developed by the Contractor and approved by the MAA Construction Manager, that addresses the management, reproduction, accounting, security, storage and return of SSI in accordance with provisions contained herein. Minimum content requirements are listed in the REQUIREMENTS section of this Specification.

k. *Sensitive Security Information (SSI).* A category of information that requires protection because public disclosure would be detrimental to the security of transportation. SSI is considered Sensitive But Unclassified (SBU). Civil penalties are assigned for unauthorized disclosure of SSI. Classified national security information is subject to more stringent handling requirements. Criminal penalties can be incurred for unauthorized release of classified national security information.

l. *Sole Source System Contractor*. An employee of the sole source contractor that provides operation and maintenance for one of the four identified physical security systems (CASS, CCTV, Flex Response and CAD) whose components constitute SSI.

m. *Transportation Security Administration (TSA).* An agency of the United States Federal Government (Executive Branch) responsible for Civil Aviation Security through the enforcement of regulations (under Title 49) designed to safeguard Civil Aviation Operations against acts of violence or acts of unlawful interference. TSA is responsible for the safety and security of passengers, flight crews, ground operations personnel, and the general public.

REQUIREMENTS

2-2.1 GENERAL REQUIREMENTS. All project documents and other media containing SSI shall be safeguarded and managed by the Contractor's Project SSI Coordinator in accordance with this specification. The Contractor shall prepare and submit for approval by the MAA Construction Manager a Project SSI Management Plan. The Contractor shall be required to submit the SSI Management Plan after receipt of a Notice of Recommended Award (NORA) and the Contractor's SSI Management Plan must be accepted by MAA before MAA will issue a Notice to Proceed (NTP) for the project.

The SSI Management Plan is subject to an MAA review and acceptance process wherein MAA has Seven (7) Calendar days to review and comment on the SSI Management Plan each time that it is submitted for review. The Contractor shall be allowed up to thirty-five (35) Calendar days from NORA (including MAA review periods) to prepare and gain approval of the SSI Management Plan. If acceptance of the SSI Management Plan occurs after thirty-five (35) Calendar days from NORA, the Contract Performance Time specified elsewhere in the contract shall be reduced by the number of days of delay in MAA acceptance of the SSI Management Plan.

Documents covered as SSI include, but are not limited to, contract plans and specifications, submittals, shop drawings, requests for information (RFIs), contract revisions, system drawings, system manuals, software documentation, training

documents and materials operation and maintenance manuals and system codes.

The Contractor shall coordinate with the Sole Source System Contractor(s) for the execution of work on physical security systems associated with this project that contains SSI.

2-2.2 MARKING AND HANDLING OF SSI. The following shall apply:

a. Protective Marking of media containing SSI:

General - Any person who creates a record containing SSI shall include a protective marking and distribution limitation statement.

Paper ("Hard Copy") - All SSI documents shall contain this protective marking in the document header:

Sensitive Security Information

This protective marking should be stamped or typed in plain style bold text.

The distribution limitation statement shall be contained in the document footer and informs the viewer that the record must be protected from unauthorized disclosure.

WARNING: This document contains Sensitive Security Information that is controlled under 49 CFR 1520. No part of this document may be released to persons without a need to know, as defined in 49 CFR 1520, except with the written permission of the TSA Administrator, Washington, DC. Unauthorized release may result in civil penalty or other action. For U.S. Government agencies, public release is governed by 5 USC 522.

The Header and Footer described above shall appear on the cover page of any document, report or specification that contains **any** SSI.

The Footer described above shall be included on all project plan sheets, diagrams, shop drawings, record drawings or any other drawings that contain SSI about the affected systems or their component parts.

Charts, maps, and drawings designated as SSI must have the appropriate protective marking and the distribution limitation statement affixed in a manner that is plainly visible.

Facsimile Cover Sheets - Documents used to transmit SSI (like facsimile cover sheets) but do not themselves contain SSI, must be marked with the protective marking and distribution limitation statement. The following statements must be affixed to the front page of the cover sheet:

This facsimile is intended for the recipient only. If this is received by someone other than the intended recipient, the person receiving the message should immediately contact the sender for further instructions.

The protective marking SENSITIVE SECURITY INFORMATION and/or the distribution limitation statement on this page are cancelled when the attachments containing SSI are removed.

Transmittal Letters – Like facsimile cover letters, transmittal letters do not themselves contain SSI, but may cover other documents that do and must be marked with the protective marking and distribution limitation statement. The following statements must be affixed to the front page of the transmittal letter:

This transmittal letter is intended for the recipient only. If this is received by someone other than the intended recipient, the person receiving the message should immediately contact the sender for further instructions.

The protective marking SENSITIVE SECURITY INFORMATION and/or the distribution limitation statement on this page are cancelled when the attachments containing SSI are removed.

Electronic - SSI contained on electronic media and magnetic media must have the protective marking and the distribution limitation statement applied at the beginning and end of the electronic and magnetic text; on each side of the disk and the disk sleeve/jacket; on the non-optical side of the CD-ROM, DVD or other format disk; and on both sides of the CD-ROM, DVD or other format disk case. Memory sticks that contain SSI shall be indelibly marked "SSI" on both sides of the devise.

Electronic Mail (e-mail) - SSI contained within an electronic mail message must include the protective marking within the subject line of the message and the distribution limitation statement applied at the end of the message text.

b. Protection and Safeguarding of SSI:

General - All personnel possessing SSI are responsible for ensuring that such information is safeguarded at all times from disclosure to unauthorized personnel. When the information is not under the individual's direct physical control, the individual is responsible for ensuring that it is safeguarded and protected so that it is not physically or visually accessible to persons who do not have a "need to know." When unattended, SSI must be secured in a locked container, office, or other restricted access area with access to the keys or combination limited to those with a need to know.

A person who receives an unmarked record containing SSI should apply the protective marking and distribution limitation statement, and inform the sender of the omission.

Anyone possessing SSI is responsible for ensuring that the information and records containing SSI are protected at all times from disclosure to anyone who does not have a "need to know."

When SSI is not under direct physical control, the covered person must ensure that it is protected in such a way that it is not physically or visually accessible to persons who do not have a "need to know."

The authority to share SSI with any person or entity without a "need to know" is limited to the TSA Administrator.

Every covered person has the responsibility to safeguard SSI according to the CFR and TSA policies. If a covered person encounters a situation in which SSI has been inadvertently shared with a person without the "need to know," immediately notify the MAA Construction Manager.

c. Transmission of SSI:

Non-electronic methods:

Mail – SSI may be transmitted by First Class mail, regular Parcel Post, or by delivery services (Federal Express or UPS).

Interoffice mail – SSI must be transmitted in a sealed envelope to prevent inadvertent visual disclosure.

Hand-carrying between buildings – SSI material carried by hand within or between buildings must be protected to prevent inadvertent visual disclosure.

Electronic methods:

Electronic Mail (e-mail) - When transmitted by e-mail, SSI must be in a password-protected attachment. The passwords and procedures must comply with standards set by the MAA DOAS. Passwords shall contain no fewer that five characters that are a combination of letters and numbers. Passwords cannot accompany the protected file.

Web Posting - MAA does not authorize the posting of SSI on Internet or intranet sites, unless the site has met prescribed MAA security standards.

Facsimile - The sender of SSI transmitted by facsimile must confirm that the fax number of the recipient is current and valid and the intended recipient can promptly retrieve the information.

Facsimiles sent to a controlled, secure area where unauthorized people cannot intercept the SSI material may be sent without requiring the recipient to be there.

Telephone - For SSI communicated via telephone, the caller must ensure that the person receiving the SSI is a "covered person" with "a need to know."

People transmitting SSI via telephone should avoid cellular or cordless phones.

d. Destruction of SSI:

When copies of records containing SSI are no longer needed, they must be promptly and completely destroyed. The objective of destruction is to preclude recognition or reconstruction of the information. Any means approved for the destruction of national security classified material may also be used for SSI. The preferred method of destruction is shredding. The Construction Manager shall supervise and coordinate the destruction of SSI and will ensure destruction at the earliest appropriate time.

When a Contractor proposes to destroy records containing SSI, the Contractor must first provide notification in writing, to the Construction Manager for approval. This notification must include the following minimum information; identification of information to be destroyed, quantities of copies, date and place of destruction, method of destruction, and residual SSI remaining in the custody of the Contractor. After destruction of the documents, the Contractor shall submit to the Construction Manager a certification and register of all documents destroyed.

2-2.3 CONTRACTOR'S SSI MANAGEMENT PLAN. The following information shall, at a minimum, be included in the Contractor's SSI Management Plan:

1. Name and contact information for the Project SSI Coordinator and designated alternate;
2. Name and contact information for the MAA Project Manager (Construction);
3. Name and contact information for the Construction Manager;
4. Name(s) and contact information of the sole source system contractor(s);
5. Roster (Full name, Date of Birth, Social Security Number (SSN) and/or MAA Security Badge Number) of Contractor and Subcontractor "covered persons" with the "need to know" by security system;
6. Names of Contractors and Subcontractors personnel who will possess or hold SSI documents and information. These personnel will be required to pass a TSA Criminal History Record Check (CHRC) and a TSA Security Threat Assessment (STS) and undergo MAA SSI training.
7. A description of the means employed by the Contractor by which reproduction of SSI shall be minimized during the project;
8. Physical description of the means of storage of all media containing SSI in Contractor and Subcontractor offices;
9. Physical description of the means of storage of all media containing SSI by Contractor and Subcontractor personnel on the project site;
10. Internal procedures for the reproduction and accounting of all documents (plans, specifications, shop drawings, cut sheets, *etc*) used by the Contractor and Subcontractor employees.
11. Method of accounting and means of destruction of any SSI documents in possession of the Contractor or their subcontractors.
12. Any other control measures deemed necessary by the Contractor.

The Contractor's SSI Management Plan is not considered SSI.

METHOD OF MEASUREMENT

2-3.1 No direct measurement will be made for SSI System Requirements During Construction.

BASIS OF PAYMENT

2-4.1 Payment will be made at the lump sum bid price for "SSI System Requirements During Construction." This payment shall be full compensation for all costs associated with the SSI requirements identified in this Specification and shall include all labor, materials, training, and equipment required to prepare and comply with the requirements specified.

Payment for these items will be made in installments throughout the project. The first payment of 25% of the lump sum price will be included in the first progress estimate. The remaining 75% of the lump sum price will be included as installments in subsequent progress estimates. Each such installment will be determined based on the ratio of the total work completed to date to the total contract amount.

Payment will be made under:

Item X-2 SSI System Requirements During Construction - per lump sum

END OF ITEM X-2

BUILDING AUTOMATION SYSTEMS SPECIFICATIONS

MARTIN STATE AIRPORT

BWI BALTIMORE/WASHINGTON INTERNATIONAL Thurgood Marshall AIRPORT

The following language shall be used when specifying Air Flow Measuring Systems (AFM/AFMS). Provide air flow measuring system on supply and/or return ducts with the following features and specifications. Coordinate with Meters and Gages, section 230519.

1.1 AFM/AFMS

A. Air flow measuring system shall be thermal dispersion type, Ebtron, Gold Series (GP1) or equal.

1. Air flow measuring system operates based on the rate of heat transfer across the heated elements.

2. Sensor probes shall use two "bead-in-glass" thermistors to determine the airflow rate at each sensing point location. Probes shall be connected to a transmitter to calculate individual airflow prior to averaging and output to local DDC panels.

1.2 TECHNICAL SPECIFICATIONS

A. Sensor Accuracy:

1. Airflow Rate: ± 2% of reading, ± 0.25% repeatability.

2. Temperature: ± 0.15° F.

B. Sensor Ranges:

1. Airflow Velocity: 0 to 5,000 FPM.

C. Sensor Distribution:

1. Equal area.

D. Sensor Assembly (Each Sensing Point):

1. Heated Element: One bead-in-glass, hermetically sealed, thermistor probe.

2. Sensor Housing: Glass-filled polypropylene.

3. Sensor Potting Material: Marine grade, waterproof epoxy.

4. Internal Wiring: Kynar® coated copper.

E. Duct Sizes:

1. Standard: 8 inch to 120 inch.

F. Tube Construction:

1. Aluminum: Gold anodized, 6063 aluminum alloy.

2. Stainless Steel: 315 polished stainless steel.

3. Nominal Tube Diameter: 1.1 inch (aluminum), 1.125 inch (316 ss).

4. Mounting Brackets: 304 stainless steel.

5. Mounting Styles: Insertion, internal or standoff.

G. Cable Assembly:

1. Type: UL® plenum rated, PVC jacket.

2. Length: 10 feet (std.), 50 feet max.

3. Termination: 0.875 inch plug (transmitter end), gold plated pins.

H. Compatible Transmitters:

1. GTA 116, GTN116, GTE116, and GRL116.

I. Listings:

1. UL® 873 airflow & temperature indicating devices.

J. Warranty:

1. 36 months from shipment.

The following language shall be used when specifying Flow Meters. Designs shall specify turbine type flow meters on hydronic piping system. Coordinate with Meters and Gages, Section 230519.

1.1 TURBINE FLOWMETERS

A. Description: Insertion type; measures flow directly in gallons per minute (liters per second).

1. Construction: Bronze or stainless-steel body and plastic turbine or impeller. Wetted metal Parts: 316 stainless steel.

2. Pressure Rating: 400 psig minimum [600 psig for High Temperature Hot Water (HTHW)].

3. Temperature Rating: 200 degrees F minimum (400 degrees for HTHW).

4. Display: Visual instantaneous rate of flow, with register to indicate total volume in gallons (liters).

5. Accuracy: Plus or minus 2-1/2 percent.

6. Sensing Method: Impedance sensing.

7. Supply Voltage: 24 ± 4 VDC at 5 OMA.

8. Output: Isolated analog.

9. Manufacturer and Model: Onicon, F1211.

23 09 00 - BUILDING AUTOMATION SYSTEM (BAS)

PART 1 - GENERAL

1.1 BAS SYSTEM SUPPLIER REQUIREMENTS

A. The Contractor, through the use of an Automatic Temperature Control (ATC) System Supplier, shall furnish, install, and place into service the complete heating, ventilating, and air conditioning (HVAC) monitoring and control system, all in accordance with the requirements of the Contract Documents. The HVAC monitoring and control system shall communicate with the existing Baltimore/Washington International Thurgood Marshall Airport (BWI Marshall) Facility Management System (FMS)/Building Automation Systems (BAS).

B. The System Supplier shall assume and execute full responsibility to select, furnish, install and connect, test and calibrate, place into operation all specified components, assemblies, and accessories needed for a complete and functional system of HVAC monitoring and control in full compliance with the requirements of the specification.

C. The system supplier shall be a single firm, or corporation subcontracted by the Contractor to assume full responsibility to perform all engineering, to select, furnish, and place into operation, a complete and functional system of HVAC monitoring and control. Acceptable System Supplier shall be "Factory Branch Office" of the following:

1. **Johnson Controls, Inc., 60 Loveton Circle, Sparks, Maryland – (Eric Badders at: telephone 410-527-2607).**

Other bids by wholesalers, contractors, and franchised dealers are not acceptable.

1.2 BAS SYSTEM DESCRIPTION:

A. The existing Baltimore/Washington International Thurgood Marshall Airport (BWI Marshall) Building Automation System is a Johnson Controls Metasys System.

B. The BAS System shall be Metasys system consisting of BACnet MS/TP direct digital controls as manufactured by Johnson Controls, utilizing electric actuation. A minimum of one (1) Network Automation Engine (NAE) shall be installed as a web-based extension to the existing Metasys ADX server network. A "Facility Explorer", FX controller, or NCM-based system is unacceptable.

C. Communications: The Building Automation Contractor shall be responsible for full communications to the existing BWI Marshall Metasys network. Full communications means, the BWI Marshall facility operators will be able, from the existing Metasys operator workstations, to fully utilize the Metasys network manager software. The

FMS operator will be able to receive alarms, logs, and reports; monitor operating conditions; change control setpoints and operating schedules; and, operate equipment as desired at all existing Metasys operator workstation locations.

1.3 LIGHTING CONTROL SOFTWARE DESCRIPTION

A. Provide lighting control software/programming at Metasys and at each lighting control panel. Prior to start of programming work, request a lighting control schedule from the MAA. This schedule will dictate default on and off control of lights on a per day basis. Do not proceed until the approved schedule is obtained from the MAA. Provide a menu driven selection screen that will allow the following:

1. Monitoring of the corridor and holdroom lighting zone on/off status.

2. Individual control of each lighting zone.

1.4 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and General Specification Sections.

B. Product Data for each type of product specified. Include manufacturer's technical Product Data for each control device furnished, indicating dimensions, capacities, performance characteristics, electrical characteristics, finishes of materials, installation instructions, and startup instructions.

C. Shop Drawings from manufacturer detailing equipment assemblies and indicating dimensions, weights, loadings, required clearances, method of field assembly, components, and location and size of each field connection. Submit damper leakage and flow characteristics, plus size schedule for controlled dampers.

D. Provide the following information for each control system:

1. Schematic flow diagram showing pumps, fans, coils, dampers, valves, air flow measurement devices, and control devices.

2. Each control device labeled with setting or adjustable range of control.

3. Diagrams for all required electrical wiring. Clearly differentiate between factory-installed, and field-installed wiring.

4. Details of control panel faces, including controls, instruments, and labeling.

5. Written description of sequence of operation.

6. Trunk cable schematic showing programmable control unit locations and trunk data conductors.

7. Listing of connected data points, including connected control unit and input device.

8. System graphics indicating monitored systems, data (connected and calculated) point addresses, and operator notations.

9. Software description and sequence of operation.

10. System configuration showing peripheral devices, diagrams, and interconnections.

E. Wiring diagrams detailing wiring for power, signal, and control systems and differentiating clearly between manufacturer-installed and field-installed wiring.

F. Maintenance data for control systems equipment to include in the operation and maintenance manual. Include the following:

1. Maintenance instructions and spare parts lists for each type of control device.

2. Interconnection wiring diagrams with identified and numbered system components and devices.

3. Inspection period, cleaning methods, cleaning materials recommended, and calibration tolerances.

4. Calibration records and list of set points.

G. Field Test Reports: Procedure and certification of pneumatic control piping system.

H. Project Record Documents: Record actual locations of control components, including control units, thermostats, and sensors. Revise Shop Drawings to reflect actual installation and operating sequences.

1.5 QUALITY ASSURANCE

A. Startup Personnel Qualifications: Engage specially trained personnel in direct employ of manufacturer of primary temperature control system.

B. Comply with NFPA 90A.

C. Comply with NFPA 70.

D. Comply with ASHRAE 135 for DDC Components.

1.6 DELIVERY, STIORAGE, AND HANDLING

A. Store equipment and materials inside and protected from weather.

B. Factory-Mounted Components: Where control devices specified in this Section are indicated to be factory mounted on equipment, arrange for shipping control devices to unit manufacturer.

1.7 WARRANTY

A. Standard Material and Labor Warranty:

1. Provide a one-year labor and material Warranty on Controls Contract work provided under this Contract.

2. If within twelve (12) months from the date of acceptance of the Controls Contract work and following receipt of written notice from the Owner, the product is found to be defective in operation, workmanship or materials, then the product shall be promptly replaced, repaired or adjusted at the option of the Controls Contractor at the cost of the Controls Contractor.

3. Maintain an adequate supply of materials available directly to the Project site such that replacement of key parts, including programming, may be promptly carried out. Warranty work shall be done during the Controls Contractor's normal business hours.

4. Maintain an on-site record of all work done, all items removed from site, all items returned to site, all new replacement items installed and all remedial programming and database entry work undertaken including software revisions installed. Maintain a record of all calibrations required as a result of Warranty service.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Johnson Controls, Inc., Loveton Circle, Sparks, Maryland (telephone: 410-527-2607). Contact Person: Erik Badders.

2.2 GENERAL PRODUCT DESCRIPTION

A. The Building Automation System shall be capable of integrating multiple building functions including equipment supervision and control, alarm management, energy management, information management, and historical data collection and archiving.

B. The Building Automation System shall consist of the following:

1. Standalone DDC panels.

2. Local Display Devices.

3. The system shall be modular in nature, and shall permit expansion of both capacity and functionality through the addition of sensors, actuators, standalone DDC panels, and operator devices.

C. System architectural design shall eliminate dependence upon any single device for alarm reporting and Control execution. Each DDC panel shall operate independently by performing its own specified control, alarm management, operator I/O, and historical data collection. The failure of any single component or network connection shall not interrupt the execution of control strategies at other operational devices.

D. Standalone DDC panels shall be able to access any data from, or send control commands and alarm reports directly to any other DDC panel or combination of panels on the network without dependence upon a central processing device, including a Central File Server. Standalone DDC panels shall also be able to send alarm reports to multiple operator workstations, terminals, and printers without dependence upon a central processing device or File Server.

2.3 CONTROLS SYSTEM ARCHITECTURE

A. General:

1. The Controls Systems shall consist of multiple Nodes and associated equipment connected by industry standard digital and communication network arrangements.

2. The Operator Workstations, Servers and principal network computer equipment shall be standard products of recognized major manufacturers available through normal PC and computer vendor channels - not "Clones" assembled by a third-party subcontractor.

3. Provide licenses for all software residing on and used by the Controls Systems and transfer these licenses to the MAA prior to completion.

4. The networks shall, at minimum, comprise, as necessary the following:

a. Operator Workstations: Fixed and portable as required by the Specifications.

b. Network computer processing, data storage and communication equipment including Servers and digital data processors.

c. Routers, bridges, switches, hubs, modems, interfaces, and the like communication equipment.

d. Active processing network Application Nodes including programmable field panels and controllers together with their power supplies, and associated equipment.

e. Addressable elements, sensors, transducers and end devices.

f. Third-party equipment interfaces as required by the Contract Documents.

g. Other components required for a complete and working Control Systems as specified.

5. The Specifications for the individual elements and component subsystems shall be minimum requirements and shall be augmented as necessary by the Contractor to achieve both compliance with all applicable codes, standards, the requirements of the Authority Having Jurisdiction (AHJ) at the site, and to meet all requirements of the Contract Documents.

B. Network:

1. The Controls Systems shall incorporate primary Tier 1 network(s) and also incorporate multiple and integrated secondary Tier 2 and tertiary Tier 3 networks.

2. The networks shall utilize only copper and optical fiber communication media as appropriate and to comply with the applicable codes, ordinances and regulations and the AHJ.

3. Dial-up Communications: Auto-dial/auto-answer communications shall be provided to allow standalone DDC panels to communicate with remote operator devices on an intermittent basis via telephone lines.

2.4 OPERATOR INTERFACES

A. General:

1. The Controls Systems Operator Interfaces shall be user friendly, readily understood and shall make maximum use of colors, graphics, icons, embedded images, animation, text-based information and data visualization techniques to enhance and simplify the use and understanding of all displays by authorized users at the OWS.

2. User access shall be protected by a flexible and Owner redefinable software-based password access protection. Password protection shall be multi-level and partitionable to accommodate the varied access requirements of the different user groups to which individual users may be assigned. Provide the means to define unique access privileges for each individual authorized user. Provide the means to on-line manage password access control under the control of a project specific

Master Password. Provide an audit trail of all user activity on the Controls Systems including all actions and changes.

3. The Operator Interface shall incorporate comprehensive support for functions including, but not necessarily limited to, the following:

   a. User access for selective information retrieval and control command execution.

   b. Monitoring and reporting.

   c. Alarm and non-normal condition annunciation.

   d. Selective operator override and other control actions.

   e. Information archiving, manipulation, formatting, display and reporting.

   f. Controls Systems internal performance supervision and diagnostics.

   g. On-line access to user HELP menus.

   h. On-line access to current as-built records and documentation. At minimum, one (1) copy of all record documentation shall be stored on a designated OWS or Server and be accessible to the MAA personnel.

   i. Means for the controlled re-programming, re-configuration of systems operation and for the manipulation of database information in compliance with the prevailing codes, approvals and regulations for the component applications and elements.

   j. Means to archive all Controls Systems Contract Project specific configuration databases, software programs and other pertinent operational data such that any component of the software and project specific operational databases may be reloaded on-site from archived data.

4. Provide on-line reports and displays making maximized use of simple English language descriptions and readily understood acronyms, abbreviations, icons and the like to assist user understanding and interpretation. All text naming conventions shall be consistent in their use and application throughout the Controls Systems. Submit proposed naming arrangements for approval prior to data entry.

B. All devices, including Servers and Application Nodes, required to support and drive the Operator Interfaces shall support multiple independent user terminals through a theoretical unlimited number of Browsers. Support shall be configured for a minimum of 25 users for all Applications and features provided.

2.5 CONTROLS SYSTEMS APPLICATIONS – GENERAL

A. General:

1. The Controls Systems Application Nodes (AN) shall include all monitoring, control and data handling Nodes including programmable field panels and controllers.

2. AN shall be programmable and governed by the requirements of their applicable codes, approvals and regulations for their Application.

3. The AN shall be designed, packaged, installed, programmed and commissioned in consideration of their specific service and prevailing operating conditions.

4. A failure at an AN shall not cause failures or non-normal operation at any other system AN other than the possible loss of active real-time information from the failed AN.

5. Ancillary AN equipment, including interfaces and power supplies, shall not be operated at more than 80% of their rated service capacity.

6. AN shall comply with FCC Part 15 subpart J Class A emission requirements.

7. AN shall maintain all programming in non-volatile or battery backed memory and shall automatically resume normal monitoring and control following the restoration of stable electrical power after a power outage.

2.6 NETWORK AUTOMATION ENGINE (NAE)

A. Description:

1. The NAE is an automation engine that manages facilities using information and Internet technology.

2. The NAE uses the communication technologies of the building automation industry, including BACnet® protocol; LONWORKS® network and the N2 Bus to monitor; and supervise Heating, Ventilating, and Air Conditioning (HVAC) equipment; and lighting, security, fire, and access control. The NAE55 supports a comprehensive set of supervisory features and functions for large facilities and technically advanced buildings and complexes. The NAE35 and NAE45 extend the power of the NAE to smaller buildings and enable the wider distribution of supervisory functions in larger facilities. The NAE85 is a high-capacity NAE. This device allows the integration of large BACnet Internet Protocol (IP) systems and can take the place of multiple NAEs.

3. A single NAE or a network of multiple NAE devices within a building provide monitoring and control, alarm and event management, data exchange, trending, energy management, scheduling, and data storage.

4. The NAE has an embedded user interface and supports concurrently connected Web browsers with password access control and the security protection technology of the Information Technology (IT) industry.

5. Features::

   a. Communication using commonly accepted IT standards at the automation and enterprise level.

   b. Web-based user interface.

   c. Site Director function.

   d. Support for Web services at the automation network level.

   e. User interface and online system configuration software embedded in NAE.

   f. Supervision of field controller networks including N2 Bus, LONWORKS network, BACnet MS/TP, and BACnet IP devices.

   g. Multiple connection options for data access.

2.7 APPLICATION AND DATA SERVER (ADS)

A. Description:

1. The Application and Data Server (ADS) is a component of the Metasys system that manages the collection and presentation of large amounts trend data, event messages, operator transactions, and system configuration data. As Site Director, the ADS provides secure communication to a network of Network Automation Engines (NAEs), Network Control Engines (NCEs), and Network Integration Engines (NIEs).

2. The User Interface (UI) of the ADS provides flexible system navigation, user graphics, comprehensive alarm management, trend analysis, and summary reporting capabilities. Via a Web browser, occupant comfort and energy usage can be efficiently managed and quickly responded to during critical events., Multiple users can gain access to information from the Building Automation System! (HAS) that uses Internet protocols and Information Technology (IT) standards, and is compatible with enterprise level communication networks.

3. Features:

a. Support of IT Standards and Internet Technologies.

b. Standard Web Browser User Interface.

c. Secure User Access.

d. Flexible System Navigation and Dynamic User Graphics.

e. Alarm and Event Management.

f. Site Director Function.

g. Long-Term Trend Data Storage.

h. Optional Storage of Historical Data on a Separate Computer.

i. Optional Metasys Advanced Reporting System.

2.8 NETWORK INTEGRATION ENGINE (NIE)

A. Description:

1. The Metasys® Network Integration Engine (NIE) integrates existing Metasys N1-based Building Automation Systems (BASs) into the new generation of technology that includes the Internet, Information Technology (IT), and enterprise level global communication. Metasys system extended architecture NI Integration is based on the NIE, a Web-enabled network controller that speaks IT and Internet language to the expanding world of Web browsers and remote operations centers. At the same time, it uses Internet Protocol (IP) Ethernet network technology to communicate with Metasys N1 networks that are installed in many facilities including BWl Marshall Airport.

2. The NIE transfers point data from one or more Network Control Module (NCM) devices in a Metasys NI network, providing alarm and event management, trending, energy management, scheduling, and data sharing capabilities in a manner consistent with the new technology of Metasys system extended.

3. Features:

a. Communication with NI Networks using commonly accepted IT standards at the automation and enterprise levels.

b. Web-based user interface.

c. User interface and online system configuration software embedded in NIE.

d. Site Director function in one NIE or one NAE or in an Application and Data Server (ADS) for large installations.

e. Scalable system integration solution for integrating and migrating Metasys N1 networks.

f. Mapping capability of N1 data 'types including analog, binary, multistate and control system objects, and access to scheduling feature.

g. Trending, totalization, and alarming functions automatically regenerated in the METASYS system extended architecture.

2.9 SYSTEM SOFTWARE FEATURES

A. General

1. All necessary software to form a complete operating system as described in this specification shall be provided.

2. The software programs specified in this section shall be provided as an integral part of the DDC panel and shall not be dependent upon any higher level computer for execution.

B. Graphics Display: Color graphic floor plan displays and system schematic for each piece of mechanical equipment shown on plans shall be provided. Provide a color graphic floor plan for all floors to show the on/off status of lighting zones.

C. Alarm Management: Alarm management shall be provided to monitor, buffer, and direct alarm reports to operator devices and memory files. Each DDC panel shall perform distributed, independent alarm analysis and filtering to minimize operator interruptions due to non-critical alarms, minimize network traffic, and prevent alarms from being lost. At no time shall the DDC panel's ability to report alarms be affected by either operator activity at a PC Workstation or local I/O device, or communications with other panels on the network.

1. Point Change Report Description: All alarm or point change reports shall include the point's description in English language, and the time and date of occurrence.

2. Prioritization: The user shall be able to define the specific system reaction for each point. Alarms shall be prioritized to minimize nuisance reporting and to speed operator response to critical alarms. A minimum of three priority levels shall be provided. Each DDC panel shall automatically inhibit the reporting of selected alarms during system shutdown and start-up. Users shall have the ability to manually inhibit alarm reporting for each point. The user shall also be able to define under which conditions point changes need to be acknowledged by an operator, and/or sent to follow-up files for retrieval and analysis at a later date.

3. Report Routing: Alarm reports, messages, and files will be directed to a user-defined list of operator devices or PC disk files used for archiving alarm information. Alarms shall also be automatically directed to a default device in the event a primary device is found to be off-line.

4. Alarm Messages: In addition to the point's descriptor and the time and date, the user shall be ¸able to print, display or store a 65-character alarm message to more fully describe the alarm condition or direct operator response. Each standalone DDC panel shall be capable of storing a library of at least 250 Alarm Messages. Each message may be assignable to any number of points in the panel.

5. Auto-Dial Alarm Management: In Dial-up' applications, only critical alarms shall initiate a call to a remote operator device. In all other cases, call activity shall be minimized by time-stamping and saving reports until an operator scheduled time, a manual request, or until the buffer space is full. The alarm buffer must store a minimum of 50 alarms.

6. Transaction Logging: Operator commands and system events shall be automatically logged to disk in Personal Computer industry standard database format. Operator commands initiated from Direct-connected workstations, dial-up workstations, and local DDC panel Network Terminal devices shall all be logged to this transaction file. This data shall be available at the Operator Workstation. Facility shall be provided to allow the user to search the transaction file using standard database query techniques, including searching by dates, operator name, data point name, etc. In addition, this transaction file shall be accessible with standard third party database and spreadsheet packages.

D. Historical Data and Trend Analysis: A variety of Historical data collection utilities shall be provided to automatically sample, store, and display system data in all of the following ways:

1. Continuous Point Histories: Standalone DDC panels shall store Point History Files for all analog and binary inputs and outputs. The Point History routine shall continuously and automatically sample the value of all analog inputs at half hour intervals. Samples for all points shall be stored for the past 24 hours to allow the user to immediately analyze equipment performance and all problem-related events for the past day. Point History Files for binary input or output points and analog output points shall include a continuous record of the last ten status changes or commands for each point.

2. Control Loop Performance Trends: Standalone DDC panels shall also provide high resolution sampling capability in one-second increments for verification of control loop performance.

3. Extended Sample Period Trends: Measured and calculated analog and binary data shall also be assignable to user-definable trends for the purpose of collecting operator-specified performance data over extended periods of time. Sample

intervals of 1 minute to 2 hours shall be provided. Each standalone DDC panel shall have a dedicated buffer for trend data, and shall be capable of storing a minimum of 5000 data samples.

4. Data Storage and Archiving: Trend data shall be stored at the Standalone DDC panels, and uploaded to hard disk storage when archival is desired. Uploads shall occur based upon either user-defined interval, manual command, or when the trend buffers become full. All trend data shall be available in disk file format compatible with Third Party personal computer applications.

E. Runtime Totalization: Standalone DDC panels shall automatically accumulate and store runtime hours for binary input and output points.

1. The Totalization routine shall have a sampling resolution of one minute or less.

2. The user shall have the ability to define a warning limit for Runtime Totalization. Unique, user-specified messages shall be generated when the limit is reached.

F. Analog/Pulse Totalization: Standalone DDC panels shall automatically sample, calculate and store consumption totals on a daily, weekly, on monthly basis for user-selected analog and binary pulse input-type points.

1. Totalization shall provide calculation and storage of accumulations of up to 99,999.9 units (e.g., KWH, gallons, KBTU, tons. etc.).

2. The Totalization routine shall have a sampling resolution of one minute or less.

3. The user shall have the ability to define a warning limit. Unique, user-specified messages shall be generated when the limit is reached.

G. Event Totalization: Standalone DDC panels shall have the ability to count events such as the number of times a pump or fan system is cycled on and off. Event totalization shall be performed on a daily, weekly, or monthly basis.

1. The Event Totalization feature shall be able to store the records associated with a minimum of 9,999,999 events before reset.

2. The user shall have the ability to define a warning limit. Unique, user-specified messages shall be generated when the limit is reached.

2.10 CONTROL SYSTEMS FIELD DEVICES

A. Input Devices: Provide controls systems devices as required for each specific project. The following is a list of major devices. Provide additional devices and instrumentation as required.

1. Air Low Differential Pressure Switch.

2. Air Low Differential Pressure Sensor.

3. Air High Differential Pressure Switch.

4. Water Differential Pressure Switch.

5. Temperature Sensors.

6. Humidity Sensors.

7. Air Flow Switch.

8. Water Flow Switch.

9. Current Switch.

10. Current Transducer.

11. Static Pressure Transmitter/Transducer.

12. Differential Pressure Transmitters/Transducer.

13. Water Pressure Transducers.

14. Water Differential-Pressure Transducers.

15. Differential-Pressure Switch (Air or Water).

16. Room Sensor Covers.

17. Room Sensor Accessories.

B. Output Devices:

1. Electric/Pneumatic Transducers.

2. Controls Relays.

C. Controlled Devices:

1. Ball Valve.

2. Butterfly Valve.

3. Globe Valve.

4. Control Damper.

5. Electric Damper Actuators.

6. Electric Valve Actuators.

7. Pneumatic Valve Actuators.

8. Pneumatic Damper Actuators.

9. Combination Fire/Smoke Dampers w/Actuator.

10. Smoke Dampers.

11. Status Sensors:

    a. Status Inputs for Fans.

    b. Status Inputs for Pumps.

    c. Status Inputs for Electric Motors.

    d. Voltage Transmitter (100- to 600-V ac).

    e. Power Monitor.

    f. Electronic Valve/Damper Position Indicator: Visual scale indicating percent of travel and 2- to 10-V dc, feedback signal.

12. Gas Detection Equipment:

    a. Carbon Monoxide Detectors.

    b. Carbon Dioxide Sensor and Transmitter.

    c. Occupancy Sensor.

13. Other Control Devices:

    a. Electric Thermostats.

    b. Humidistats.

    c. Pressure Controller.

END OF SECTION 23 09 00

The following language shall be used when specifying Variable (Adjustable) Frequency Drives (VFD's). Coordinate with Variable-Frequency Motor Controllers, section 262923.

1.1 VFD'S

A. Variable frequency motor drive shall be of a pulse width modulated (PWM) inverter for use on a standard NEMA Design B induction motor. The drive shall be designed specifically for variable torque applications.

B. Integral bypass motor starter package shall be included where required.

PART 2 - PRODUCTS

2.1 VARIABLE FREQUENCY DRIVES

A. The Variable Frequency Drives (VFD's) shall be solid state, with 6/12 Pulse Width Modulated (PWM) Drive utilizing insulated gate bipolar transistors (IGBT's). Provide minimum 12 pulse VFD's for 50 HP motors and larger. Six pulse VFD's for motors smaller than 50 HP shall conform to IEEE519 and BWI standards. The VFD package shall be completely assembled and tested by the manufacturer. The enclosure shall be NEMA 1, 12 or 4; as appropriate for the installation environment. The drive efficiency shall be 97 percent or better at full speed and full load and the fundamental power factor shall be 0.98 at all speeds and loads. Total current harmonic distortion shall be 15% or less at 50% load or higher, measured at the power input terminals of the VFD, also, THD of voltage wave form shall be 3% or less at the power input.

B. All VFD's shall have the following standard features:

1. All VFD's shall have the same customer interface, including digital display, and keypad, regardless of horsepower rating. The keypad shall be used for local control, for setting all parameters, and for stepping through the displays and menus. The keypad shall be removable, capable of remote mounting, and shall have its own non-volatile memory. The keypad shall allow for uploading and downloading of parameter settings as an aid for start-up of multiple VFD's.

2. The VFD's shall utilize plain English digital display (code numbers and letters are not acceptable). All set-up parameters, indications, faults, warnings and other information must be displayed in words to allow the user to understand what is being displayed without the use of an installation manual or cross-reference table. VFD's utilizing codes are not acceptable.

3. The keypad shall include Hand-Off-Auto membrane selections. The drive shall incorporate "bumpless transfer" of speed reference when switching between "Auto" and "Hand" modes and vice-versa.

4. VFD's shall be provided with displays or meters showing:

    a. Output frequency

    b. Motor Speed (RPM)

    c. Motor Current

    d. Motor Power (kW)

    e. DC Bus Voltage

    f. Output Voltage

    g. Heat Sink Temperature

    h. Analog Input Values

    i. Elapsed Time Meter (resettable)

    j. kWh meter (resettable)

    k. Last three faults

5. The VFD shall be capable of starting into a rotating load (forward or reverse) and accelerate or decelerate to setpoint without safety tripping or component damage (flying start). The VFD shall also be capable of DC injection braking at start to stop a reverse spinning motor prior to ramp.

6. Three (3) programmable critical frequency lockout ranges to prevent the VFD from continuously operating at an unstable speed.

C. The VFD's shall have the following field programmable features:

1. If the input reference (4-20mA or 2-10V) is lost, the VFD shall give the user the option of either; (1) stopping and displaying a fault, (2) running at a programmable preset speed, (3) hold the VFD speed based on the last good reference received, or (4) cause a warning to be issued, as selected by the user. The drive shall be programmable to signal this condition via a keypad warning, relay output and/or over the serial communications bus.

2. Control Inputs and Outputs:

    a. Isolated.

b. Five digital inputs.

c. Two digital outputs.

d. Two analog inputs.

e. One analog output.

f. Fully field programmable.

3. Digital outputs shall include field adjustable motor current levels for motor status. Drives not having this feature shall provide and install field adjustable three phase current relays for digital status of motor (proof of flow). Digital outputs must be true, form C type contacts; open collector outputs are not acceptable. Relays shall be capable of programmable on and off delay times.

4. Analog output capabilities shall include, but not be limited to, frequency, speed, current, voltage, active reference, and kW indications. Manufacturers not having kW output shall provide current transformers and kW transducers for kW output.

APPENDIX E

SURVEY CONTROL MANUALS

MARTIN STATE AIRPORT

BWI BALTIMORE/WASHINGTON INTERNATIONAL Thurgood Marshall AIRPORT

MARTIN STATE AIRPORT
SURVEY CONTROL MANUAL

MARTIN STATE AIRPORT

BWI BALTIMORE/WASHINGTON INTERNATIONAL Thurgood Marshall AIRPORT

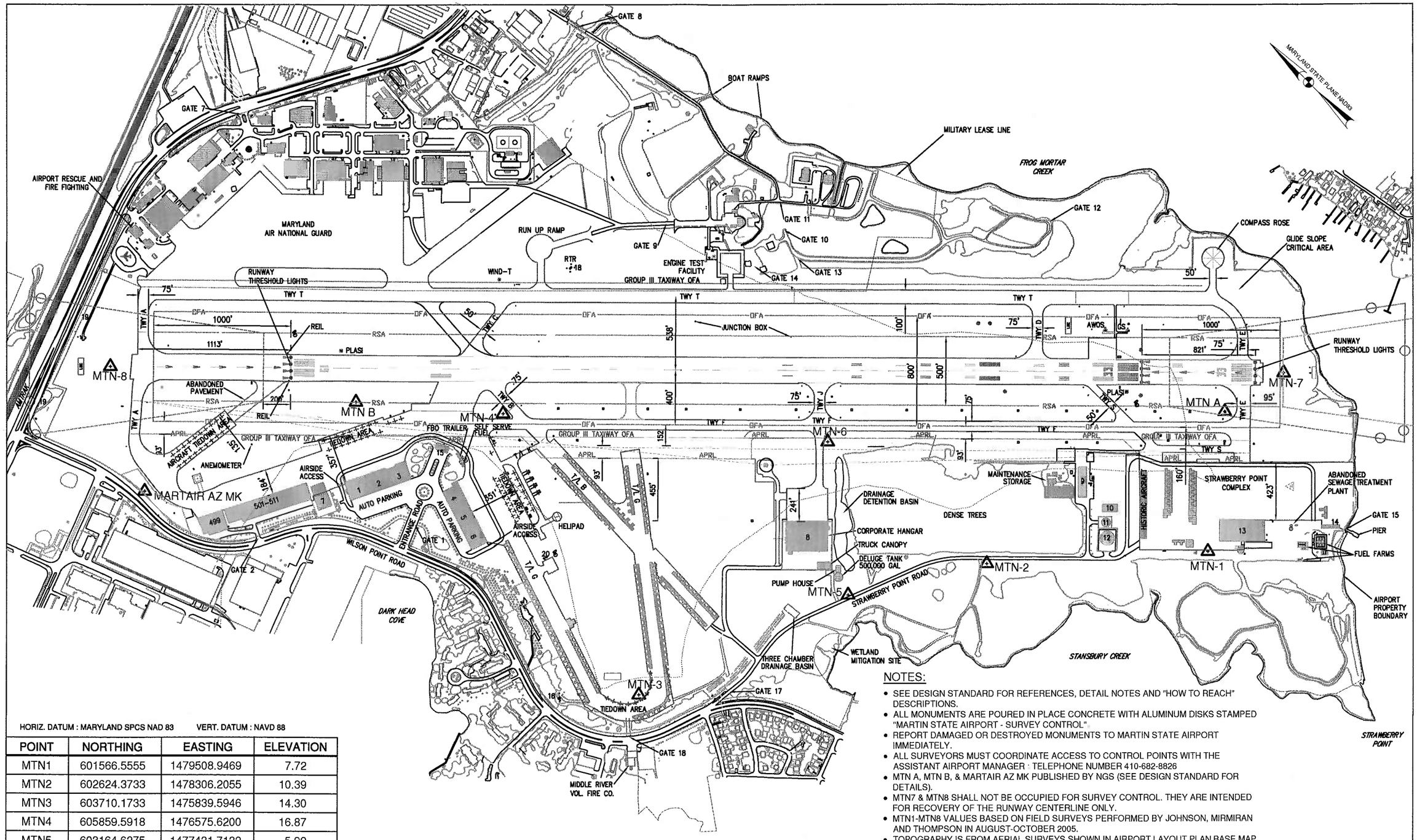
MARTIN STATE AIRPORT

Survey Control Manual

November 11, 2005

Important Note:

All Surveys Performed at Martin State Airport after November 11, 2005 are to Utilize this Manual and must be tied to the Martin State Airport Survey Control Network.



HORIZ. DATUM : MARYLAND SPCS NAD 83 VERT. DATUM : NAVD 88

POINT	NORTHING	EASTING	ELEVATION
MTN1	601566.5555	1479508.9469	7.72
MTN2	602624.3733	1478306.2055	10.39
MTN3	603710.1733	1475839.5946	14.30
MTN4	605859.5918	1476575.6200	16.87
MTN5	603164.6275	1477431.7132	5.92
MTN6	604064.3021	1478107.5955	12.90

UNITS : U.S. SURVEY FEET

NOTES:

- SEE DESIGN STANDARD FOR REFERENCES, DETAIL NOTES AND "HOW TO REACH" DESCRIPTIONS.
- ALL MONUMENTS ARE POURED IN PLACE CONCRETE WITH ALUMINUM DISKS STAMPED "MARTIN STATE AIRPORT - SURVEY CONTROL".
- REPORT DAMAGED OR DESTROYED MONUMENTS TO MARTIN STATE AIRPORT IMMEDIATELY.
- ALL SURVEYORS MUST COORDINATE ACCESS TO CONTROL POINTS WITH THE ASSISTANT AIRPORT MANAGER : TELEPHONE NUMBER 410-682-8826
- MTN A, MTN B, & MARTAIR AZ MK PUBLISHED BY NGS (SEE DESIGN STANDARD FOR DETAILS).
- MTN7 & MTN8 SHALL NOT BE OCCUPIED FOR SURVEY CONTROL. THEY ARE INTENDED FOR RECOVERY OF THE RUNWAY CENTERLINE ONLY.
- MTN1-MTN8 VALUES BASED ON FIELD SURVEYS PERFORMED BY JOHNSON, MIRMIRAN AND THOMPSON IN AUGUST-OCTOBER 2005.
- TOPOGRAPHY IS FROM AERIAL SURVEYS SHOWN IN AIRPORT LAYOUT PLAN BASE MAP DRAWING.

CONSULTANTS

DESIGNED:
DRAWN BY: BRH
CHECKED: DKS
APPROVED: DAL

REVISION NO.	REVISION DATE	REVISION DESCRIPTION

MARTIN STATE AIRPORT
MARYLAND DEPARTMENT OF TRANSPORTATION
MARYLAND AVIATION ADMINISTRATION
OFFICE OF PLANNING AND ENGINEERING

PROJECT TITLE:

SHEET TITLE: SURVEY CONTROL

CONTRACT NO.
SCALE: NOT TO SCALE
DATE:
SHEET NO.

MARTIN STATE AIRPORT (MTN) - SURVEY CONTROL DATA

NAME OF STATION: MTN-1 | **DATE ESTABLISHED:** August 2005

MARYLAND STATE PLANE COORDINATES (NAD 83):

NORTHING (Y):	601566.5555 US ft.	183357.853 m
EASTING (X):	1479508.9469 US ft.	450955.229 m
ORTHOMETRIC HEIGHT (NAVD 88):	7.72 US ft.	2.353 m
CONVERGENCE ANGLE:	0°22'15.1"	
SCALE FACTOR:	0.99997943	
COMBINED SCALE FACTOR:	0.99998425	

GEOGRAPHIC COORDINATES (NAD 83):

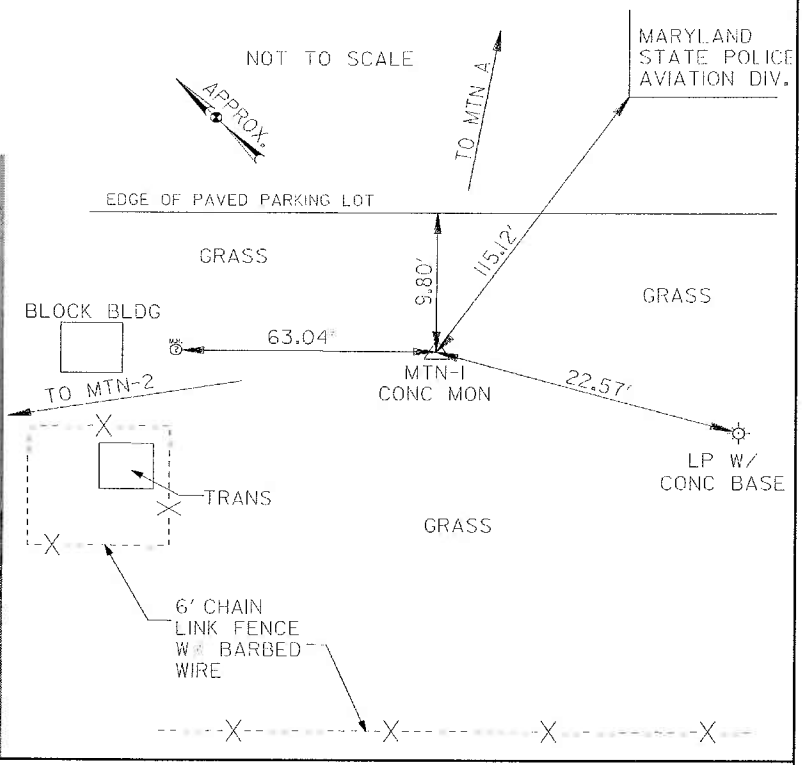
LATITUDE:	39°19'01.04312" (N)	
LONGITUDE:	76°24'32.83307" (W)	
ELLIPSOID HT:	-100.628 US ft.	-30.671 m

AVAILABLE CONVENTIONAL BACKSIGHT POINTS (FIELD DATA):

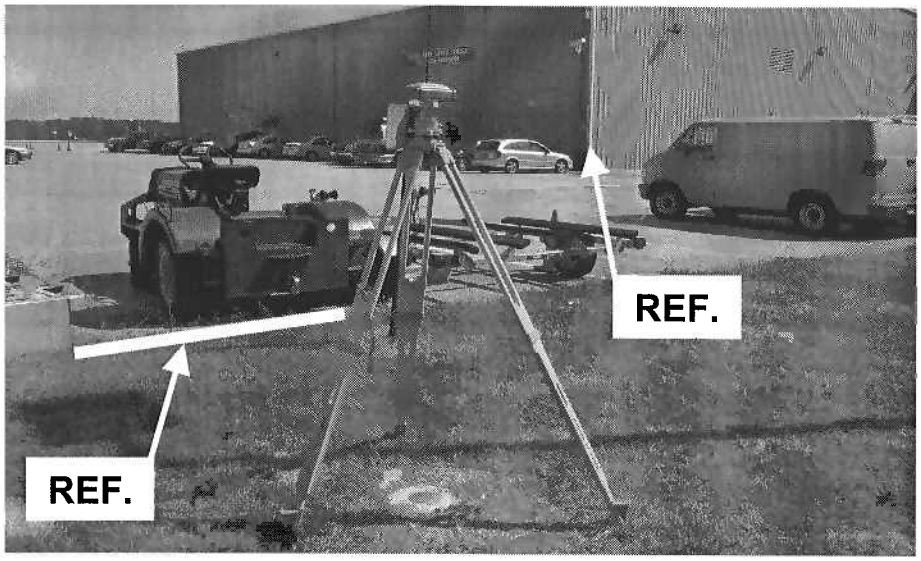
POINT	AZIMUTH	DISTANCE (US FT.)	DISTANCE (m)
MTN A	51° 15' 50"	1027.33	313.131
MTN-2	311° 19' 55"	1601.77	488.220

STATION DESCRIPTION:

To reach the monument from the traffic circle at MTN airport in front of the air traffic control tower, proceed S to Airside Access point by Hangars 4-6. After passing through the fence, proceed NE to the second Stop sign. Turn right and proceed SE past private plane hangars. Road will curve to the left, bearing North. At the intersection of T/L B and T/L G, turn right and proceed SE to Yield sign. Continue to Stop sign at Strawberry Point Road. Turn left on Strawberry Point Road. Continue past the entrance road to the maintenance shop and the salt dome. Road will turn to the left (North), passing along the back side of the historic aircraft display. Turn right (east) at the end of the road, continue to turn right, heading South along the front of the historic aircraft display. Monument is SW of the SW corner of the Strawberry Point Complex Maryland State Police hangar. Monument is 9.80' SW of the SW edge of paved parking lot, 63.04' SE of manhole in concrete, 22.57' NE of light pole with concrete base.



SURVEYED BY: JMT ENGINEERING — **SPARKS, MARYLAND**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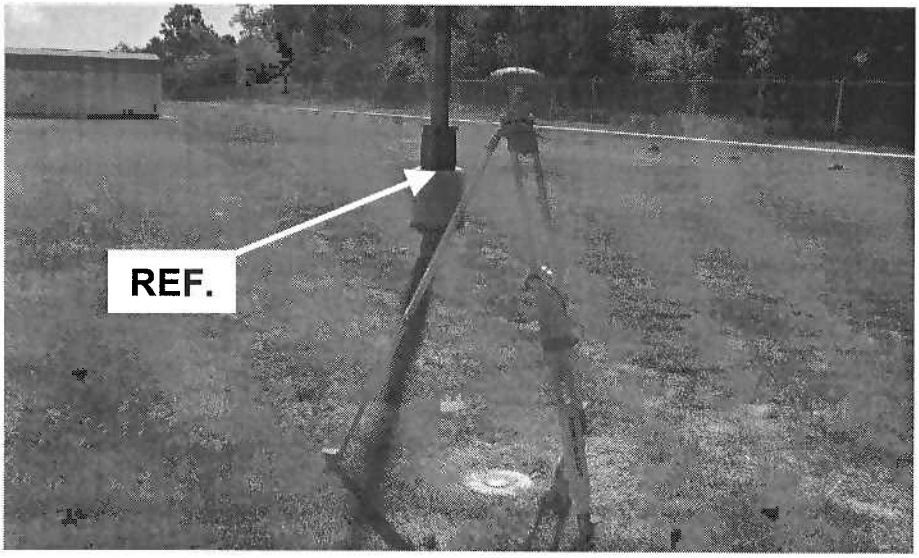
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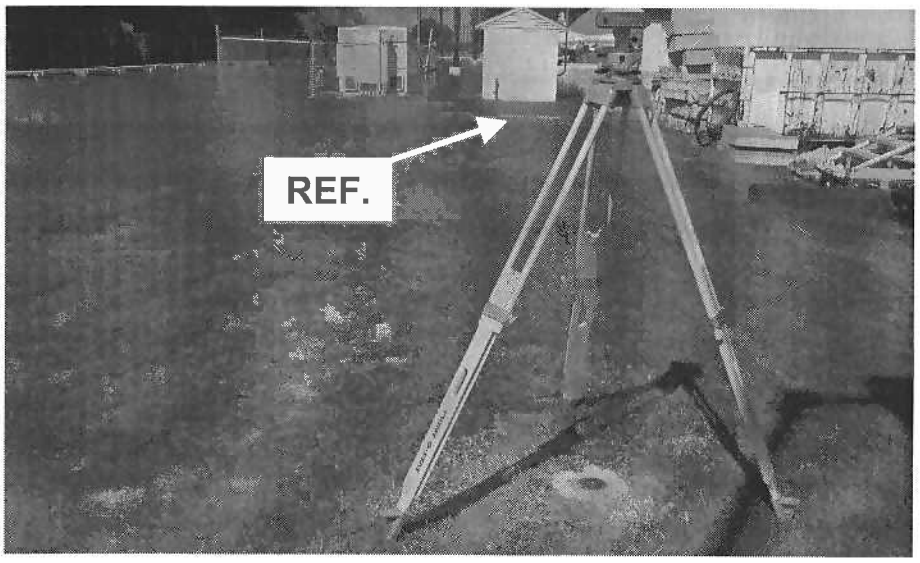
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MARTIN STATE AIRPORT (MTN) - SURVEY CONTROL DATA

NAME OF STATION: MTN-2 | **DATE ESTABLISHED:** August 2005

MARYLAND STATE PLANE COORDINATES (NAD 83):

NORTHING (Y):	602624.3733 US ft.	183680.276 m
EASTING (X):	1478306.2055 US ft.	450588.633 m
ORTHOMETRIC HEIGHT (NAVD 88):	10.39 US ft.	3.167 m
CONVERGENCE ANGLE:	0°22'05.5"	
SCALE FACTOR:	0.99997983	
COMBINED SCALE FACTOR:	0.99998451	

GEOGRAPHIC COORDINATES (NAD 83):

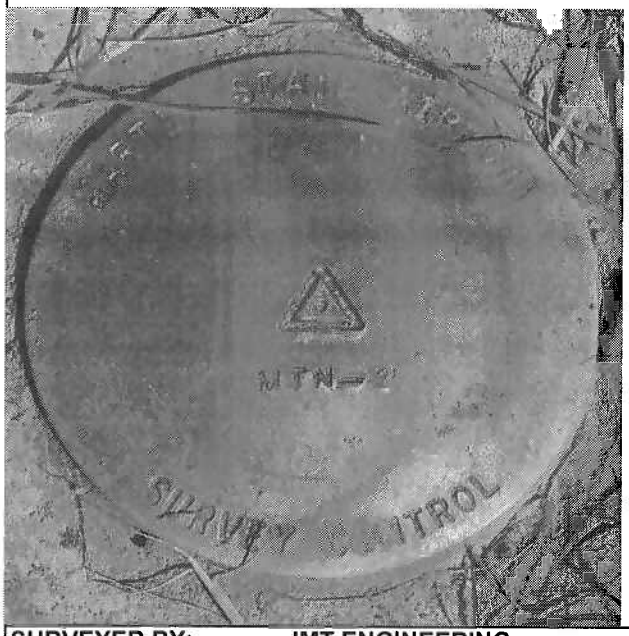
LATITUDE:	39°19'11.57473" (N)	
LONGITUDE:	76°24'48.05001" (W)	
ELLIPSOID HT:	-97.95 US ft.	-29.854 m

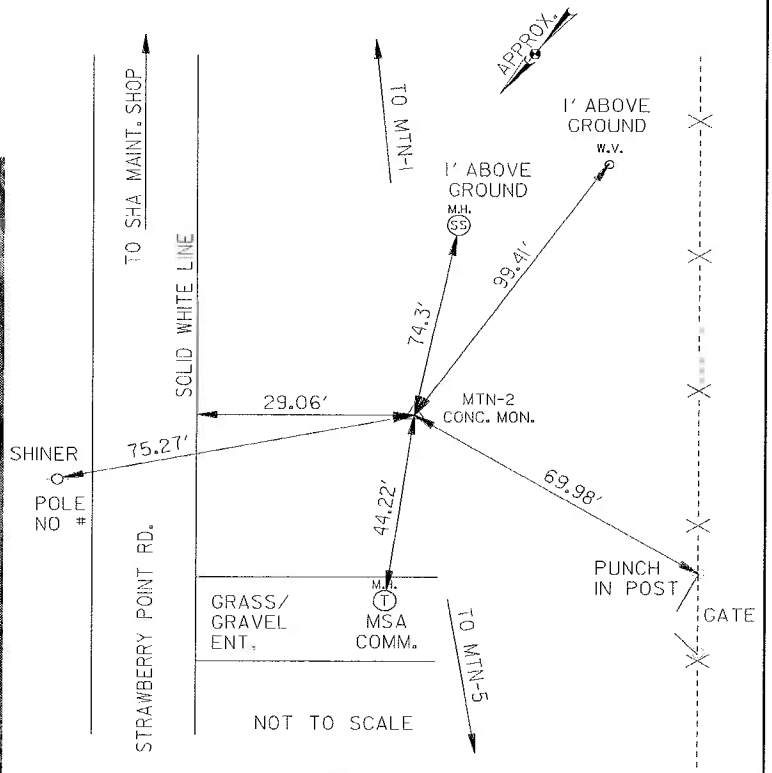
AVAILABLE CONVENTIONAL BACKSIGHT POINTS (FIELD DATA):

POINT	AZIMUTH	DISTANCE (US FT.)	DISTANCE (m)
MTN-1	131° 19' 55"	1601.78	488.224
MTN-5	301° 42' 27"	1027.94	313.317

STATION DESCRIPTION:

To reach the monument from the traffic circle at MTN airport in front of the air traffic control tower, proceed S to Airside Access point by Hangars 4-6. After passing through the fence, proceed NE to the second Stop sign. Turn right and proceed SE past private plane hangars. Road will curve to the left, bearing North. At the intersection of T/L B and T/L G, turn right and proceed SE to Yield sign. Continue to Stop sign at Strawberry Point Road. Turn left on Strawberry Point Road. Proceed 1874 feet (0.35 mi.). Continue past the pump house and water tank to a gravel/grass lane and the station on the right. Monument is located 29.06' SW of SW edge of Strawberry Point Road, 74.3' N of Sanitary Sewer manhole 1' above ground, 99.41' N of water valve 1' above ground, 69.98' E of punch mark in southern gate post, 44.22' S of communications manhole in grass/gravel drive, 75.27' SW of nail and shiner in pole with no number.





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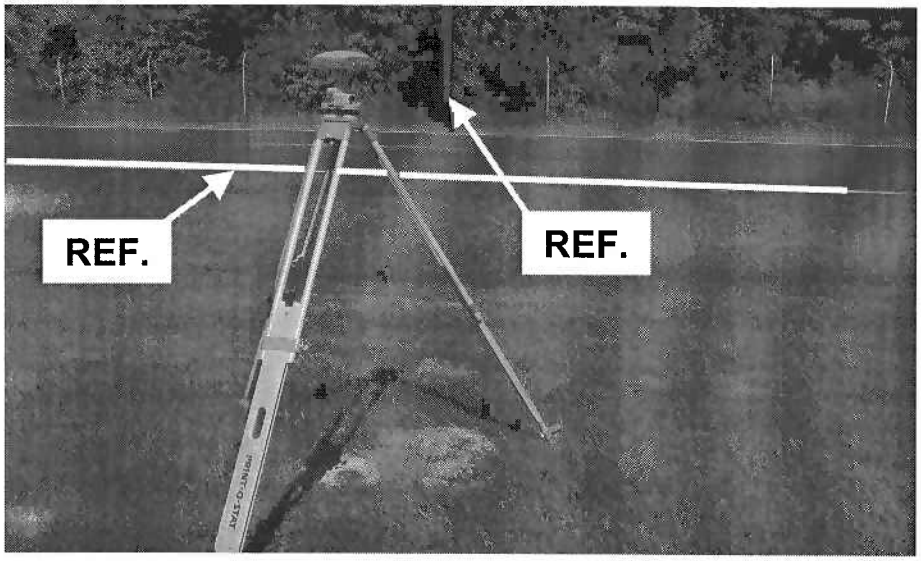
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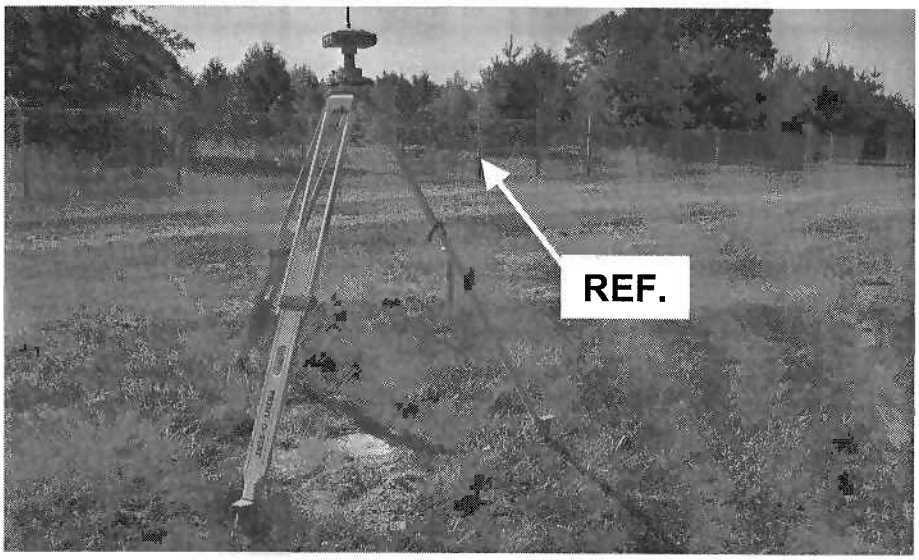
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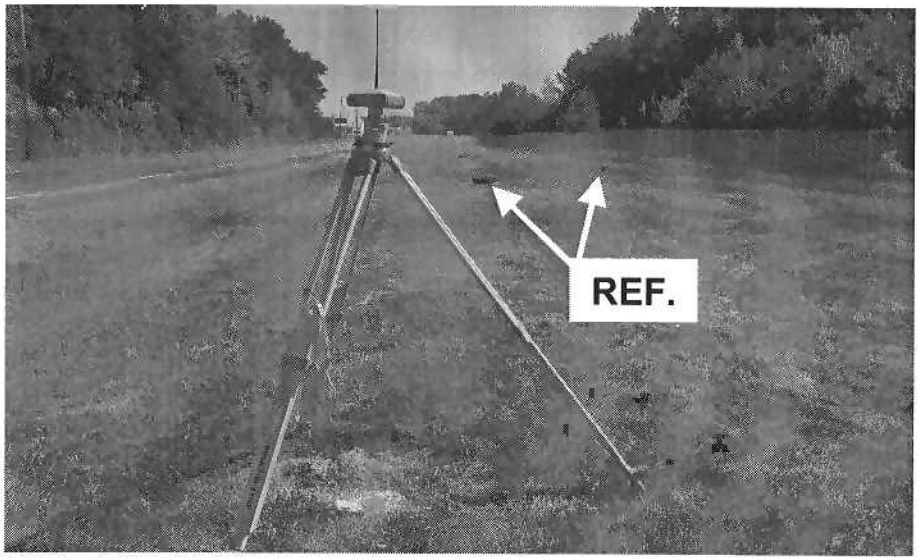
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MARTIN STATE AIRPORT (MTN) - SURVEY CONTROL DATA

NAME OF STATION: MTN-3 | **DATE ESTABLISHED:** August 2005

MARYLAND STATE PLANE COORDINATES (NAD 83):

NORTHING (Y):	603710.1733 US ft.	184011.229 m
EASTING (X):	1475839.5946 US ft.	449836.808 m
ORTHOMETRIC HEIGHT (NAVD 88):	14.30 US ft.	4.359 m
CONVERGENCE ANGLE:	0°21'45.9"	
SCALE FACTOR:	0.99998024	
COMBINED SCALE FACTOR:	0.99998473	

GEOGRAPHIC COORDINATES (NAD 83):

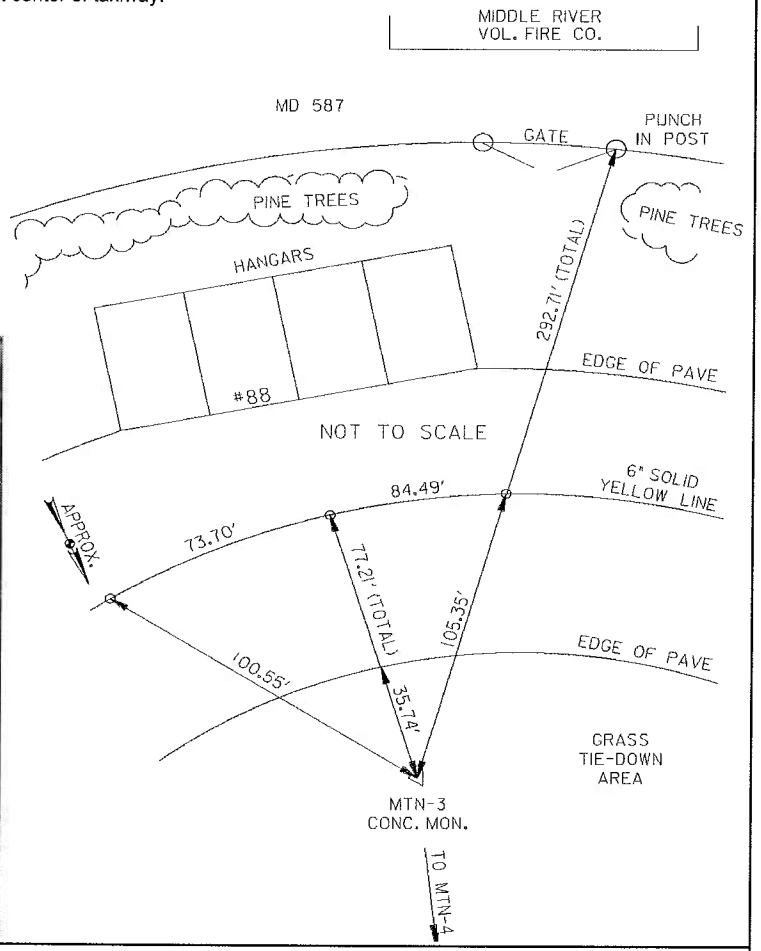
LATITUDE:	39°19'22.46174" (N)	
LONGITUDE:	76°25'19.34850" (W)	
ELLIPSOID HT:	-93.995 US ft.	-28.650 m

AVAILABLE CONVENTIONAL BACKSIGHT POINTS (FIELD DATA):

POINT	AZIMUTH	DISTANCE (US FT.)	DISTANCE (m)
MTN-4	18° 54' 10"	2272.00	692.507

STATION DESCRIPTION:

To reach the monument from the traffic circle at MTN airport in front of the air traffic control tower, proceed S to Airside Access point by Hangars 4-6. After passing through the fence, proceed NE to the second Stop sign. Turn right and proceed SE past private plane hangars. Where the road curves to the left, the station is on the left between aircraft tiedowns. Monument is 292.71' NE of punch mark in western gate post to MD 587, 105.35' NE of MAG Nail on same line, set in solid yellow line at center of taxiway, 77.21' N of MAG Nail set in solid yellow line at center of taxiway in line with Hanger #88, 35.74' N of N edge of taxiway on same line, 100.55' NW of MAG Nail set in solid yellow line at center of taxiway.



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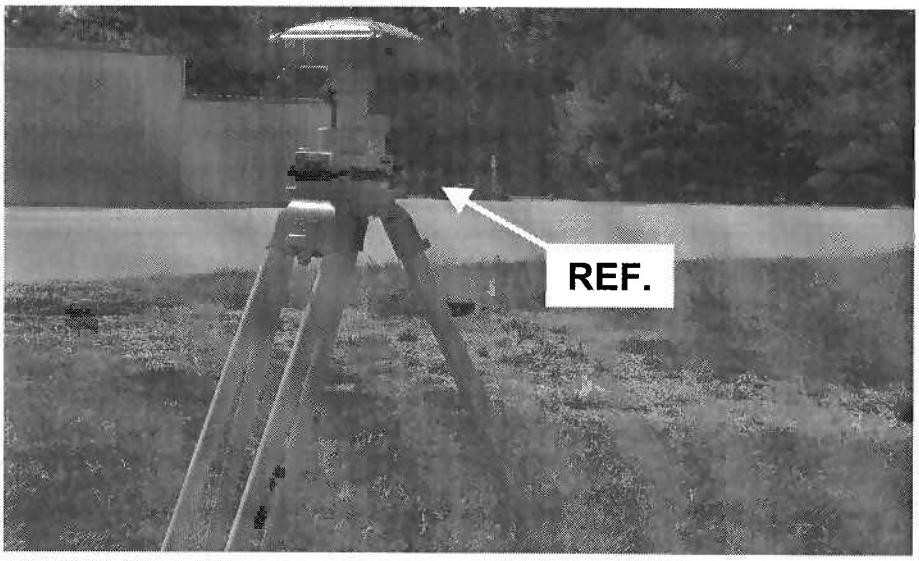
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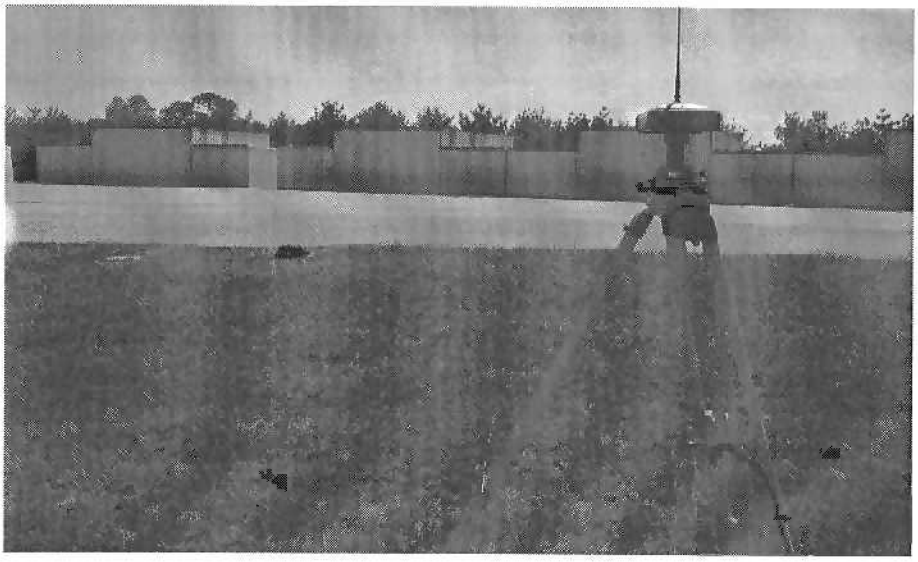


MARTIN STATE AIRPORT (MTN) - SURVEY CONTROL DATA

NAME OF STATION: MTN-4 | **DATE ESTABLISHED:** August 2005

MARYLAND STATE PLANE COORDINATES (NAD 83):

NORTHING (Y):	605859.5918 US ft.	184666.373 m
EASTING (X):	1476575.6200 US ft.	450061.149 m
ORTHOMETRIC HEIGHT (NAVD 88):	16.87 US ft.	5.142 m
CONVERGENCE ANGLE:	0°21'51.9"	
SCALE FACTOR:	0.99998104	
COMBINED SCALE FACTOR:	0.99998542	

GEOGRAPHIC COORDINATES (NAD 83):

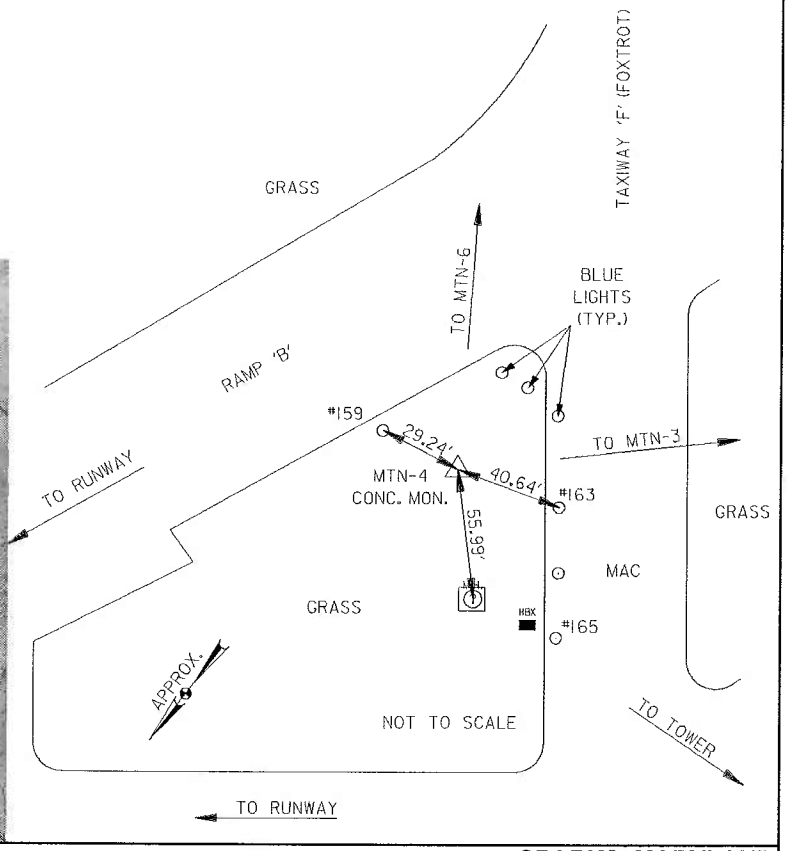
LATITUDE:	39°19'43.65932" (N)	
LONGITUDE:	76°25'09.80871" (W)	
ELLIPSOID HT:	-91.422 US ft.	-27.865 m

AVAILABLE CONVENTIONAL BACKSIGHT POINTS (FIELD DATA):

POINT	AZIMUTH	DISTANCE (US FT.)	DISTANCE (m)
MTN B	318° 58' 21"	1076.78	328.203
MTN-3	198° 54' 10"	2271.98	692.499
MTN-6	139° 31 29"	2360.13	719.369
MTN A	134° 20' 41"	5222.32	1591.765
MARTAIR AZ MK	302° 12' 00"	2675.15	815.387

STATION DESCRIPTION:

To reach the monument from the traffic circle at MTN airport in front of the air traffic control tower, proceed S to Airside Access point by Hangars 4-6. After passing through the fence, proceed NE to the second Stop sign.Turn left and pass in front of the helicopter hangar. Proceed to small triangular grass island next to Taxiway B in front of the air-traffic control tower and station on the right. Permission must be granted from Tower Control to cross Taxiway 'F' on foot (must park and walk out to MTN-4). Monument is 29.24' SW of ground light #159, 40.64' NE of ground light #163, and 55.99' from center of manhole in concrete.



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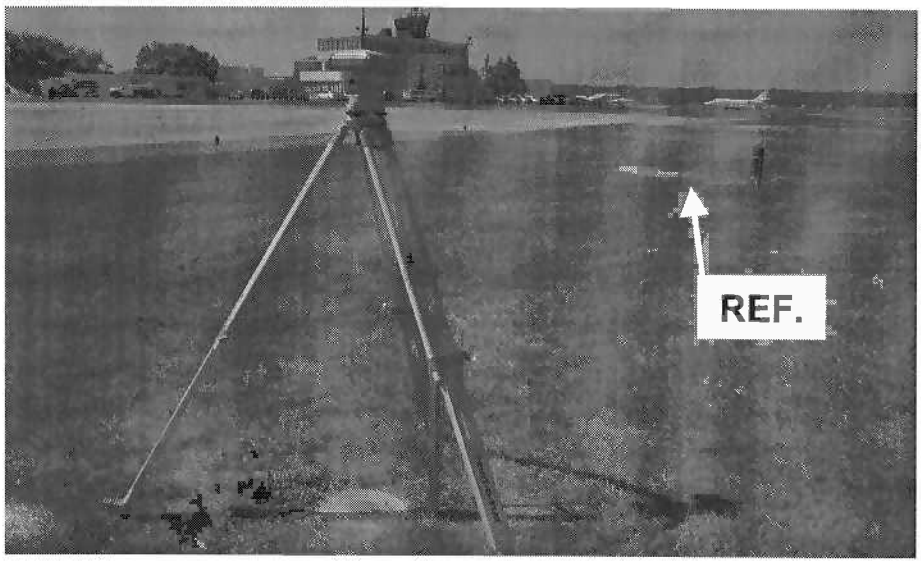
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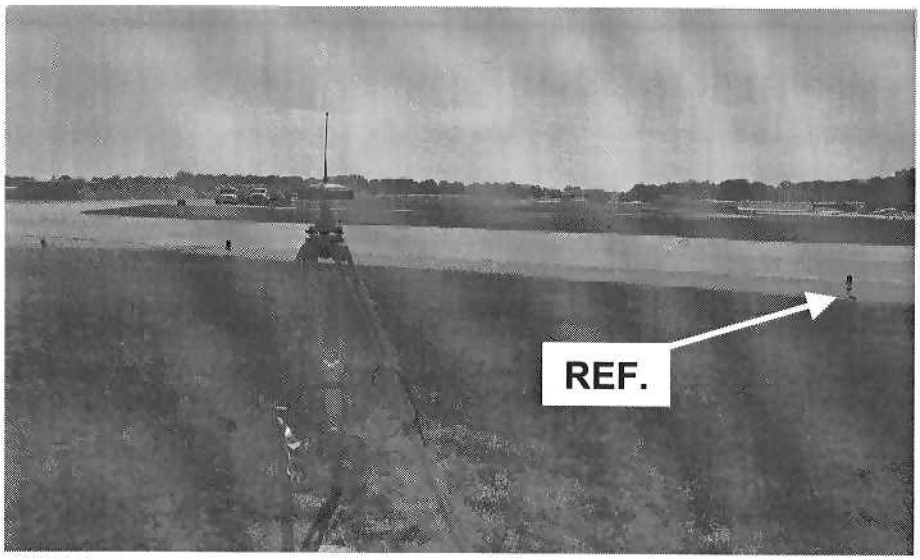
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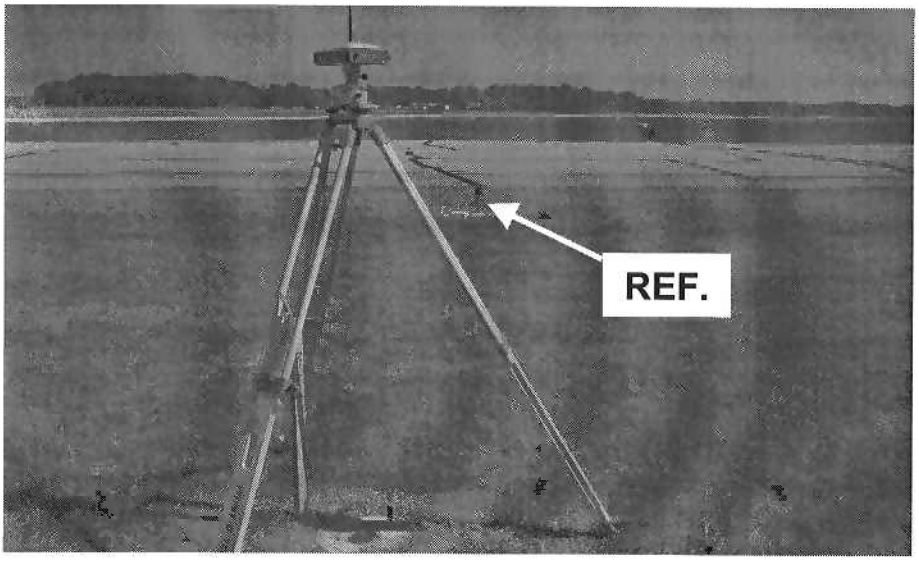
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MARTIN STATE AIRPORT (MTN) - SURVEY CONTROL DATA

NAME OF STATION: MTN-5 | **DATE ESTABLISHED:** August 2005

MARYLAND STATE PLANE COORDINATES (NAD 83):

NORTHING (Y):	603164.6275 US ft.	183844.946 m
EASTING (X):	1477431.7132 US ft.	450322.087 m
ORTHOMETRIC HEIGHT (NAVD 88)	5.92 US ft.	1.804 m
CONVERGENCE ANGLE:	0°21'58.6"	
SCALE FACTOR:	0.99998003	
COMBINED SCALE FACTOR:	0.99998493	

GEOGRAPHIC COORDINATES (NAD 83):

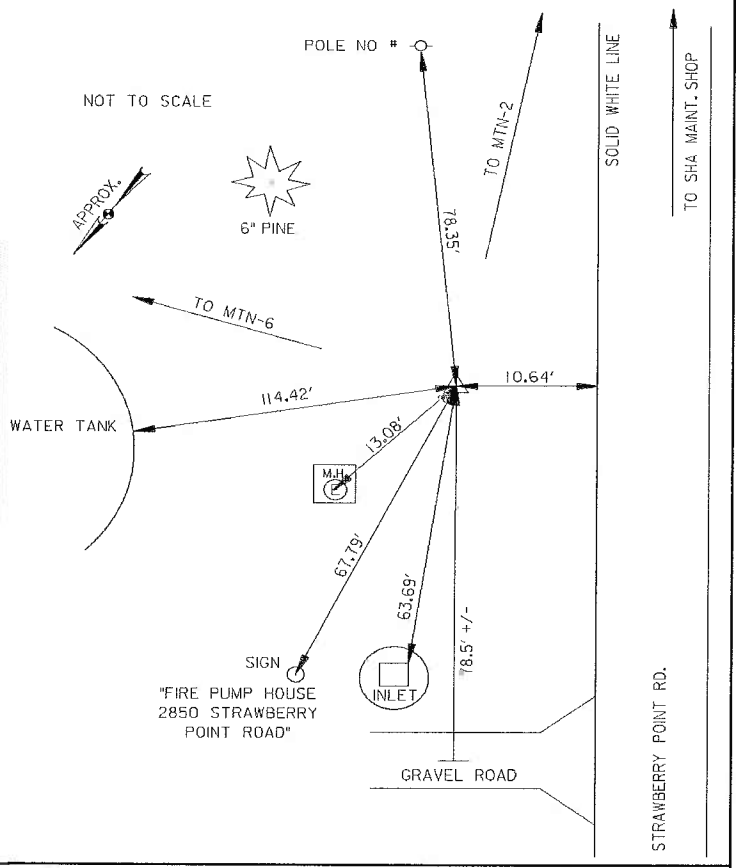
LATITUDE:	39°19'16.96973" (N)	
LONGITUDE:	76°24'59.13338" (W)	
ELLIPSOID HT:	-102.401 US ft.	-31.212 m

AVAILABLE CONVENTIONAL BACKSIGHT POINTS (FIELD DATA):

POINT	AZIMUTH	DISTANCE (US FT.)	DISTANCE (m)
MTN-6	36° 54' 57"	1125.30	342.991
MTN-2	121° 42' 27"	1027.93	313.314

STATION DESCRIPTION:

To reach the monument from the traffic circle at MTN airport in front of the air traffic control tower, proceed S to Airside Access point by Hangars 4-6. After passing through the fence, proceed NE to the second Stop sign. Turn right and proceed SE past private plane hangars. Road will curve to the left, bearing North. At the intersection of T/L B and T/L G, turn right and proceed SE to Yield sign. Continue to Stop sign at Strawberry Point Road. Turn left on Strawberry Point Road. Proceed 819 feet (0.16 mi.) to station the left. Station is located approximately 78.5 feet past the centerline of gravel/grass road (entrance to fire pump house/water tank). Monument is 63.69' SE of drop inlet in concrete near edge of gravel road, 67.79' SE of sign (Fire Pump House 2850 Strawberry Point Road), 114.42' S of face of water tower, 78.35' NW of guy pole with no number, and 10.64' NE of NE edge of Strawberry Point Road.



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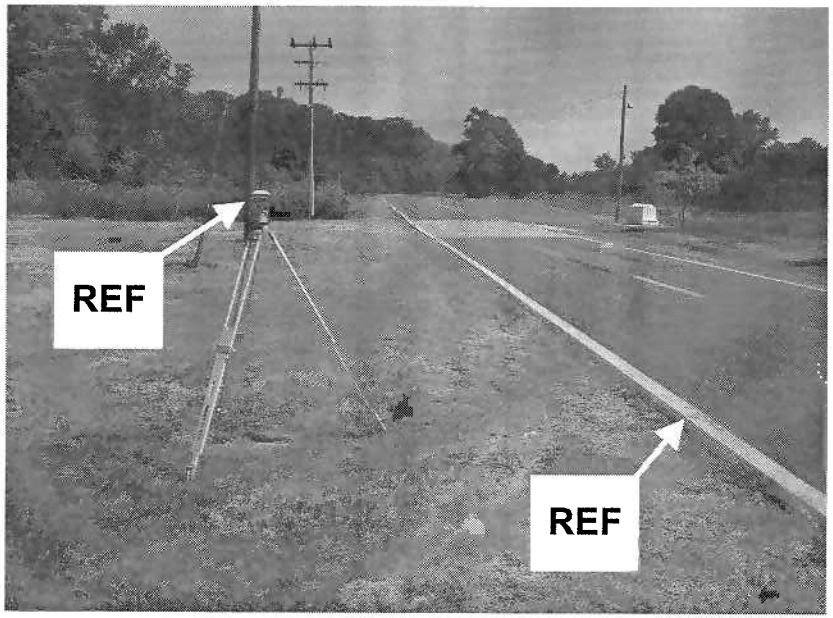
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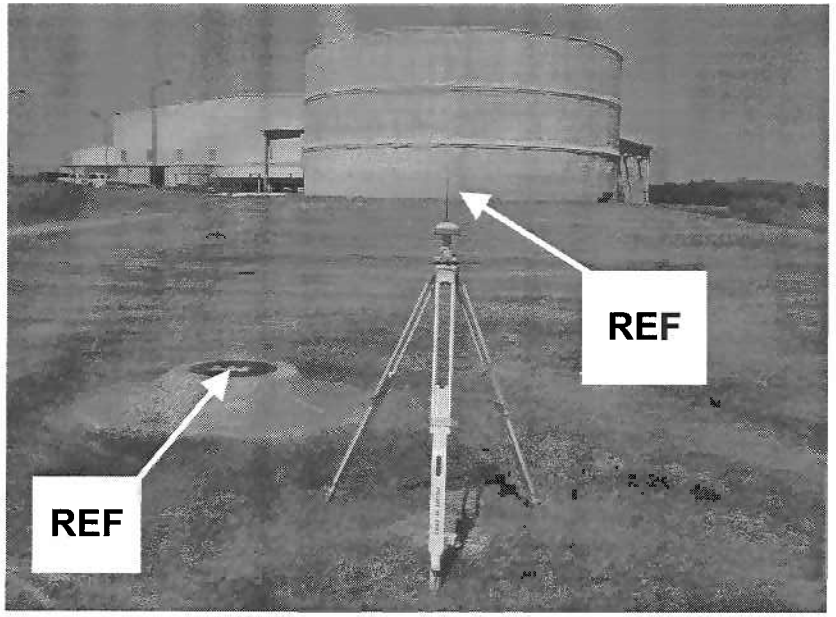
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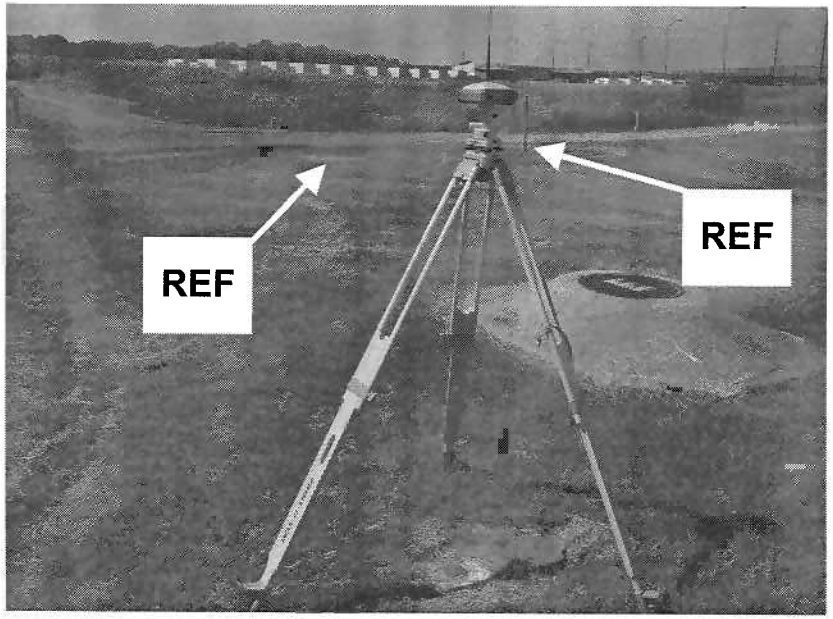
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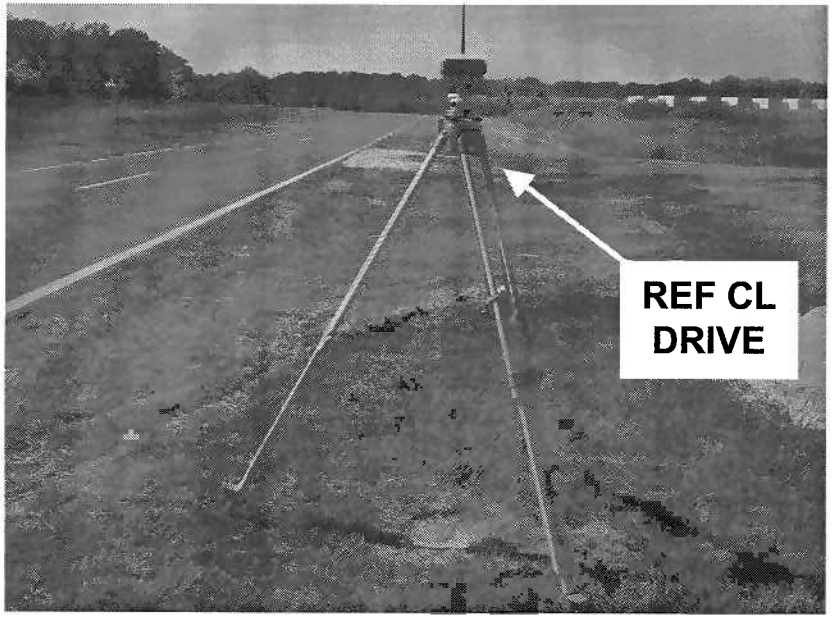

REF CL
DRIVE

MARTIN STATE AIRPORT (MTN) - SURVEY CONTROL DATA

NAME OF STATION: MTN-6 | **DATE ESTABLISHED:** August 2005

MARYLAND STATE PLANE COORDINATES (NAD 83):

NORTHING (Y):	604064.3021 US ft.	184119.168 m
EASTING (X):	1478107.5955 US ft.	450528.096 m
ORTHOMETRIC HEIGHT (NAVD 88)	12.90 US ft.	3.932 m
CONVERGENCE ANGLE:	0°22'04.0"	
SCALE FACTOR:	0.99998036	
COMBINED SCALE FACTOR:	0.99998493	

GEOGRAPHIC COORDINATES (NAD 83):

LATITUDE:	39°19'25.81887" (N)	
LONGITUDE:	76°24'50.45958" (W)	
ELLIPSOID HT:	-95.427 US ft.	-29.086 m

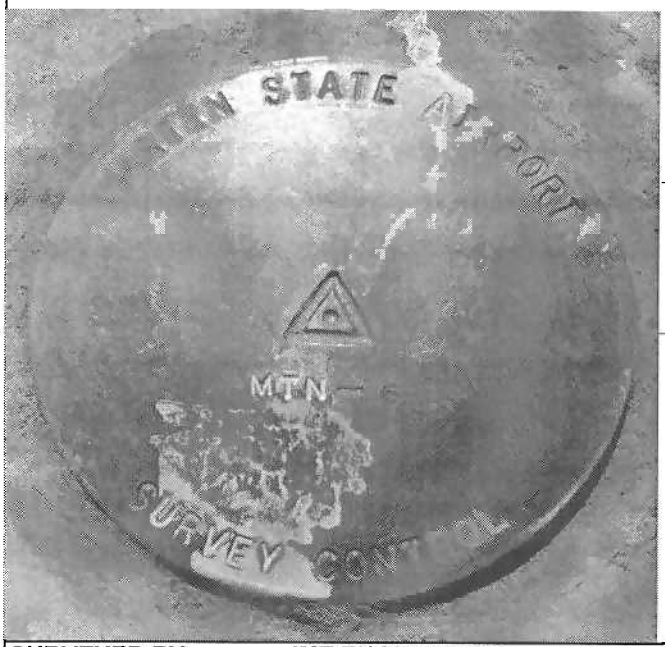
AVAILABLE CONVENTIONAL BACKSIGHT POINTS (FIELD DATA):

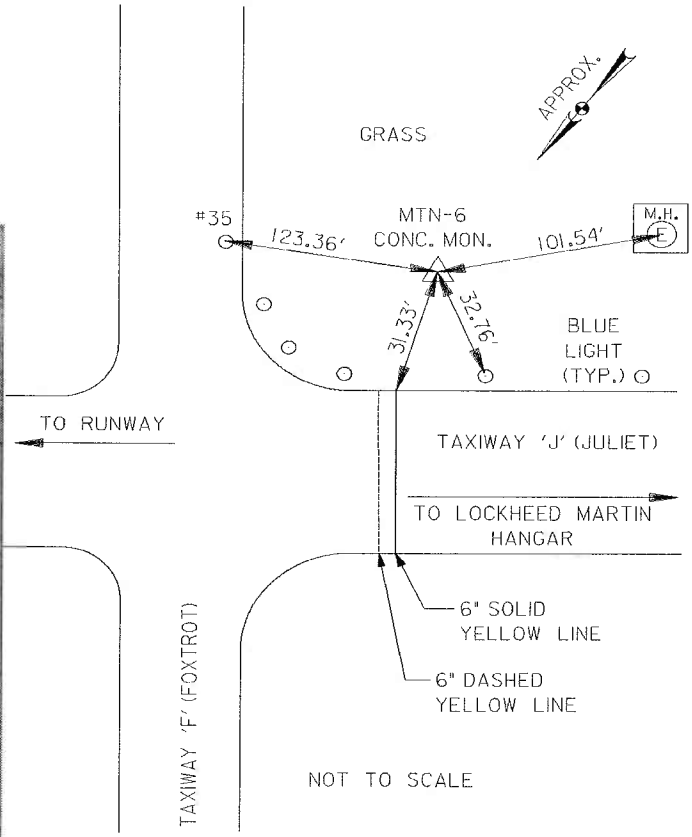
POINT	AZIMUTH	DISTANCE (US FT.)	DISTANCE (m)
MTN A	130° 06' 04"	2879.72	877.740
MTN-5	216° 54' 57"	1125.29	342.989
MTN-4	319° 31' 29"	2360.15	719.375
MTN-B	319° 21' 07"	3436.89	1047.566

STATION DESCRIPTION:

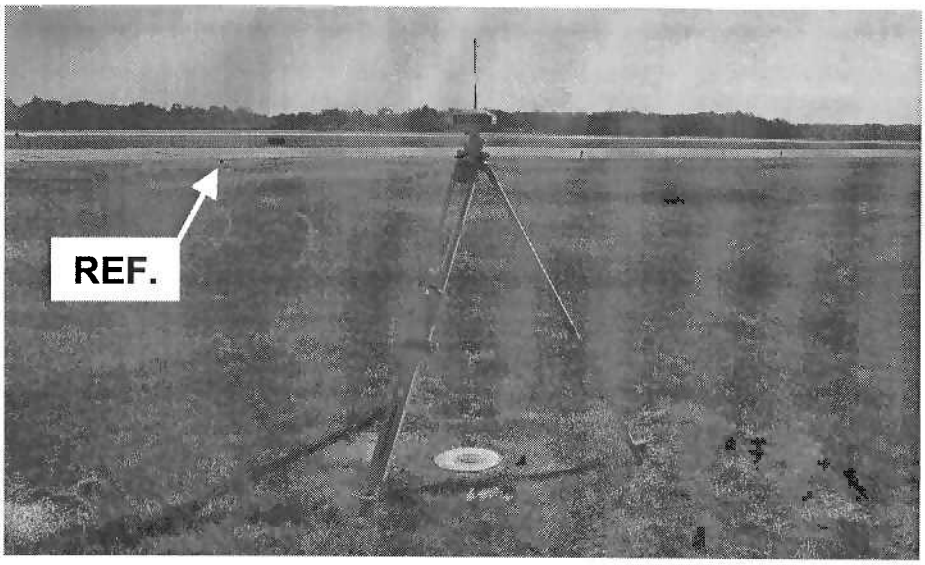
To reach the monument from the traffic circle at MTN airport in front of the air traffic control tower, proceed S to Airside Access point by Hangars 4-6. After passing through the fence, proceed NE to the second Stop sign. Turn right and proceed SE past private plane hangars. Road will curve to the left, bearing North. At the intersection of T/L B and T/L G, turn right and proceed SE to Yield sign. Continue to Stop sign at Strawberry Point Road. Turn left on Strawberry Point Road. Continue to the pump house and water tank on the left. Turn left into gravel lane. Park at pump house. Walk along fence and wetlands area to Taxiway F and the station on the right. Station is near the intersection of Taxiway F, Taxiway J, and the entrance road to Lockheed Martin's hangar/facility. Monument is 123.36' W of taxiway light #35, 101.54' NE of center of electric manhole 0.5' above ground, 32.76' SE of ground way light with no number, 31.33' S of S end 6" solid yellow line on Taxiway 'J'.

***Monument is outside the APRL. Access to this monument by way of Taxiway "F" requires airport tower permission.**





SURVEYED BY: JMT ENGINEERING — **SPARKS, MARYLAND**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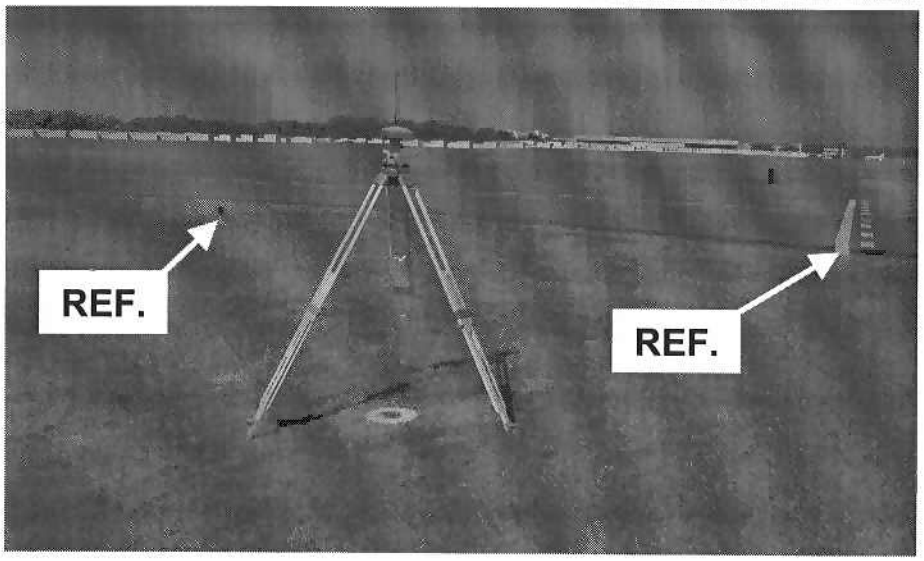
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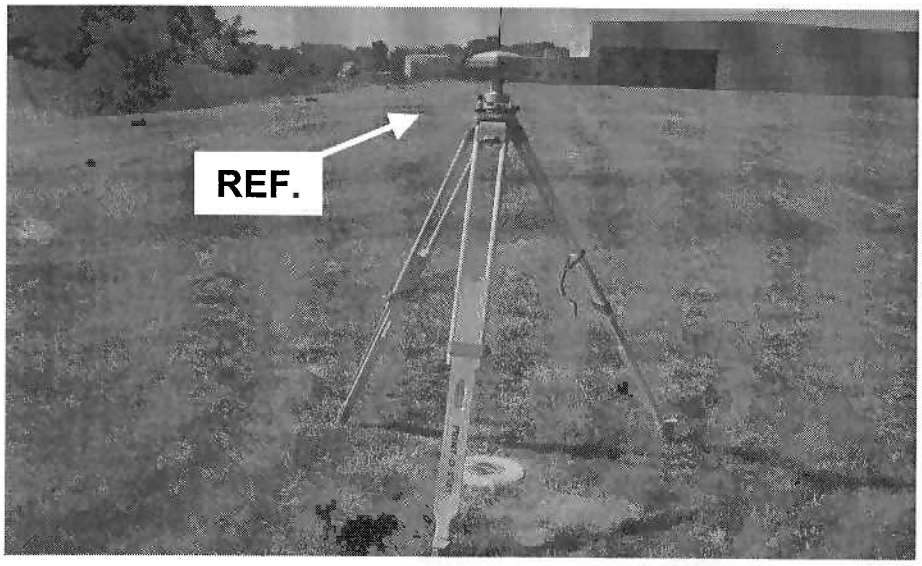

REF.

MARTIN STATE AIRPORT (MTN) - SURVEY CONTROL DATA

NAME OF STATION: MTN-7 | **DATE ESTABLISHED:** August 2005

MARYLAND STATE PLANE COORDINATES (NAD 83):

NORTHING (Y):	US ft.	m
EASTING (X):	US ft.	m
ORTHOMETRIC HEIGHT (NAVD 88):	US ft.	m
CONVERGENCE ANGLE:		
SCALE FACTOR:		
COMBINED SCALE FACTOR:		

GEOGRAPHIC COORDINATES (NAD 83):

LATITUDE:	(N)	
LONGITUDE:	(W)	
ELLIPSOID HT:	US ft.	m

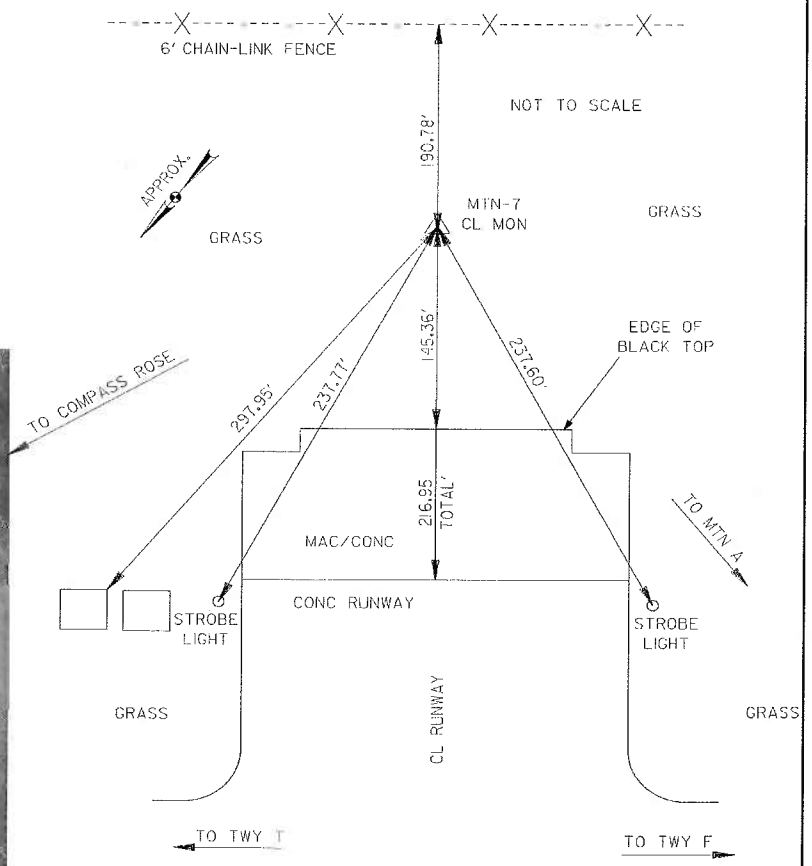
AVAILABLE CONVENTIONAL BACKSIGHT POINTS (FIELD DATA):

POINT	AZIMUTH	DISTANCE (US FT.)	DISTANCE (m)

STATION DESCRIPTION:

***SHALL NOT BE OCCUPIED FOR SURVEY CONTROL. THIS POINT IS INTENDED FOR RECOVERY OF THE RUNWAY CENTERLINE ONLY**

AT THE 33 END OF THE RUNWAY



SURVEYED BY: JMT ENGINEERING — SPARKS, MARYLAND

MARTIN STATE AIRPORT (MTN) - SURVEY CONTROL DATA

NAME OF STATION: MTN-8 | **DATE ESTABLISHED:** August 2005

MARYLAND STATE PLANE COORDINATES (NAD 83):

NORTHING (Y):	US ft.	m
EASTING (X):	US ft.	m
ORTHOMETRIC HEIGHT (NAVD 88)	US ft.	m
CONVERGENCE ANGLE:		
SCALE FACTOR:		
COMBINED SCALE FACTOR:		

GEOGRAPHIC COORDINATES (NAD 83):

LATITUDE:	(N)	
LONGITUDE:	(W)	
ELLIPSOID HT:	US ft.	m

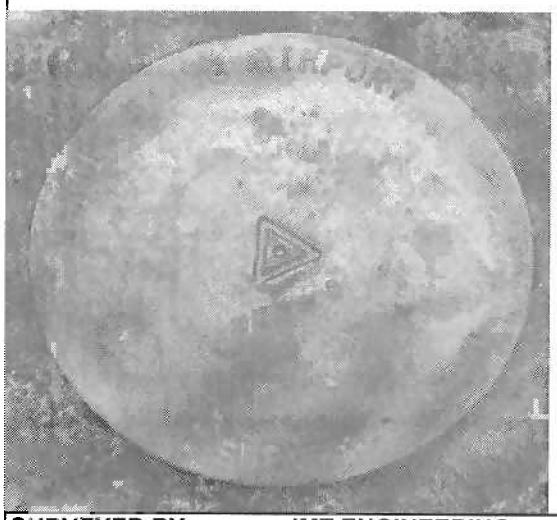
AVAILABLE CONVENTIONAL BACKSIGHT POINTS (FIELD DATA):

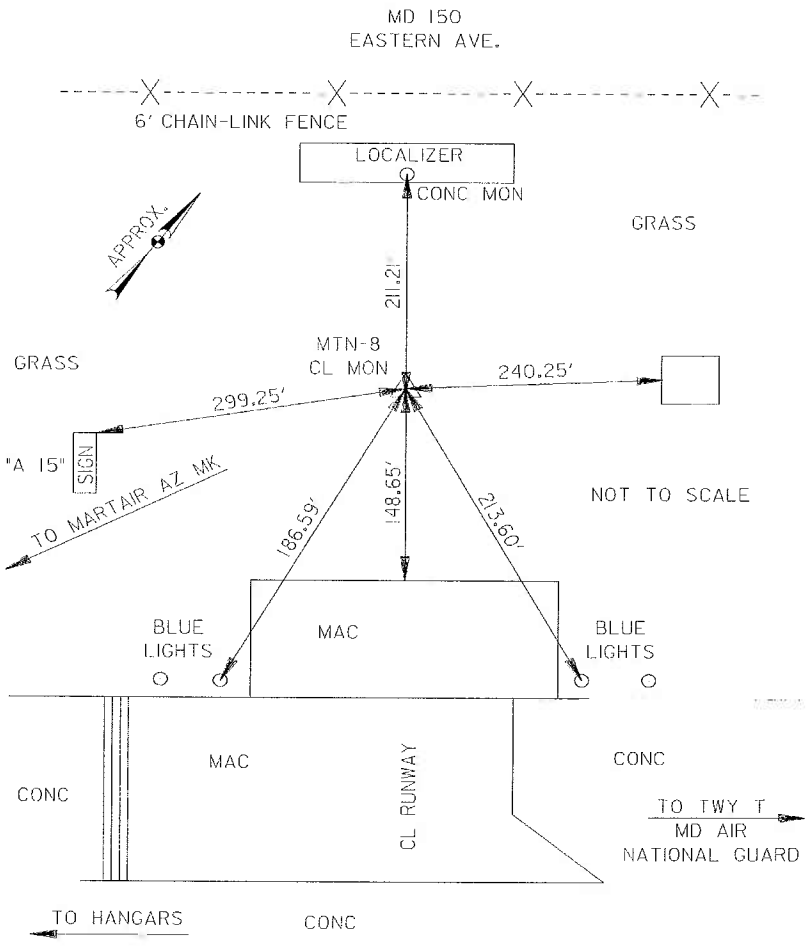
POINT	AZIMUTH	DISTANCE (US FT.)	DISTANCE (m)

STATION DESCRIPTION:

*SHALL NOT BE OCCUPIED FOR SURVEY CONTROL. THIS POINT IS INTENDED FOR RECOVERY OF THE RUNWAY CENTERLINE ONLY

AT THE 15 END OF THE RUNWAY





SURVEYED BY: JMT ENGINEERING — **SPARKS, MARYLAND**

MARTIN STATE AIRPORT (MTN) - SURVEY CONTROL DATA

NAME OF STATION: MARTAIR AZ MK
NGS PID: JV6476
DATE ESTABLISHED: 1985

MARYLAND STATE PLANE COORDINATES (NAD 83):

NORTHING (Y):	607285.0956 US ft.	185100.8676 m
EASTING (X):	1474311.9473 US ft.	449371.18 m
ORTHOMETRIC HEIGHT (NAVD 88):	20.71 US ft.	6.311 m
CONVERGENCE ANGLE:	0°21'33.9"	
SCALE FACTOR:	0.99998159	
COMBINED SCALE FACTOR:	0.99998578	

GEOGRAPHIC COORDINATES (NAD 83):

LATITUDE:	39 19 57.88957 (N)	
LONGITUDE:	076 25 38.50226 (W)	
ELLIPSOID HT:	-87.54 US ft.	-26.681 m

AVAILABLE CONVENTIONAL BACKSIGHT POINTS (FIELD DATA):

POINT	AZIMUTH	DISTANCE (US FT.)	DISTANCE (m)
MTN B	111° 29' 52"	1673.275	510.015
MTN-4	122° 12' 00"	2675.150	815.387

STATION DESCRIPTION:

SEE NGS DATASHEETS ATTACHED

HORZ ORDER - B
VERT ORDER - THIRD
ELLP ORDER - FOURTH CLASS II

SURVEYED BY: JMT ENGINEERING — SPARKS, MARYLAND

DATASHEETS

1 National Geodetic Survey, Retrieval Date = NOVEMBER 8, 2005
JV6476 **********
JV6476 PACS - This is a Primary Airport Control Station.
JV6476 DESIGNATION - MARTAIR AZ MK
JV6476 PID - JV6476
JV6476 STATE/COUNTY- MD/BALTIMORE
JV6476 USGS QUAD - MIDDLE RIVER (1985)
JV6476
JV6476 *CURRENT SURVEY CONTROL
JV6476 ---
JV6476* NAD 83(1991)- 39 19 57.88957(N) 076 25 38.50226(W) ADJUSTED
JV6476* NAVD 88 - 6.311 (meters) 20.71 (feet) ADJUSTED
JV6476 ---
JV6476 X - 1,159,303.234 (meters) COMP
JV6476 Y - -4,802,017.867 (meters) COMP
JV6476 Z - 4,020,941.106 (meters) COMP
JV6476 LAPLACE CORR- -2.64 (seconds) DEFLEC99
JV6476 ELLIP HEIGHT- -26.67 (meters) (08/09/02) GPS OBS
JV6476 GEOID HEIGHT- -32.99 (meters) GEOID03
JV6476 DYNAMIC HT - 6.308 (meters) 20.70 (feet) COMP
JV6476 MODELED GRAV- 980,107.4 (mgal) NAVD 88
JV6476
JV6476 HORZ ORDER - B
JV6476 VERT ORDER - THIRD
JV6476 ELLP ORDER - FOURTH CLASS II
JV6476
JV6476.This mark is at Martin State Airport (MTN)
JV6476
JV6476.The horizontal coordinates were established by GPS observations
JV6476.and adjusted by the National Geodetic Survey in March 1998.
JV6476
JV6476.The orthometric height was determined by differential leveling
JV6476.and adjusted by the National Geodetic Survey in February 1998.
JV6476
JV6476.The X, Y, and Z were computed from the position and the ellipsoidal ht.
JV6476
JV6476.The Laplace correction was computed from DEFLEC99 derived deflections.
JV6476
JV6476.The ellipsoidal height was determined by GPS observations
JV6476.and is referenced to NAD 83.
JV6476
JV6476.The geoid height was determined by GEOID03.
JV6476
JV6476.The dynamic height is computed by dividing the NAVD 88
JV6476.geopotential number by the normal gravity value computed on the
JV6476.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
JV6476.degrees latitude (g = 980.6199 gals.).
JV6476
JV6476.The modeled gravity was interpolated from observed gravity values.
JV6476
JV6476; North East Units Scale Factor Converg.

JV6476;SPC MD - 185,100.867 449,371.180 MT 0.99998159 +0 21 33.9
JV6476;SPC MD - 607,285.09 1,474,311.95 sFT 0.99998159 +0 21 33.9
JV6476;UTM 18 - 4,354,674.286 376,980.708 MT 0.99978633 -0 54 17.3
JV6476
JV6476! - Elev Factor x Scale Factor = Combined Factor
JV6476!SPC MD - 1.00000418 x 0.99998159 = 0.99998577
JV6476!UTM 18 - 1.00000418 x 0.99978633 = 0.99979051
JV6476
JV6476: Primary Azimuth Mark Grid Az
JV6476:SPC MD - MARTAIR 111 32 54.8
JV6476:UTM 18 - MARTAIR 112 48 46.0
JV6476
JV6476|--|
JV6476| PID Reference Object Distance Geod. Az |
JV6476| dddmmss.s |
JV6476| JV6144 MARTAIR 496.478 METERS 1115428.7 |
JV6476|--|
JV6476
JV6476 SUPERSEDED SURVEY CONTROL
JV6476
JV6476 ELLIP H (03/24/98) -26.61 (m) GP( ) 4 1
JV6476 NAD 83(1991)- 39 19 57.88953(N) 076 25 38.50223(W) AD( ) B
JV6476 ELLIP H (11/22/95) -26.61 (m) GP( ) 1 1
JV6476 NAD 83(1991)- 39 19 57.88854(N) 076 25 38.50294(W) AD( ) 1
JV6476 ELLIP H (01/27/92) -26.53 (m) GP( ) 4 1
JV6476 NAD 83(1986)- 39 19 57.88372(N) 076 25 38.51118(W) AD( ) 1
JV6476 NAD 27 - 39 19 57.49393(N) 076 25 39.65548(W) AD( ) 1
JV6476 NAVD 88 (03/24/98) 6.31 (m) 20.7 (f) LEVELING 3
JV6476 NGVD 29 (11/20/87) 6.3 (m) 21 (f) GPS OBS
JV6476
JV6476.Superseded values are not recommended for survey control.
JV6476.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
JV6476.See file dsdata.txt to determine how the superseded data were derived.
JV6476
JV6476_U.S. NATIONAL GRID SPATIAL ADDRESS: 18SUJ7698154674(NAD 83)
JV6476_MARKER: DZ = AZIMUTH MARK DISK
JV6476_SETTING: 7 = SET IN TOP OF CONCRETE MONUMENT
JV6476_SP_SET: SET IN TOP OF CONCRETE MONUMENT
JV6476_STAMPING: MARTAIR 1985
JV6476_MARK LOGO: NGS
JV6476_MAGNETIC: N = NO MAGNETIC MATERIAL
JV6476_STABILITY: C = MAY HOLD, BUT OF TYPE COMMONLY SUBJECT TO
JV6476+STABILITY: SURFACE MOTION
JV6476_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
JV6476+SATELLITE: SATELLITE OBSERVATIONS - October 01, 2002
JV6476
JV6476 HISTORY - Date Condition Report By
JV6476 HISTORY - 1985 MONUMENTED NGS
JV6476 HISTORY - 19860123 GOOD
JV6476 HISTORY - 19911107 GOOD NGS
JV6476 HISTORY - 19940902 GOOD NGS
JV6476 HISTORY - 19950201 GOOD MCCRON
JV6476 HISTORY - 19961010 GOOD NGS

JV6476 HISTORY - 19970620 GOOD DMW
JV6476 HISTORY - 19980928 GOOD DMW
JV6476 HISTORY - 19990902 GOOD MDSHA
JV6476 HISTORY - 20020929 GOOD JCLS
JV6476 HISTORY - 20021001 GOOD JCLS
JV6476
JV6476 STATION DESCRIPTION
JV6476
JV6476'DESCRIBED BY NATIONAL GEODETIC SURVEY 1985 (RGP)
JV6476'THE STATION IS LOCATED ABOUT 16 KM (10 MI) EAST FROM THE APPROXIMATE
JV6476'CENTER OF BALTIMORE, 5-1/2 KM (3-1/2 MI) SOUTH FROM WHITE MARSH
JV6476'AND 1 KM (1/2 MI) EAST FROM THE APPROXIMATE CENTER OF MIDDLE
JV6476'RIVER.
JV6476'
JV6476'OWNERSHIP--STATE OWNED PROPERTY.
JV6476'
JV6476'NO TO REACH NECESSARY.
JV6476'
JV6476'THE STATION SURFACE MARK IS A STANDARD NGS AZIMUTH MARK DISK
JV6476'STAMPED--MARTAIR--1985 SET IN THE TOP OF A 25 CM (10 INCH)
JV6476'ROUND CONCRETE POST WHICH IS FLUSH WITH THE SURFACE. THE SUB
JV6476'SURFACE DISK IS IDENTICAL TO THE SURFACE MARK AND IT IS SET IN
JV6476'A MASS OF CONCRETE 114 CM (45 INCHES) BELOW THE SURFACE.
JV6476'
JV6476'THE MARK IS LOCATED 67.9 METERS (222.9 FT) EAST FROM THE EAST
JV6476'CORNER OF THE MIDDLE RIVER POST OFFICE, 16.7 METERS (54.7 FT) EAST
JV6476'NORTHEAST FROM THE NORTHEAST CURB OF THE STATE HIGHWAY 587,
JV6476'23.0 METERS (75.6 FT) SOUTHWEST FROM THE EDGE OF A TAXI STRIP AND
JV6476'0.5 METER (1.8 FT) SOUTHEAST FROM A CARSONITE WITNESS POST.
JV6476
JV6476 STATION RECOVERY (1986)
JV6476
JV6476'RECOVERED 1986
JV6476'RECOVERED IN GOOD CONDITION.
JV6476
JV6476 STATION RECOVERY (1991)
JV6476
JV6476'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1991
JV6476'THE STATION IS LOCATED AT THE NW END OF THE INNER TAXIWAY NEAR THE
JV6476'INTERSECTION WITH TAXIWAY A WEST. THE STATION IS 45 FT (13.7 M) SW OF
JV6476'THE CENTERLINE EXTENSION OF THE RAMP AREA TO THE EAST, 74.9 FT (22.8
JV6476'M) WEST OF THE WEST EDGE OF THE TAXIWAY, 135 FT (41.1 M) SW OF THE NW
JV6476'CORNER OF ASPHALT, 180.4 FT (55.0 M) NW OF THE W CORNER OF A SIGN A,
JV6476'AND 18.5 FT (5.6 M) EAST OF A FENCE. THE STATION IS A STANDARD NGS
JV6476'DISK SET IN THE TOP OF A CONCRETE POST FLUSH WITH THE GROUND STAMPED
JV6476'MARTAIR 1985.
JV6476
JV6476 STATION RECOVERY (1994)
JV6476
JV6476'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1994 (RAH)
JV6476'RECOVERED IN GOOD CONDITION.
JV6476'
JV6476'CONTACT MR. JAKE WEST, AIRPORT MANAGER, MARTIN STATE AIRPORT, BOX 20,

JV6476'701 WILSON POINT ROAD, BALTIMORE, MD 21220, PHONE (410) 682-8810.
JV6476'
JV6476'TO REACH THE STATION FROM THE CONTROL TOWER, GO NORTHWESTERLY FOR
JV6476'0.42 KM (0.25 MI) ALONG AN APRON AND TAXIWAY TO THE STATION ON THE RIGHT.
JV6476'
JV6476'THE STATION IS LOCATED 55.0 M (180.4 FT) NORTHEAST OF THE WEST CORNER
JV6476'OF A SIGN A, 41.1 M (134.8 FT) SOUTHWEST OF THE NORTHWEST CORNER OF
JV6476'ASPHALT PAVEMENT, 22.8 M (74.8 FT) WEST IF THE WEST EDGE OF THE
JV6476'TAXIWAY, 5.6 M (18.4 FT) EAST OF A CHAIN LINK FENCE, AND THE MONUMENT
JV6476'IS FLUSH WITH THE GROUND.
JV6476'
JV6476'DESCRIBED BY KLF.
JV6476
JV6476 STATION RECOVERY (1995)
JV6476
JV6476'RECOVERY NOTE BY J R MCCRONE JR INCORPORATED 1995 (HAS)
JV6476'RECOVERED AS DESCRIBED.
JV6476
JV6476 STATION RECOVERY (1996)
JV6476
JV6476'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1996 (AJL)
JV6476'RECOVERED AS DESCRIBED.
JV6476
JV6476 STATION RECOVERY (1997)
JV6476
JV6476'RECOVERY NOTE BY DAFT MCCUNE WALKER INCORPORATED 1997 (DMM)
JV6476'RECOVERED AS DESCRIBED.
JV6476
JV6476 STATION RECOVERY (1998)
JV6476
JV6476'RECOVERY NOTE BY DAFT MCCUNE WALKER INCORPORATED 1998 (JMS)
JV6476'RECOVERED IN GOOD CONDITION.
JV6476
JV6476 STATION RECOVERY (1999)
JV6476
JV6476'RECOVERY NOTE BY MARYLAND DOT HIGHWAY ADMINISTRATION 1999 (DMM)
JV6476'RECOVERED AS DESCRIBED
JV6476
JV6476 STATION RECOVERY (2002)
JV6476
JV6476'RECOVERY NOTE BY JOHN CHANCE LAND SURVEYS INC 2002 (MRY)
JV6476'RECOVERED IN GOOD CONDITION.
JV6476
JV6476 STATION RECOVERY (2002)
JV6476
JV6476'RECOVERY NOTE BY JOHN CHANCE LAND SURVEYS INC 2002
JV6476'RECOVERED IN GOOD CONDITION.

*** retrieval complete.
Elapsed Time = 00:00:00

MARTIN STATE AIRPORT (MTN) - SURVEY CONTROL DATA

NAME OF STATION: MTN A
NGS PID: AA9279
DATE ESTABLISHED: 1989

MARYLAND STATE PLANE COORDINATES (NAD 83):

NORTHING (Y):	602209.3862 US ft.	183553.788 m
EASTING (X):	1480310.2956 US ft.	451199.481 m
ORTHOMETRIC HEIGHT (NAVD 88):	5.4 US ft.	1.64 m
CONVERGENCE ANGLE:	0°22'21.5"	
SCALE FACTOR:	0.99997967	
COMBINED SCALE FACTOR:	0.99998459	

GEOGRAPHIC COORDINATES (NAD 83):

LATITUDE:	39 19 07.34515 (N)	
LONGITUDE:	076 24 22.58368 (W)	
ELLIPSOID HT:	-102.92 US ft.	-31.370 m

AVAILABLE CONVENTIONAL BACKSIGHT POINTS (FIELD DATA):

POINT	AZIMUTH	DISTANCE (US FT.)	DISTANCE (m)
MTN B	315° 08' 07"	6296.22	1919.092
MTN-6	310° 06' 04"	2879.73	877.743
MTN-4	314° 20' 41"	5222.33	1591.769
MTN-1	231° 15' 50"	1027.35	313.137

STATION DESCRIPTION:

SEE NGS DATASHEETS ATTACHED

HORZ ORDER - FIRST
ELLP ORDER - FOURTH CLASS II

SURVEYED BY: JMT ENGINEERING — SPARKS, MARYLAND

DATASHEETS

1 National Geodetic Survey, Retrieval Date = NOVEMBER 8, 2005
AA9279 **********
AA9279 SACS - This is a Secondary Airport Control Station.
AA9279 DESIGNATION - MTN A
AA9279 PID - AA9279
AA9279 STATE/COUNTY- MD/BALTIMORE
AA9279 USGS QUAD - MIDDLE RIVER (1985)
AA9279
AA9279 *CURRENT SURVEY CONTROL
AA9279 ---
AA9279* NAD 83(1991)- 39 19 07.34515(N) 076 24 22.58368(W) ADJUSTED
AA9279* NAVD 88 - 1.64 (meters) 5.4 (feet) GPS OBS
AA9279 ---
AA9279 X - 1,161,301.923 (meters) COMP
AA9279 Y - -4,802,547.463 (meters) COMP
AA9279 Z - 4,019,732.347 (meters) COMP
AA9279 LAPLACE CORR- -2.19 (seconds) DEFLEC99
AA9279 ELLIP HEIGHT- -31.37 (meters) (08/19/02) GPS OBS
AA9279 GEOID HEIGHT- -33.03 (meters) GEOID03
AA9279
AA9279 HORZ ORDER - FIRST
AA9279 ELLP ORDER - FOURTH CLASS II
AA9279
AA9279.This mark is at Martin State Airport (MTN)
AA9279
AA9279.The horizontal coordinates were established by GPS observations
AA9279.and adjusted by the National Geodetic Survey in April 1998.
AA9279
AA9279.The orthometric height was determined by GPS observations and a
AA9279.high-resolution geoid model.
AA9279
AA9279.GPS derived orthometric heights for airport stations designated as
AA9279.PACS or SACS are published to 2 decimal places. This maintains
AA9279.centimeter relative accuracy between the PACS and SACS. It does
AA9279.not indicate centimeter accuracy relative to other marks which are
AA9279.part of the NAVD 88 network.
AA9279
AA9279.The X, Y, and Z were computed from the position and the ellipsoidal ht.
AA9279
AA9279.The Laplace correction was computed from DEFLEC99 derived deflections.
AA9279
AA9279.The ellipsoidal height was determined by GPS observations
AA9279.and is referenced to NAD 83.
AA9279
AA9279.The geoid height was determined by GEOID03.
AA9279
AA9279; North East Units Scale Factor Converg.
AA9279;SPC MD - 183,553.788 451,199.481 MT 0.99997967 +0 22 21.5
AA9279;SPC MD - 602,209.39 1,480,310.30 sFT 0.99997967 +0 22 21.5
AA9279;UTM 18 - 4,353,087.565 378,774.082 MT 0.99978094 -0 53 28.2
AA9279

AA9279! - Elev Factor x Scale Factor = Combined Factor
AA9279!SPC MD - 1.00000492 x 0.99997967 = 0.99998459
AA9279!UTM 18 - 1.00000492 x 0.99978094 = 0.99978586
AA9279
AA9279 SUPERSEDED SURVEY CONTROL
AA9279
AA9279 ELLIP H (04/02/98) -31.31 (m) GP( ) 4 2
AA9279 NAD 83(1991)- 39 19 07.34511(N) 076 24 22.58365(W) AD( ) 1
AA9279 ELLIP H (11/30/95) -31.31 (m) GP( ) 4 2
AA9279
AA9279.Superseded values are not recommended for survey control.
AA9279.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
AA9279.See file dsdata.txt to determine how the superseded data were derived.
AA9279
AA9279_U.S. NATIONAL GRID SPATIAL ADDRESS: 18SUJ7877453088(NAD 83)
AA9279_MARKER: DD = SURVEY DISK
AA9279_SETTING: 30 = SET IN A LIGHT STRUCTURE
AA9279_SP_SET: SET IN A LIGHT STRUCTURE
AA9279_STAMPING: MTN A 1989
AA9279_MARK LOGO: NOS
AA9279_MAGNETIC: O = OTHER; SEE DESCRIPTION
AA9279_STABILITY: C = MAY HOLD, BUT OF TYPE COMMONLY SUBJECT TO
AA9279+STABILITY: SURFACE MOTION
AA9279_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
AA9279+SATELLITE: SATELLITE OBSERVATIONS - September 02, 1999
AA9279
AA9279 HISTORY - Date Condition Report By
AA9279 HISTORY - 1989 MONUMENTED NOS
AA9279 HISTORY - 19911107 GOOD NOS
AA9279 HISTORY - 19940902 GOOD NGS
AA9279 HISTORY - 19961010 GOOD NGS
AA9279 HISTORY - 19990902 GOOD MDSHA
AA9279
AA9279 STATION DESCRIPTION
AA9279
AA9279'DESCRIBED BY NATIONAL OCEAN SERVICE 1991
AA9279'THE STATION IS LOCATED AT THE MARTIN STATE AIRPORT SOUTHWEST OF RUNWAY
AA9279'END 32, AND NORTH OF THE PARALLEL TAXIWAY. THE STATION IS A STANDARD
AA9279'NOS DISK SET IN THE NE CORNER OF THE INNER CONCRETE SECTION OF A STORM
AA9279'DRAIN. THE STATION IS 126.6 FT (38.6 M) NW OF THE CENTERLINE OF A
AA9279'TAXIWAY, 70.7 FT (21.5 M) NNE OF TAXIWAY LIGHT 81, 118.0 FT (36.0 M)
AA9279'NE OF THE CENTERLINE OF THE PARALLEL TAXIWAY, AND 55.5 FT (16.9 M) SE
AA9279'OF THE SE CORNER OF A SIGN E. THE DISK IS STAMPED MTN A 1989.
AA9279
AA9279 STATION RECOVERY (1994)
AA9279
AA9279'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1994 (RAH)
AA9279'THE STATION IS LOCATED ABOUT 6.4 KM (3.95 MI) SOUTH-SOUTHEAST OF WHITE
AA9279'MARSH, 5.3 KM (3.30 MI) NORTHEAST OF ESSEX, AND 4.8 KM (3.00 MI)
AA9279'SOUTHWEST OF CHASE, NEAR THE NORTHEAST CORNEROF THE INNER CONCRETE
AA9279'SECTION OF A STORM DRAIN NEAR THE SOUTHEAST END OF THE ACTIVE RUNWAY
AA9279'14-32. OWNERSHIP- STATE OF MARYLAND. CONTACT MR. JAKE WEST, AIRPORT
AA9279'MANAGER, MARTIN STATE AIRPORT, BOX 20, 701 WILSON POINT ROAD,

AA9279'BALTIMORE, MD 21220, PHONE (410) 682-8810.
AA9279'
AA9279'TO REACH THE STATION FROM THE CONTROL TOWER, GO SOUTHEAST FOR 1.12 KM
AA9279'(0.70 MI) ALONG AN APRON AND THE SOUTHERN PARALLEL TAXIWAY TO RUNWAY
AA9279'14-32 AND THE STATION ON THE LEFT.
AA9279'
AA9279'THE STATION IS LOCATED 38.6 M (126.6 FT) NORTHWEST OF THE CENTERLINE
AA9279'OF A CONNECTING TAXIWAY, 36.0 M (118.1 FT) NORTHEAST OF THE PARALLEL
AA9279'TAXIWAY, 21.5 M (70.5 FT) NORTH-NORTHEAST OF A TAXIWAY LIGHT NUMBER
AA9279'81, AND 16.9 M (55.4 FT) SOUTHEAST OF THE SOUTHEAST CORNER OF A SIGN
AA9279'E.
AA9279'
AA9279'DESCRIBED BY KLF
AA9279
AA9279 STATION RECOVERY (1996)
AA9279
AA9279'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1996 (AJL)
AA9279'RECOVERED AS DESCRIBED.
AA9279
AA9279 STATION RECOVERY (1999)
AA9279
AA9279'RECOVERY NOTE BY MARYLAND DOT HIGHWAY ADMINISTRATION 1999 (DMM)
AA9279'RECOVERED AS DESCRIBED

*** retrieval complete.
Elapsed Time = 00:00:00

MARTIN STATE AIRPORT (MTN) - SURVEY CONTROL DATA

NAME OF STATION: MTN B
NGS PID: AI4374
DATE ESTABLISHED: 1998

MARYLAND STATE PLANE COORDINATES (NAD 83):

NORTHING (Y):	606671.9075 US ft.	184913.9672 m
EASTING (X):	1475868.8004 US ft.	449845.7101 m
ORTHOMETRIC HEIGHT (NAVD 88):	16.8 US ft.	5.12 m
CONVERGENCE ANGLE:	0°21'46.3"	
SCALE FACTOR:	0.99998135	
COMBINED SCALE FACTOR:	0.99998573	

GEOGRAPHIC COORDINATES (NAD 83):

LATITUDE:	39 19 51.73216 (N)	
LONGITUDE:	076 25 18.73818 (W)	
ELLIPSOID HT:	-91.417 US ft.	-27.864 m

AVAILABLE CONVENTIONAL BACKSIGHT POINTS (FIELD DATA):

POINT	AZIMUTH	DISTANCE (US FT.)	DISTANCE (m)
MARTAIR AZ MK	291° 29' 52"	1673.30	510.023
MTN-4	138° 58' 21"	1076.79	328.206
MTN-6	139° 21' 07"	3436.91	1047.572
MTN A	135° 08' 07"	6296.23	1919.095

STATION DESCRIPTION:

SEE NGS DATASHEETS ATTACHED

HORZ ORDER - FIRST
ELLP ORDER - FOURTH CLASS I

SURVEYED BY: JMT ENGINEERING — **SPARKS, MARYLAND**

DATASHEETS

1 National Geodetic Survey, Retrieval Date = NOVEMBER 8, 2005
AI4374 **********
AI4374 SACS - This is a Secondary Airport Control Station.
AI4374 DESIGNATION - MTN B
AI4374 PID - AI4374
AI4374 STATE/COUNTY- MD/BALTIMORE
AI4374 USGS QUAD - MIDDLE RIVER (1985)
AI4374
AI4374 *CURRENT SURVEY CONTROL
AI4374 ---
AI4374* NAD 83(1991)- 39 19 51.73216(N) 076 25 18.73818(W) ADJUSTED
AI4374* NAVD 88 - 5.12 (meters) 16.8 (feet) GPS OBS
AI4374 ---
AI4374 X - 1,159,791.391 (meters) COMP
AI4374 Y - -4,802,022.850 (meters) COMP
AI4374 Z - 4,020,793.468 (meters) COMP
AI4374 LAPLACE CORR- -2.55 (seconds) DEFLEC99
AI4374 ELLIP HEIGHT- -27.87 (meters) (10/28/02) GPS OBS
AI4374 GEOID HEIGHT- -33.00 (meters) GEOID03
AI4374
AI4374 HORZ ORDER - FIRST
AI4374 ELLP ORDER - FOURTH CLASS I
AI4374
AI4374.This mark is at Martin State Airport (MTN)
AI4374
AI4374.The horizontal coordinates were established by GPS observations
AI4374.and adjusted by the National Geodetic Survey in March 2000.
AI4374
AI4374.The orthometric height was determined by GPS observations and a
AI4374.high-resolution geoid model.
AI4374
AI4374.GPS derived orthometric heights for airport stations designated as
AI4374.PACS or SACS are published to 2 decimal places. This maintains
AI4374.centimeter relative accuracy between the PACS and SACS. It does
AI4374.not indicate centimeter accuracy relative to other marks which are
AI4374.part of the NAVD 88 network.
AI4374
AI4374.The X, Y, and Z were computed from the position and the ellipsoidal ht.
AI4374
AI4374.The Laplace correction was computed from DEFLEC99 derived deflections.
AI4374
AI4374.The ellipsoidal height was determined by GPS observations
AI4374.and is referenced to NAD 83.
AI4374
AI4374.The geoid height was determined by GEOID03.
AI4374
AI4374; North East Units Scale Factor Converg.
AI4374;SPC MD - 184,913.967 449,845.710 MT 0.99998135 +0 21 46.3
AI4374;SPC MD - 606,671.91 1,475,868.80 sFT 0.99998135 +0 21 46.3
AI4374;UTM 18 - 4,354,477.001 377,450.907 MT 0.99978491 -0 54 04.7
AI4374

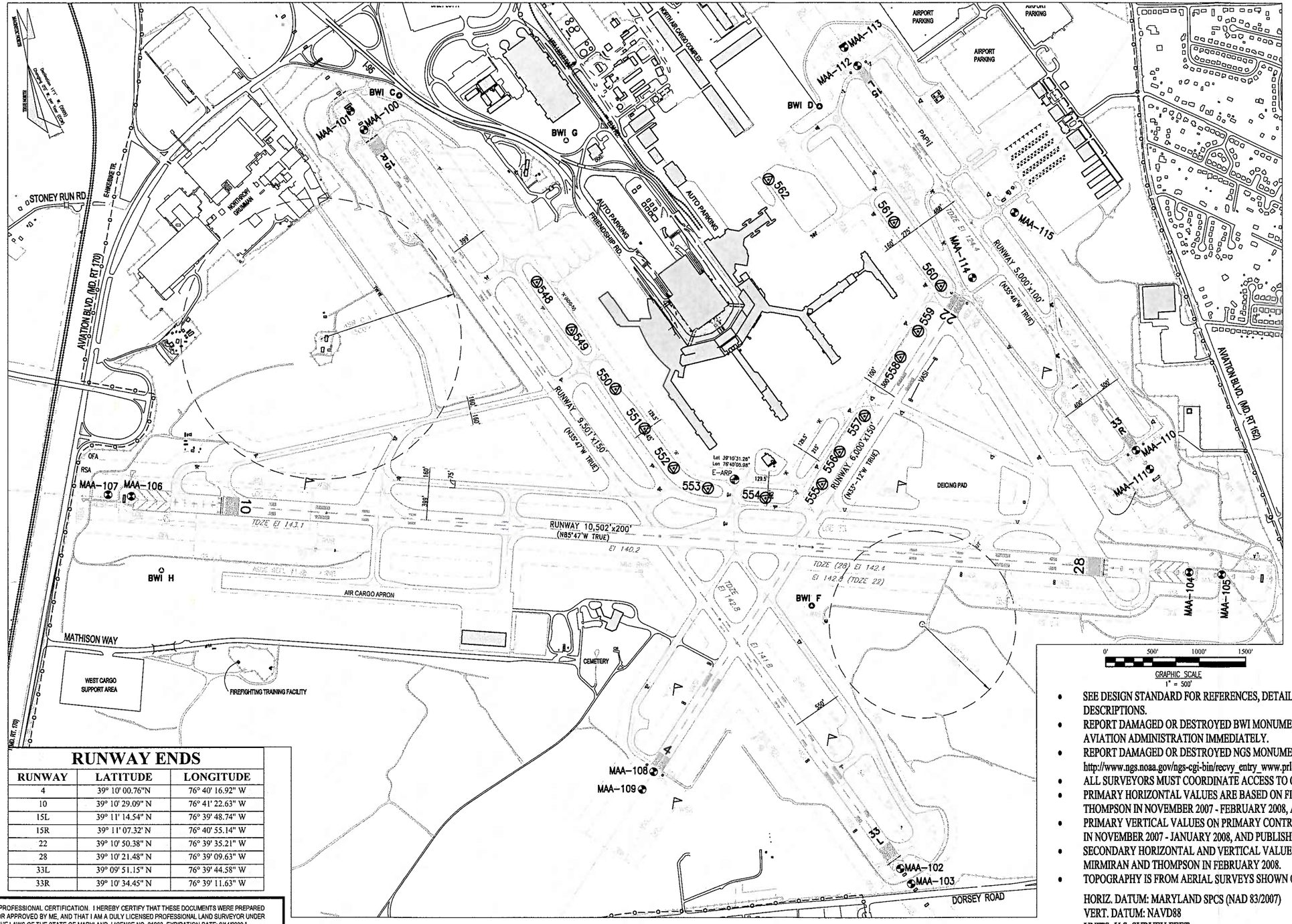
AI4374! - Elev Factor x Scale Factor = Combined Factor
AI4374!SPC MD - 1.00000437 x 0.99998135 = 0.99998572
AI4374!UTM 18 - 1.00000437 x 0.99978491 = 0.99978928
AI4374
AI4374 SUPERSEDED SURVEY CONTROL
AI4374
AI4374 ELLIP H (03/31/00) -27.86 (m) GP( ) 4 1
AI4374
AI4374.Superseded values are not recommended for survey control.
AI4374.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
AI4374.See file dsdata.txt to determine how the superseded data were derived.
AI4374
AI4374_U.S. NATIONAL GRID SPATIAL ADDRESS: 18SUJ7745154477(NAD 83)
AI4374_MARKER: DD = SURVEY DISK
AI4374_SETTING: 7 = SET IN TOP OF CONCRETE MONUMENT
AI4374_SP_SET: SET IN TOP OF CONCRETE MONUMENT
AI4374_STAMPING: MTN B 1998
AI4374_MARK LOGO: MDSHA
AI4374_MAGNETIC: N = NO MAGNETIC MATERIAL
AI4374_STABILITY: C = MAY HOLD, BUT OF TYPE COMMONLY SUBJECT TO
AI4374+STABILITY: SURFACE MOTION
AI4374_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
AI4374+SATELLITE: SATELLITE OBSERVATIONS - 1998
AI4374
AI4374 HISTORY - Date Condition Report By
AI4374 HISTORY - 1998 MONUMENTED MDSHA
AI4374
AI4374 STATION DESCRIPTION
AI4374
AI4374'DESCRIBED BY MARYLAND DOT HIGHWAY ADMINISTRATION 1998 (DMM)
AI4374'STATION IS LOCATED ON THE MARTIN STATE AIRPORT BETWEEN RUNWAY 15-33
AI4374'AND AN AIRCRAFT TIE-DOWN AREA NEAR HANGAR 2. IT IS 199.8 FT (60.9 M)
AI4374'SSW OF RUNWAY LIGHT 2, 169.2 FT (51.6 M) NE OF THE NE EDGE OF THE
AI4374'TIE-DOWN AREA, 156.0 FT (47.5 M) SW OF THE SW EDGE OF THE RUNWAY,
AI4374'152.7 FT (46.5 M) W OF RUNWAY LIGHT 3, 35.5 FT (10.8 M) N OF A
AI4374'DRAINAGE INLET AND 2.7 FT (0.8 M) SW OF A CARSONITE WITNESS POST.
AI4374'MONUMENT IS A MARYLAND STATE HIGHWAY ADMINISTRATION DISK SET IN THE
AI4374'TOP OF A 12 IN ROUND CONCRETE POST WHICH IS FLUSH WITH THE GROUND.

*** retrieval complete.
Elapsed Time = 00:00:00

BALTIMORE/WASHINGTON INTERNATIONAL THURGOOD MARSHALL AIRPORT SURVEY CONTROL MANUAL

MARTIN STATE AIRPORT

BALTIMORE/WASHINGTON INTERNATIONAL Thurgood Marshall AIRPORT



SURVEY CONTROL

POINT	NORTHING	EASTING	ELEV.
BWI D	553596.51	1407273.55	154.41
BWI F	548273.30	1407184.15	156.48
BWI G	553233.77	1404563.51	166.38
BWI H	548646.39	1400229.31	132.74
MON-548	551723.79	1404244.74	132.26*
MON-549	551216.07	1404616.37	130.39*
MON-550	550585.40	1405086.90	137.82*
MON-551	550161.65	1405397.56	141.64*
MON-552	549741.23	1405708.65	144.14*
MON-553	549523.67	1406074.10	143.97*
MON-554	549421.87	1406688.43	140.26*
MON-555	549571.87	1407298.32	139.74*
MON-556	549914.33	1407485.58	137.64*
MON-557	550297.17	1407753.38	140.42*
MON-558	550925.72	1408139.87	137.49
MON-559	551200.22	1408328.30	137.08
MON-560	551682.95	1408572.65	137.03
MON-561	552359.49	1408073.44	140.58
MON-562	552817.81	1406723.85	153.92

* ELEVATIONS ARE DERIVIED FROM GPS OBSERVATIONS. (NOT PART OF DIFFERENTIAL LEVELING BY J.A.RICE)

RUNWAY CENTERLINE MONUMENTS

POINT	DESC.
MAA-100	OFFSET 10' RT.
MAA-101	OFFSET 10' RT.
MAA-102	CENTERLINE
MAA-103	CENTERLINE
MAA-104	OFFSET 10' RT.
MAA-105	OFFSET 10' RT.
MAA-106	OFFSET 32' LT.
MAA-107	OFFSET 32' LT.
MAA-108	CENTERLINE
MAA-109	CENTERLINE
MAA-110	CENTERLINE
MAA-111	CENTERLINE
MAA-112	CENTERLINE
MAA-113	CENTERLINE
MAA-114	CENTERLINE
MAA-115	CENTERLINE

RUNWAY CENTERLINE MONUMENTS ARE INTENDED FOR RECOVERY OF THE RUNWAY CENTERLINE ONLY AND SHALL NOT BE USED FOR SURVEY CONTROL. SEE BWI SURVEY CONTROL MANUAL FOR MONUMENT SKETCHES & RECOVERY COORDINATES.

RUNWAY ENDS

RUNWAY	LATITUDE	LONGITUDE
4	39° 10' 00.76"N	76° 40' 16.92" W
10	39° 10' 29.09" N	76° 41' 22.63" W
15L	39° 11' 14.54" N	76° 39' 48.74" W
15R	39° 11' 07.32' N	76° 40' 55.14" W
22	39° 10' 50.38" N	76° 39' 35.21" W
28	39° 10' 21.48" N	76° 39' 09.63" W
33L	39° 09' 51.15" N	76° 39' 44.58" W
33R	39° 10' 34.45" N	76° 39' 11.63" W

- SEE DESIGN STANDARD FOR REFERENCES, DETAIL NOTES, MONUMENT TYPES, AND "HOW TO REACH" DESCRIPTIONS.
- REPORT DAMAGED OR DESTROYED BWI MONUMENTS TO THE MANAGER OF FACILITIES DESIGN, MARYLAND AVIATION ADMINISTRATION IMMEDIATELY.
- REPORT DAMAGED OR DESTROYED NGS MONUMENTS TO NGS VIA THEIR WEB PAGE AT http://www.ngs.noaa.gov/ngs-cgi-bin/recvy_entry_www.prl
- ALL SURVEYORS MUST COORDINATE ACCESS TO CONTROL POINTS WITH AIRPORT OPERATIONS AT 410-859-7018.
- PRIMARY HORIZONTAL VALUES ARE BASED ON FIELD SURVEYS PERFORMED BY JOHNSON, MIRMIRAN AND THOMPSON IN NOVEMBER 2007 - FEBRUARY 2008, AND PUBLISHED BY NGS.
- PRIMARY VERTICAL VALUES ON PRIMARY CONTROL ARE BASED ON FIELD SURVEYS PERFORMED BY J. A. RICE IN NOVEMBER 2007 - JANUARY 2008, AND PUBLISHED BY NGS.
- SECONDARY HORIZONTAL AND VERTICAL VALUES ARE BASED ON FIELD SURVEYS PERFORMED BY JOHNSON, MIRMIRAN AND THOMPSON IN FEBRUARY 2008.
- TOPOGRAPHY IS FROM AERIAL SURVEYS SHOWN ON THE AIRPORT LAYOUT PLAN BASE MAP DRAWING.

HORIZ. DATUM: MARYLAND SPCS (NAD 83/2007)
VERT. DATUM: NAVD88
UNITS: U.S. SURVEY FEET

BWI D — PRIMARY CONTROL STATIONS (NGS 'B' ORDER)
548 — SECONDARY CONTROL (NGS 1st ORDER)
MAA-100 — RUNWAY MONUMENTS (RECOVERY ONLY)

"PROFESSIONAL CERTIFICATION. I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL LAND SURVEYOR UNDER THE LAWS OF THE STATE OF MARYLAND, LICENSE NO. 21263, EXPIRATION DATE: 6/14/2009."

JMT WSA
JOHNSON, MIRMIRAN & THOMPSON | WILBUR SMITH ASSOCIATES
A JOINT VENTURE
72 Loveton Circle
Sparks, MD 21152

DESIGNED	BRH / JAF
DRAWN	BRH / JAF
CHECKED	DKS
APPROVED	DAL

REVISION NO.	REVISION DATE	DESCRIPTIONS

BALTIMORE/WASHINGTON INTERNATIONAL Thurgood Marshall AIRPORT

MARYLAND DEPARTMENT OF TRANSPORTATION
MARYLAND AVIATION ADMINISTRATION
OFFICE OF ENGINEERING & CONSTRUCTION MANAGEMENT
DIVISION OF FACILITES DESIGN

PROJECT TITLE
SHEET TITLE
SURVEY CONTROL SHEET
SCALE 1" = 500'
DATE SEPTEMBER 25, 2008
PROJECT NO.
SHEET NO.

File: Q:\AGY\BWI\ALL CAD\BWIControl_SS\Dwgs\Survey\SVY\SURVEY CONTROL SHEET.dwg

Immediately report any damaged or destroyed monumentation.

Please notify
NGS
and the
Manager of Facilities Design,
Maryland Aviation Administration

BWI THURGOOD MARSHALL AIRPORT-PRIMARY SURVEY CONTROL DATA

NAME OF STATION: BWI D
NGS PID: AB6219
DATE ESTABLISHED: 1991
READJUSTED FEBRUARY 2007

MARYLAND STATE PLANE COORDINATES (NAD 83):

*	**NORTHING (Y):**	553596.506 US ft.	168736.553 m
*	**EASTING (X):**	1407273.545 US ft.	428937.834 m
*	**ORTHOMETRIC HEIGHT (NAVD 88):**	154.406 US ft.	47.063 m
	CONVERGENCE ANGLE:	0° 12' 36.8"	
	SCALE FACTOR:	0.99996449	
	COMBINED SCALE FACTOR:	0.99996224	

GEOGRAPHIC COORDINATES (NAD 83):

LATITUDE:	39° 11' 10.53800" (N)	
LONGITUDE:	76° 39' 54.19499" (W)	
ELLIPSOID HT:	47.12 US ft.	14.363 m

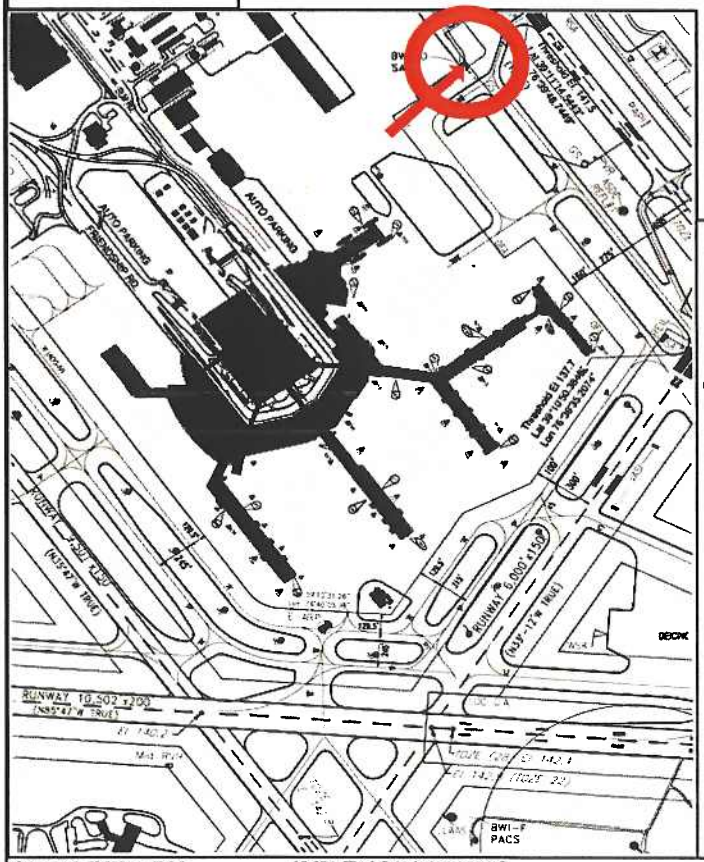
AVAILABLE CONVENTIONAL BACKSIGHT POINTS (COMPUTED DATA):

POINT	GEODETIC AZIMUTH	DISTANCE (US FT.)	DISTANCE (m)
MON-561	147°19'19.2'	1473.10	449.003
MON-562	215°25'44.0'	953.17	290.527

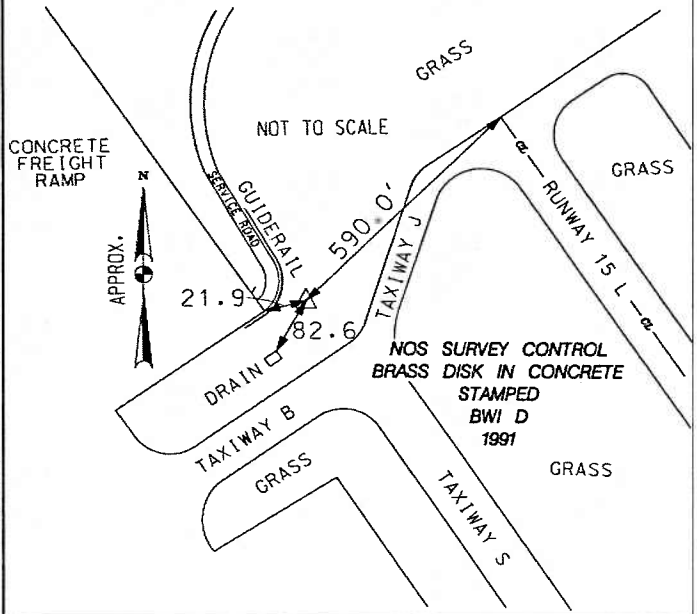
STATION DESCRIPTION:

* SEE ATTACHED NGS DATASHEETS

LOCATION PLAN



DETAIL MAP



SURVEYED BY: JMT ENGINEERING — SPARKS, MARYLAND

BWI THURGOOD MARSHALL AIRPORT-PRIMARY SURVEY CONTROL DATA

NAME OF STATION:	BWI D	**DATE ESTABLISHED:**	1991
NGS PID:	AB6219		READJUSTED FEBRUARY 2007

SURVEYED BY:	**JMT ENGINEERING**	**SPARKS, MARYLAND**

BWI THURGOOD MARSHALL AIRPORT-PRIMARY SURVEY CONTROL DATA

NAME OF STATION: BWI D	**DATE ESTABLISHED:** 1991
NGS PID: AB6219	READJUSTED FEBRUARY 2007

```
1        National Geodetic Survey,   Retrieval Date = JUNE 25, 2008
 AB6219 ***********************************************************************
 AB6219  SACS         -  This is a Secondary Airport Control Station.
 AB6219  DESIGNATION -  BWI D
 AB6219  PID          -  AB6219
 AB6219  STATE/COUNTY-  MD/ANNE ARUNDEL
 AB6219  USGS QUAD    -  RELAY (1974)
 AB6219
 AB6219                          *CURRENT SURVEY CONTROL
 AB6219
 AB6219* NAD 83(2007)-  39 11 10.53800(N)     076 39 54.19499(W)      ADJUSTED
 AB6219* NAVD 88      -        47.063   (meters)      154.41   (feet)  ADJUSTED
 AB6219
 AB6219  EPOCH DATE  -        2002.00
 AB6219  X           -   1,141,753.123  (meters)                       COMP
 AB6219  Y           -  -4,816,831.114  (meters)                       COMP
 AB6219  Z           -   4,008,374.848  (meters)                       COMP
 AB6219  LAPLACE CORR-          -5.39   (seconds)                      DEFLEC99
 AB6219  ELLIP HEIGHT-          14.363  (meters)          (02/10/07)   ADJUSTED
 AB6219  GEOID HEIGHT-         -32.67   (meters)                       GEOID03
 AB6219  DYNAMIC HT  -          47.038  (meters)      154.32   (feet)  COMP
 AB6219
 AB6219  ------- Accuracy Estimates (at 95% Confidence Level in cm) --------
 AB6219  Type    PID    Designation                        North   East  Ellip
 AB6219  ----------------------------------------------------------------------
 AB6219  NETWORK AB6219 BWI D                               1.08   0.78   2.10
 AB6219  ----------------------------------------------------------------------
 AB6219  MODELED GRAV-     980,094.8    (mgal)                        NAVD 88
 AB6219
 AB6219  VERT ORDER  -  FIRST     CLASS II
 AB6219
 AB6219.This mark is at Baltimore-Washington Int'l Airport (BWI)
 AB6219
 AB6219.The horizontal coordinates were established by GPS observations
 AB6219.and adjusted by the National Geodetic Survey in February 2007.
 AB6219
 AB6219.The datum tag of NAD 83(2007) is equivalent to NAD 83(NSRS2007).
 AB6219.See National Readjustment for more information.
 AB6219.The horizontal coordinates are valid at the epoch date displayed above.
 AB6219.The epoch date for horizontal control is a decimal equivalence
 AB6219.of Year/Month/Day.
 AB6219
 AB6219.The orthometric height was determined by differential leveling
 AB6219.and adjusted in June 2008.
 AB6219.No vertical observational check was made to the station.
 AB6219
 AB6219.The X, Y, and Z were computed from the position and the ellipsoidal ht.
 AB6219
 AB6219.The Laplace correction was computed from DEFLEC99 derived deflections.
 AB6219
 AB6219.The ellipsoidal height was determined by GPS observations
 AB6219.and is referenced to NAD 83.
 AB6219
 AB6219.The geoid height was determined by GEOID03.
```

SURVEYED BY:	**JMT ENGINEERING**	**SPARKS, MARYLAND**

BWI THURGOOD MARSHALL AIRPORT-PRIMARY SURVEY CONTROL DATA

NAME OF STATION: BWI D	**DATE ESTABLISHED:** 1991
NGS PID: AB6219	READJUSTED FEBRUARY 2007

```
AB6219
AB6219.The dynamic height is computed by dividing the NAVD 88
AB6219.geopotential number by the normal gravity value computed on the
AB6219.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
AB6219.degrees latitude (g = 980.6199 gals.).
AB6219
AB6219.The modeled gravity was interpolated from observed gravity values.
AB6219
AB6219;                    North          East      Units Scale Factor Converg.
AB6219;SPC MD       -   168,736.553   428,937.834    MT  0.99996449   +0 12 36.8
AB6219;SPC MD       -   553,596.51  1,407,273.54   sFT  0.99996449   +0 12 36.8
AB6219;UTM  18      - 4,338,766.916   356,194.692    MT  0.99985463   -1 03 08.0
AB6219
AB6219!             -  Elev Factor  x  Scale Factor =   Combined Factor
AB6219!SPC MD       -   0.99999775  x   0.99996449  =   0.99996224
AB6219!UTM  18      -   0.99999775  x   0.99985463  =   0.99985238
AB6219
AB6219                            SUPERSEDED SURVEY CONTROL
AB6219
AB6219  ELLIP H (10/28/02)    14.378  (m)                          GP(        ) 4 2
AB6219  NAD 83(1991)-  39 11 10.53909(N)     076 39 54.19473(W) AD(        ) 1
AB6219  ELLIP H (05/31/01)    14.449  (m)                          GP(        ) 4 2
AB6219
AB6219.Superseded values are not recommended for survey control.
AB6219.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
AB6219.See file dsdata.txt to determine how the superseded data were derived.
AB6219
AB6219_U.S. NATIONAL GRID SPATIAL ADDRESS: 18SUJ5619538767(NAD 83)
AB6219_MARKER: DD = SURVEY DISK
AB6219_SETTING: 7 = SET IN TOP OF CONCRETE MONUMENT
AB6219_STAMPING: BWI D 1991
AB6219_MARK LOGO: NOS
AB6219_PROJECTION: RECESSED 5 CENTIMETERS
AB6219_MAGNETIC: N = NO MAGNETIC MATERIAL
AB6219_STABILITY: C = MAY HOLD, BUT OF TYPE COMMONLY SUBJECT TO
AB6219+STABILITY: SURFACE MOTION
AB6219_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
AB6219+SATELLITE: SATELLITE OBSERVATIONS - November 07, 2007
AB6219
AB6219  HISTORY     - Date     Condition        Report By
AB6219  HISTORY     - 1991     MONUMENTED       NOS
AB6219  HISTORY     - 20001130 GOOD             NGS
AB6219  HISTORY     - 20071107 GOOD             JARICE
AB6219
```

SURVEYED BY:	**JMT ENGINEERING**	**SPARKS, MARYLAND**

BWI THURGOOD MARSHALL AIRPORT-PRIMARY SURVEY CONTROL DATA

NAME OF STATION:	BWI D	**DATE ESTABLISHED:**	1991
NGS PID:	AB6219		READJUSTED FEBRUARY 2007

AB6219 STATION DESCRIPTION
AB6219
AB6219'DESCRIBED BY NATIONAL OCEAN SERVICE 1991 (DAH)
AB6219'THE STATION IS LOCATED IN THE NORTH PART OF THE AIRPORT AT THE EAST
AB6219'CORNER OF A LARGE CONCRETE FREIGHT RAMP. IT IS 590 FT (179.8 M) SW OF
AB6219'THE CL END OF RWY 15L, NW OF THE INTERSECTION OF A TAXIWAY CL AND AN
AB6219'ILS HOLD LINE AND ON RANGE WITH THE HOLD LINE. IT IS 82.6 FT (25.2 M)
AB6219'NORTH OF THE CENTER OF A 3 FT (0.9 M) X 4 FT (1.2 M) STEEL DRAIN AND
AB6219'21.9 FT (6.7 M) EAST OF THE EAST CORNER OF THE RAMP (V-4-91 CHSQ). IT
AB6219'IS AT THE TOP OF A SLOPE AND JUST OUTSIDE A STEEL QUARDRAIL FOR A
AB6219'SERVICE ROAD. IT AN NOS DISK STAMPED BWI D 1991 AND SET IN THE TOP OF
AB6219'A CONCRETE POST FLUSH WITH THE GROUND.
AB6219
AB6219 STATION RECOVERY (2000)
AB6219
AB6219'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 2000 (APF)
AB6219'THE STATION IS LOCATED ON THE BALTIMORE-WASHINGTON
AB6219'INTERNATIONAL AIRPORT AT THE EAST CORNER OF A LARGE CONCRETE
AB6219'FREIGHT RAMP.
AB6219'TO REACH THE STATION FROM GATE L, KEEP PROCEEDING STRAIGHT IN A
AB6219'SOUTHWEST DIRECTION FOR 0.1 MI TO A PERIMETER ROAD, TURN RIGHT,
AB6219'HEADING NORTH, AND FOLLOW PERIMETER ROAD FOR 0.65 MI TO THE
AB6219'STATION ON THE LEFT AT THE TOP OF A SLOPE AND JUST OUTSIDE A STEEL
AB6219'GUARDRAIL FOR THE PERIMETER ROAD.
AB6219'THE STATION IS 590.0 FT SOUTHWEST FROM THE CENTERLINE END OF
AB6219'RUNWAY END 15L, 21.9 FT EAST OF THE EAST CORNER OF A CONCRETE
AB6219'MAINTENANCE AND FREIGHT RAMP, 82.6 FT NORTH OF THE CENTER OF A 3
AB6219'BY 4-FOOT STEEL DRAIN, AND THE MONUMENT IS FLUSH WITH THE GROUND
AB6219'SURFACE. NOTE--THIS STATION HAS BEEN DESIGNATED A SACS.
AB6219'
AB6219
AB6219 STATION RECOVERY (2007)
AB6219
AB6219'RECOVERY NOTE BY J A RICE INC 2007 (MRA)
AB6219'RECOVERED AS DESCRIBED.

SURVEYED BY:	**JMT ENGINEERING**	**SPARKS, MARYLAND**

BWI THURGOOD MARSHALL AIRPORT-PRIMARY SURVEY CONTROL DATA

NAME OF STATION: BWI F
NGS PID: AA9297
DATE ESTABLISHED: 1991
READJUSTED FEBRUARY 2007

MARYLAND STATE PLANE COORDINATES (NAD 83):

*	**NORTHING (Y):**	548273.296 US ft.	167114.035 m
*	**EASTING (X):**	1407184.150 US ft.	428910.587 m
*	**ORTHOMETRIC HEIGHT (NAVD 88):**	156.483 US ft.	47.696 m
	CONVERGENCE ANGLE:	0° 12' 35.9"	
	SCALE FACTOR:	0.99996314	
	COMBINED SCALE FACTOR:	0.99996079	

GEOGRAPHIC COORDINATES (NAD 83):

LATITUDE:	39° 10' 17.92645" (N)	
LONGITUDE:	76° 39' 55.57814" (W)	
ELLIPSOID HT:	49.13 US ft.	14.975 m

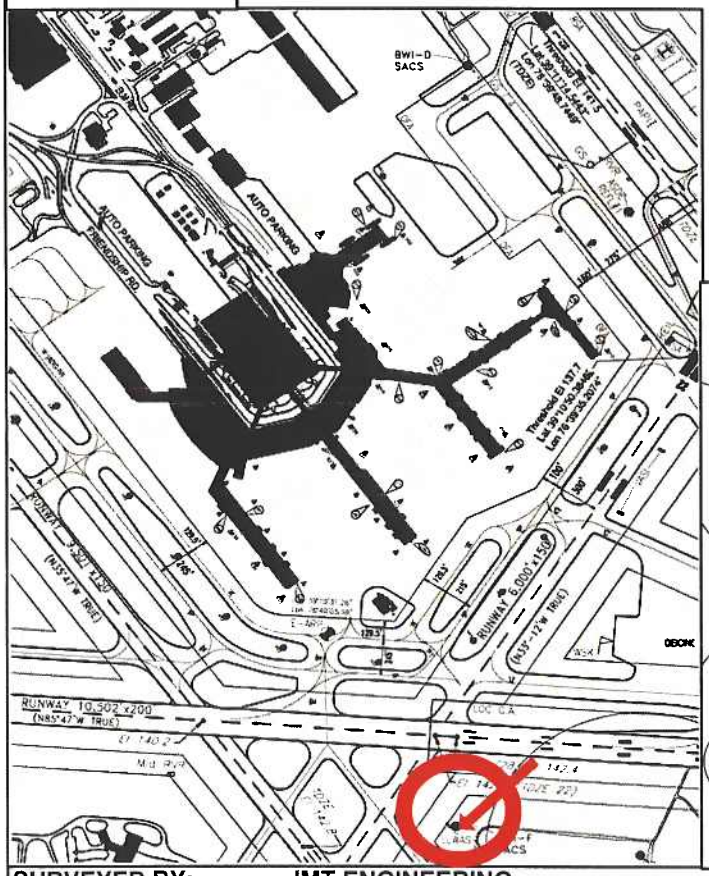
AVAILABLE CONVENTIONAL BACKSIGHT POINTS (COMPUTED DATA):

POINT	GEODETIC AZIMUTH	DISTANCE (US FT.)	DISTANCE (m)
MON-554	336°51'54.6'	1250.99	381.301
MON-555	5°14'03.7"	1303.58	397.332
MON-556	10°37'05.6"	1668.49	508.558

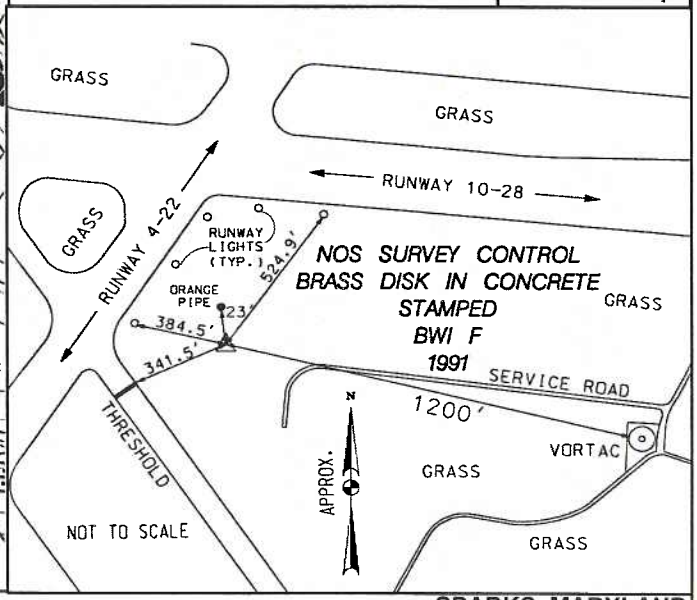
STATION DESCRIPTION:

* SEE ATTACHED NGS DATASHEETS

LOCATION PLAN



DETAIL MAP



SURVEYED BY: JMT ENGINEERING — SPARKS, MARYLAND

BWI THURGOOD MARSHALL AIRPORT-PRIMARY SURVEY CONTROL DATA

NAME OF STATION:	BWI F	**DATE ESTABLISHED:**	1991
NGS PID:	AA9297		READJUSTED FEBRUARY 2007

SURVEYED BY: **JMT ENGINEERING** **SPARKS, MARYLAND**

BWI THURGOOD MARSHALL AIRPORT-PRIMARY SURVEY CONTROL DATA

NAME OF STATION: BWI F	**DATE ESTABLISHED:** 1991
NGS PID: AA9297	READJUSTED FEBRUARY 2007

```
1        National Geodetic Survey,   Retrieval Date = JUNE 25, 2008
AA9297 ***********************************************************************
AA9297  PACS        -  This is a Primary Airport Control Station.
AA9297  DESIGNATION -  BWI F
AA9297  PID         -  AA9297
AA9297  STATE/COUNTY-  MD/ANNE ARUNDEL
AA9297  USGS QUAD   -  RELAY (1974)
AA9297
AA9297                          *CURRENT SURVEY CONTROL
AA9297
AA9297* NAD 83(2007)-  39 10 17.92645(N)     076 39 55.57814(W)      ADJUSTED
AA9297* NAVD 88     -        47.696  (meters)      156.48   (feet)   ADJUSTED
AA9297
AA9297  EPOCH DATE  -         2002.00
AA9297  X           -   1,141,957.332 (meters)                       COMP
AA9297  Y           -  -4,817,836.584 (meters)                       COMP
AA9297  Z           -   4,007,117.534 (meters)                       COMP
AA9297  LAPLACE CORR-          -5.43  (seconds)                      DEFLEC99
AA9297  ELLIP HEIGHT-          14.975 (meters)          (02/10/07)  ADJUSTED
AA9297  GEOID HEIGHT-         -32.68  (meters)                       GEOID03
AA9297  DYNAMIC HT  -          47.671 (meters)      156.40   (feet)  COMP
AA9297
AA9297  ------- Accuracy Estimates (at 95% Confidence Level in cm) --------
AA9297  Type    PID    Designation                        North   East   Ellip
AA9297  ----------------------------------------------------------------------
AA9297  NETWORK AA9297 BWI F                               1.02   0.73   2.08
AA9297  ----------------------------------------------------------------------
AA9297  MODELED GRAV-     980,092.5    (mgal)                        NAVD 88
AA9297
AA9297  VERT ORDER  -  FIRST     CLASS II
AA9297
AA9297.This mark is at Baltimore-Washington Int'l Airport (BWI)
AA9297
AA9297.The horizontal coordinates were established by GPS observations
AA9297.and adjusted by the National Geodetic Survey in February 2007.
AA9297
AA9297.The datum tag of NAD 83(2007) is equivalent to NAD 83(NSRS2007).
AA9297.See National Readjustment for more information.
AA9297.The horizontal coordinates are valid at the epoch date displayed above.
AA9297.The epoch date for horizontal control is a decimal equivalence
AA9297.of Year/Month/Day.
AA9297
AA9297.The orthometric height was determined by differential leveling
AA9297.and adjusted in June 2008.
AA9297.No vertical observational check was made to the station.
AA9297
AA9297.The X, Y, and Z were computed from the position and the ellipsoidal ht.
AA9297
AA9297.The Laplace correction was computed from DEFLEC99 derived deflections.
AA9297
AA9297.The ellipsoidal height was determined by GPS observations
AA9297.and is referenced to NAD 83.
AA9297
AA9297.The geoid height was determined by GEOID03.
```

SURVEYED BY:	**JMT ENGINEERING**	**SPARKS, MARYLAND**

BWI THURGOOD MARSHALL AIRPORT-PRIMARY SURVEY CONTROL DATA

NAME OF STATION: BWI F	**DATE ESTABLISHED:** 1991
NGS PID: AA9297	READJUSTED FEBRUARY 2007

```
AA9297
AA9297.The dynamic height is computed by dividing the NAVD 88
AA9297.geopotential number by the normal gravity value computed on the
AA9297.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
AA9297.degrees latitude (g = 980.6199 gals.).
AA9297
AA9297.The modeled gravity was interpolated from observed gravity values.
AA9297
AA9297;                      North         East      Units Scale Factor Converg.
AA9297;SPC MD       -   167,114.035   428,910.587   MT  0.99996314   +0 12 35.9
AA9297;SPC MD       -   548,273.30  1,407,184.15   sFT  0.99996314   +0 12 35.9
AA9297;UTM  18      - 4,337,145.570   356,131.715   MT  0.99985486   -1 03 07.7
AA9297
AA9297!             -  Elev Factor  x  Scale Factor =   Combined Factor
AA9297!SPC MD       -   0.99999765  x   0.99996314  =   0.99996079
AA9297!UTM  18      -   0.99999765  x   0.99985486  =   0.99985251
AA9297
AA9297                            SUPERSEDED SURVEY CONTROL
AA9297
AA9297  ELLIP H (08/09/02)    14.986  (m)                          GP(        ) 4 2
AA9297  NAD 83(1991)-  39 10 17.92754(N)    076 39 55.57787(W) AD(        ) B
AA9297  ELLIP H (03/24/98)    15.057  (m)                          GP(        ) 4 1
AA9297  NAD 83(1991)-  39 10 17.92754(N)    076 39 55.57783(W) AD(        ) B
AA9297  ELLIP H (11/22/95)    15.057  (m)                          GP(        ) 1 1
AA9297
AA9297.Superseded values are not recommended for survey control.
AA9297.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
AA9297.See file dsdata.txt to determine how the superseded data were derived.
AA9297
AA9297_U.S. NATIONAL GRID SPATIAL ADDRESS: 18SUJ5613237146(NAD 83)
AA9297_MARKER: DD = SURVEY DISK
AA9297_SETTING: 7 = SET IN TOP OF CONCRETE MONUMENT
AA9297_STAMPING: BWI F 1991
AA9297_MARK LOGO: NOS
AA9297_PROJECTION: PROJECTING 5 CENTIMETERS
AA9297_MAGNETIC: N = NO MAGNETIC MATERIAL
AA9297_STABILITY: C = MAY HOLD, BUT OF TYPE COMMONLY SUBJECT TO
AA9297+STABILITY: SURFACE MOTION
AA9297_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
AA9297+SATELLITE: SATELLITE OBSERVATIONS - November 01, 2007
AA9297  HISTORY     - Date     Condition        Report By
AA9297  HISTORY     - 1991     MONUMENTED       NOS
AA9297  HISTORY     - 19911107 GOOD             NOS
AA9297  HISTORY     - 19941030 GOOD             NGS
AA9297  HISTORY     - 19961009 GOOD             NGS
AA9297  HISTORY     - 20001130 GOOD             NGS
AA9297  HISTORY     - 20071101 GOOD             JARICE
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SURVEYED BY:	**JMT ENGINEERING**	**SPARKS, MARYLAND**

BWI THURGOOD MARSHALL AIRPORT-PRIMARY SURVEY CONTROL DATA

NAME OF STATION:	BWI F	**DATE ESTABLISHED:**	1991
NGS PID:	AA9297		READJUSTED FEBRUARY 2007

AA9297 STATION DESCRIPTION
AA9297'DESCRIBED BY NATIONAL OCEAN SERVICE 1991
AA9297'THE STATION IS LOCATED NEAR THE CENTER OF THE AIRPORT JUST SOUTH OF
AA9297'THE INTERSECTION OF RUNWAYS 4-22 AND 10-28. IT IS ON THE NORTHWEST
AA9297'POINT OF A LOW HILL AND ABOUT 1200 FT (365.8 M) WEST OF THE VORTAC. IT
AA9297'IS 524.9 FT (160.0 M) SSW OF THE SECOND RUNWAY LIGHT EAST OF THE
AA9297'INTERSECTION ALONG THE SOUTH EDGE OF RWY 10-28, 384.5 FT (117.2 M)
AA9297'EAST OF THE THIRD RUNWAY LIGHT SOUTHWEST OF THE INTERSECTION ALONG THE
AA9297'SOUTHEAST EDGE OF RWY 4-22, AND 341.5 FT (104.1 M) NORTHEAST OF THE
AA9297'INTERSECTION OF THE CL OF A NW/SE TAXIWAY AND ITS HOLD BAR. IT IS 2.3
AA9297'FT (0.7 M) SOUTH OF A 3 FT (0.9 M) HIGH SECTION OF 2 INCH ORANGE
AA9297'PLASTIC PIPE DRIVEN INTO THE GROUND AS A WITNESS POST. THE STATION IS
AA9297'AN NOS DISK STAMPED BWI F 1991 AND SET IN THE TOP OF A CONCRETE POST
AA9297'WHICH PROJECTS 2 INCHES ABOVE THE GROUND.
AA9297 STATION RECOVERY (1994)
AA9297'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1994 (JDR)
AA9297'THE STATION IS LOCATED ABOUT 8 MI (12.9 KM) SOUTH-SOUTHWEST OF
AA9297'DOWNTOWN BALTIMORE, MD. AT THE BALTIMORE-WASHINGTON INTERNATIONAL
AA9297'AIRPORT JUST SOUTH OF THE INTERSECTION OF RUNWAYS 4-22 AND 10-28. IT
AA9297'IS ON THE NORTHWEST POINT OF A LOW HILL ABOUT 1200 FT (365.8 M) WEST
AA9297'OF THE VORTAC. CONTACT BILL ABEL, AIRPORT OPERATIONS, AT (410)
AA9297'859-7018.
AA9297'IT IS 524.9 FT (160.0 M) SOUTH-SOUTHWEST OF THE OF THE SECOND RUNWAY
AA9297'LIGHT EAST OF THE INTERSECTION ALONG THE SOUTH EDGE OF RUNWAY 10-28.
AA9297'384.5 FT (117.2 M) EAST OF THE THIRD RUNWAY LIGHT SOUTHWEST OF THE
AA9297'INTERSECTION ALONG THE SOUTHEAST EDGE OF RUNWAY 4-22, AND 341.5 FT
AA9297'(104.1 M) NORTHEAST OF THE INTERSECTION OF THE CENTERLINE OF A
AA9297'NORTHWEST-SOUTHEAST TAXIWAY AND ITS HOLD BAR. THE STATION IS A
AA9297'STANDARD NOS DISK STAMPED ---BWI F 1991--- AND SET IN THE TOP OF A
AA9297'CONCRETE MONUMENT WHICH PROJECTS 2 INCHES ABOVE THE GROUND.
AA9297 STATION RECOVERY (1996)
AA9297'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1996 (AJL)
AA9297'RECOVERED AS DESCRIBED.
AA9297 STATION RECOVERY (2000)
AA9297'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 2000 (APF)
AA9297'RECOVERED AS DESCRIBED.
AA9297 STATION RECOVERY (2007)
AA9297'RECOVERY NOTE BY J A RICE INC 2007 (MRA)
AA9297'RECOVERED AS DESCRIBED.

SURVEYED BY:	**JMT ENGINEERING**	**SPARKS, MARYLAND**

BWI THURGOOD MARSHALL AIRPORT-PRIMARY SURVEY CONTROL DATA

NAME OF STATION: BWI G
NGS PID: DJ9002
DATE ESTABLISHED: OCTOBER 2007
READJUSTED FEBRUARY 2008

MARYLAND STATE PLANE COORDINATES (NAD 83):

*	**NORTHING (Y):**	553233.769 US ft.	168625.990 m
*	**EASTING (X):**	1404563.506 US ft.	428111.813 m
*	**ORTHOMETRIC HEIGHT (NAVD 88):**	166.384 US ft.	50.714 m
	CONVERGENCE ANGLE:	0° 12' 15.2"	
	SCALE FACTOR:	0.99996440	
	COMBINED SCALE FACTOR:	0.99996157	

GEOGRAPHIC COORDINATES (NAD 83):

LATITUDE:	39° 11' 07.04959" (N)	
LONGITUDE:	76° 40' 28.63045" (W)	
ELLIPSOID HT:	59.26 US ft.	18.061 m

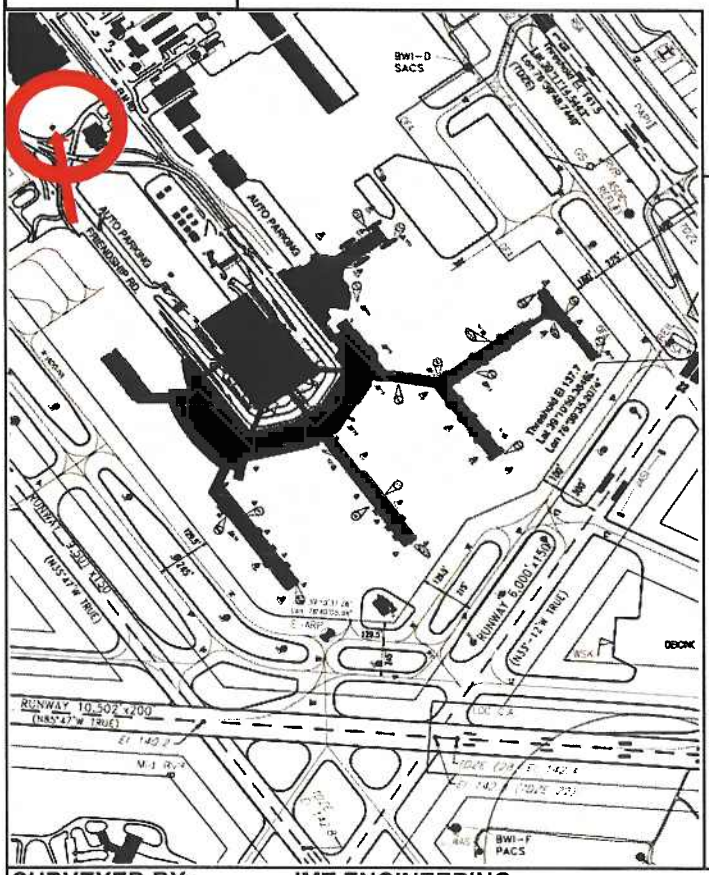
AVAILABLE CONVENTIONAL BACKSIGHT POINTS (COMPUTED DATA):

POINT	GEODETIC AZIMUTH	DISTANCE (US FT.)	DISTANCE (m)

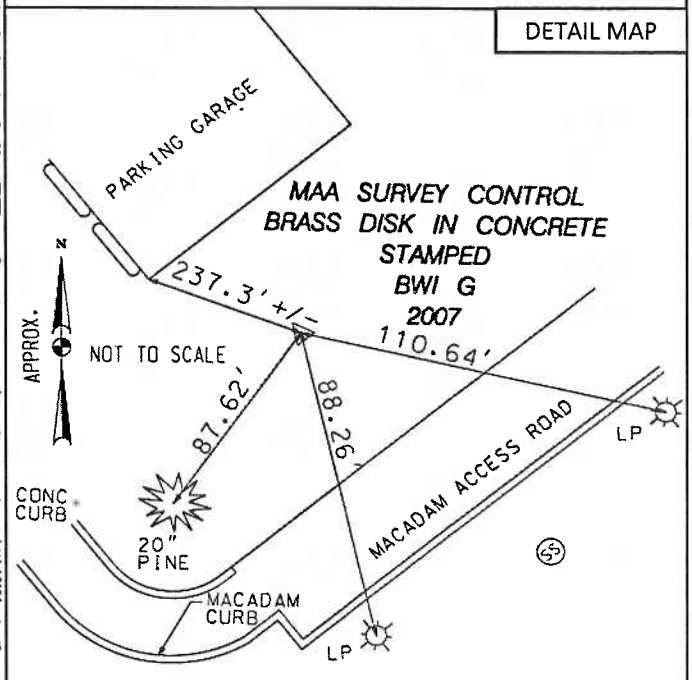
STATION DESCRIPTION:

* SEE ATTACHED NGS DATASHEETS

LOCATION PLAN



DETAIL MAP



SURVEYED BY: JMT ENGINEERING — SPARKS, MARYLAND

BWI THURGOOD MARSHALL AIRPORT-PRIMARY SURVEY CONTROL DATA

NAME OF STATION:	BWI G	**DATE ESTABLISHED:**	OCTOBER 2007
NGS PID:	DJ9002		

SURVEYED BY:	**JMT ENGINEERING**	**SPARKS, MARYLAND**

BWI THURGOOD MARSHALL AIRPORT-PRIMARY SURVEY CONTROL DATA

NAME OF STATION: BWI G	**DATE ESTABLISHED:** OCTOBER 2007
NGS PID: DJ9002	READJUSTED FEBRUARY 2008

```
1         National Geodetic Survey,   Retrieval Date = JUNE 25, 2008
DJ9002 ***********************************************************************
DJ9002  DESIGNATION -  BWI G
DJ9002  PID         -  DJ9002
DJ9002  STATE/COUNTY-  MD/ANNE ARUNDEL
DJ9002  USGS QUAD   -  RELAY (1974)
DJ9002
DJ9002                          *CURRENT SURVEY CONTROL
DJ9002 ______________________________________________________________________
DJ9002* NAD 83(2007)-  39 11 07.04959(N)     076 40 28.63045(W)      ADJUSTED
DJ9002* NAVD 88     -        50.714  (meters)      166.38   (feet)   ADJUSTED
DJ9002 ______________________________________________________________________
DJ9002  EPOCH DATE  -        2002.00
DJ9002  X           -  1,140,965.275 (meters)                        COMP
DJ9002  Y           -  -4,817,090.591 (meters)                       COMP
DJ9002  Z           -  4,008,293.800 (meters)                        COMP
DJ9002  LAPLACE CORR-         -5.39  (seconds)                       DEFLEC99
DJ9002  ELLIP HEIGHT-         18.061 (meters)          (02/29/08)    ADJUSTED
DJ9002  GEOID HEIGHT-        -32.65  (meters)                        GEOID03
DJ9002  DYNAMIC HT  -         50.687 (meters)      166.30   (feet)   COMP
DJ9002  MODELED GRAV-     980,095.4  (mgal)                          NAVD 88
DJ9002
DJ9002  HORZ ORDER  -  FIRST
DJ9002  VERT ORDER  -  FIRST     CLASS II
DJ9002  ELLP ORDER  -  SECOND    CLASS II
DJ9002
DJ9002.The horizontal coordinates were established by GPS observations
DJ9002.and adjusted by the JMT ENGINEERING in February 2008.
DJ9002
DJ9002.The datum tag of NAD 83(2007) is equivalent to NAD 83(NSRS2007).
DJ9002.See National Readjustment for more information.
DJ9002.The horizontal coordinates are valid at the epoch date displayed above.
DJ9002.The epoch date for horizontal control is a decimal equivalence
DJ9002.of Year/Month/Day.
DJ9002
DJ9002.The orthometric height was determined by differential leveling
DJ9002.and adjusted in June 2008.
DJ9002.No vertical observational check was made to the station.
DJ9002
DJ9002.The X, Y, and Z were computed from the position and the ellipsoidal ht.
DJ9002
DJ9002.The Laplace correction was computed from DEFLEC99 derived deflections.
DJ9002
DJ9002.The ellipsoidal height was determined by GPS observations
DJ9002.and is referenced to NAD 83.
DJ9002
DJ9002.The geoid height was determined by GEOID03.
DJ9002
DJ9002.The dynamic height is computed by dividing the NAVD 88
DJ9002.geopotential number by the normal gravity value computed on the
DJ9002.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
DJ9002.degrees latitude (g = 980.6199 gals.).
DJ9002
DJ9002.The modeled gravity was interpolated from observed gravity values.
```

SURVEYED BY:	**JMT ENGINEERING**	**SPARKS, MARYLAND**

BWI THURGOOD MARSHALL AIRPORT-PRIMARY SURVEY CONTROL DATA

NAME OF STATION:	BWI G	**DATE ESTABLISHED:**	OCTOBER 2007
NGS PID:	DJ9002		READJUSTED FEBRUARY 2008

```
DJ9002
DJ9002;                      North          East      Units Scale Factor Converg.
DJ9002;SPC MD       -   168,625.990   428,111.813    MT  0.99996440   +0 12 15.2
DJ9002;SPC MD       -   553,233.77  1,404,563.51    sFT  0.99996440   +0 12 15.2
DJ9002;UTM  18      - 4,338,674.590   355,366.525    MT  0.99985758   -1 03 29.7
DJ9002
DJ9002!             -  Elev Factor  x  Scale Factor =   Combined Factor
DJ9002!SPC MD       -   0.99999717  x   0.99996440  =   0.99996157
DJ9002!UTM  18      -   0.99999717  x   0.99985758  =   0.99985475
DJ9002
DJ9002                          SUPERSEDED SURVEY CONTROL
DJ9002
DJ9002.No superseded survey control is available for this station.
DJ9002
DJ9002_U.S. NATIONAL GRID SPATIAL ADDRESS: 18SUJ5536738675(NAD 83)
DJ9002_MARKER: DD = SURVEY DISK
DJ9002_SETTING: 7 = SET IN TOP OF CONCRETE MONUMENT
DJ9002_STAMPING: BWI G 2007
DJ9002_MARK LOGO: MDAVIA
DJ9002_PROJECTION: RECESSED 5 CENTIMETERS
DJ9002_MAGNETIC: M = MARKER EQUIPPED WITH BAR MAGNET
DJ9002_STABILITY: C = MAY HOLD, BUT OF TYPE COMMONLY SUBJECT TO
DJ9002+STABILITY: SURFACE MOTION
DJ9002_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
DJ9002+SATELLITE: SATELLITE OBSERVATIONS - November 27, 2007
DJ9002
DJ9002  HISTORY     - Date     Condition        Report By
DJ9002  HISTORY     - 20071127 MONUMENTED       JMTMD
DJ9002
DJ9002                          STATION DESCRIPTION
DJ9002
DJ9002'DESCRIBED BY JMT ENGINEERING 2007
DJ9002'THE MARK IS LOCATED ABOUT 3.3 MI (5.3 KM) SOUTH-SOUTHEAST OF RELAY,
DJ9002'2.8 MI (4.5 KM) SOUTHEAST OF ELKRIDGE AND 2.7 MI (4.3 KM) EAST OF
DJ9002'HANOVER.  OWNERSHIP--BALTIMORE WASHINGTON INTERNATIONAL AIRPORT.
DJ9002'
DJ9002'TO REACH FROM THE JUNCTION OF I-97 AND MD 176, GO WEST-SOUTHWEST ON MD
DJ9002'176 FOR 0.24 MI (0.39 KM) TO AN INTERSECTION.  TURN RIGHT AND GO NORTH
DJ9002'ON MD 162 FOR 2.32 MI (3.74 KM) TO A INTERSECTION.  CONTINUE STRAIGHT
DJ9002'AHEAD FOR 0.74 MI (1.20 KM) TO A INTERSECTION.  TURN LEFT AND GO SOUTH
DJ9002'ON SCOTT DRIVE FOR 0.10 MI (0.17 KM) TO A SIDE ROAD LEFT.  TURN LEFT
DJ9002'AND GO SOUTHEAST ON ELM ROAD FOR 0.25 MI (0.40 KM) TO A RAMP ON THE
DJ9002'RIGHT.  TURN RIGHT AND GO SOUTHWEST ON THE RAMP FOR 0.09 MI (0.15 KM)
DJ9002'TO THE MARK ON THE RIGHT.
DJ9002'
DJ9002'IT IS 192.8 FT (58.8 M) EAST OF A METAL SIGN SHAPED LIKE A HOT-AIR
DJ9002'BALLOON, 89.0 FT (27.1 M) NORTHEAST OF A 30-IN (76 CM) SPRUCE TREE,
DJ9002'88.5 FT (27.0 M) NORTH-NORTHWEST OF A STREET LIGHT POLE, 62.2 FT (19.0
DJ9002'M) NORTHEAST OF A WATER VALVE NUMBERED 118, 57.0 FT (17.4 M) NORTHWEST
DJ9002'OF THE CENTERLINE OF A PAVED PARKING LOT AND SET IN THE TOP OF A
DJ9002'12-INCH (30 CM) ROUND CONCRETE POST.
```

SURVEYED BY:	**JMT ENGINEERING**	**SPARKS, MARYLAND**

BWI THURGOOD MARSHALL AIRPORT-PRIMARY SURVEY CONTROL DATA

NAME OF STATION: BWI H
NGS PID: DJ9003
DATE ESTABLISHED: OCTOBER 2007
READJUSTED FEBRUARY 2008

MARYLAND STATE PLANE COORDINATES (NAD 83):

*	**NORTHING (Y):**	548646.392 US ft.	167227.755 m
*	**EASTING (X):**	1400229.308 US ft.	426790.747 m
*	**ORTHOMETRIC HEIGHT (NAVD 88):**	132.739 US ft.	40.459 m
	CONVERGENCE ANGLE:	0° 11' 40.5"	
	SCALE FACTOR:	0.99996324	
	COMBINED SCALE FACTOR:	0.99996202	

GEOGRAPHIC COORDINATES (NAD 83):

LATITUDE:	39° 10' 21.85685" (N)	
LONGITUDE:	76° 41' 23.87437" (W)	
ELLIPSOID HT:	25.52 US ft.	7.778 m

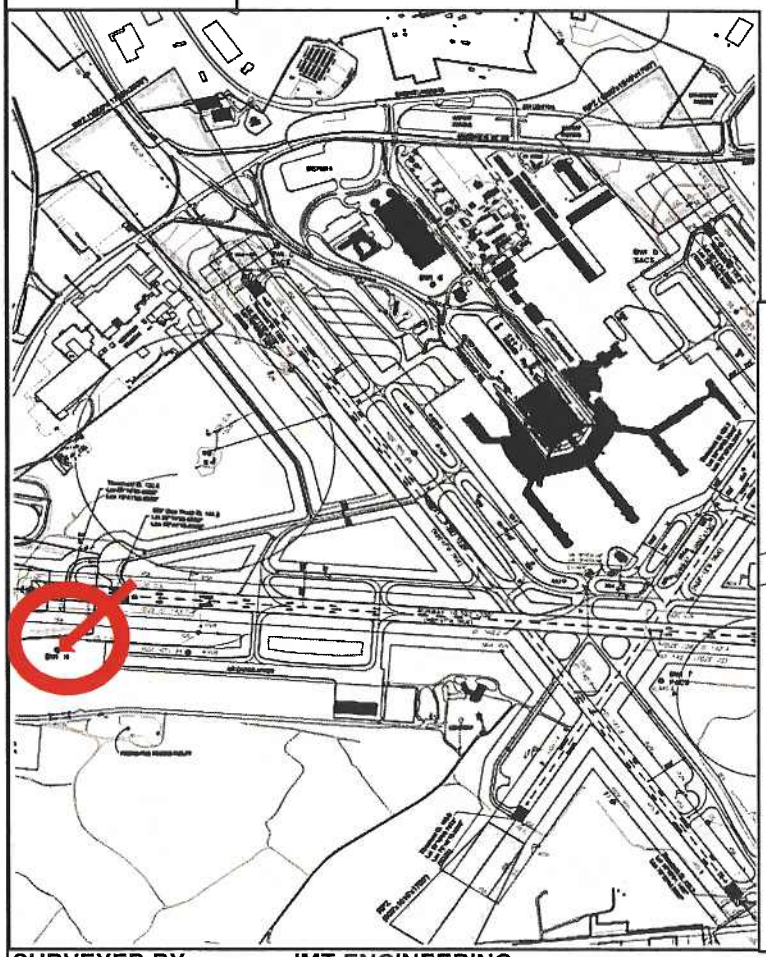
AVAILABLE CONVENTIONAL BACKSIGHT POINTS (COMPUTED DATA):

POINT	GEODETIC AZIMUTH	DISTANCE (US FT.)	DISTANCE (m)

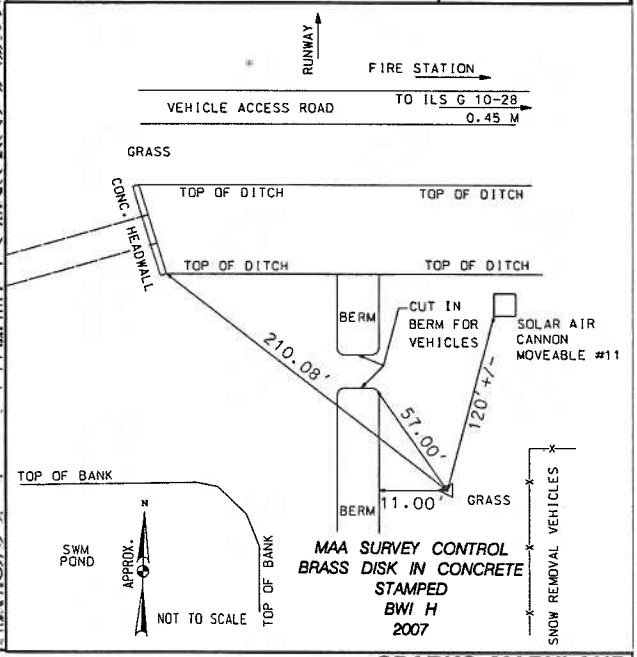
STATION DESCRIPTION:

* SEE ATTACHED NGS DATASHEETS

LOCATION PLAN



DETAIL MAP



SURVEYED BY: JMT ENGINEERING — SPARKS, MARYLAND

BWI THURGOOD MARSHALL AIRPORT-PRIMARY SURVEY CONTROL DATA

NAME OF STATION:	BWI H	**DATE ESTABLISHED:**	OCTOBER 2007
NGS PID:	DJ9003		

SURVEYED BY:	**JMT ENGINEERING**	**SPARKS, MARYLAND**

BWI THURGOOD MARSHALL AIRPORT-PRIMARY SURVEY CONTROL DATA

NAME OF STATION: BWI H	**DATE ESTABLISHED:** OCTOBER 2007
NGS PID: DJ9003	READJUSTED FEBRUARY 2008

```
1        National Geodetic Survey,   Retrieval Date = JUNE 25, 2008
DJ9003 ***********************************************************************
DJ9003  DESIGNATION -  BWI H
DJ9003  PID         -  DJ9003
DJ9003  STATE/COUNTY-  MD/ANNE ARUNDEL
DJ9003  USGS QUAD   -  RELAY (1974)
DJ9003
DJ9003                          *CURRENT SURVEY CONTROL
DJ9003
DJ9003* NAD 83(2007)-  39 10 21.85685(N)     076 41 23.87437(W)      ADJUSTED
DJ9003* NAVD 88     -        40.459  (meters)      132.74   (feet)   ADJUSTED
DJ9003
DJ9003  EPOCH DATE  -        2002.00
DJ9003  X           -   1,139,875.935 (meters)                       COMP
DJ9003  Y           -  -4,818,245.049 (meters)                       COMP
DJ9003  Z           -   4,007,206.955 (meters)                       COMP
DJ9003  LAPLACE CORR-          -5.46  (seconds)                      DEFLEC99
DJ9003  ELLIP HEIGHT-           7.778 (meters)          (02/29/08)  ADJUSTED
DJ9003  GEOID HEIGHT-         -32.61  (meters)                       GEOID03
DJ9003  DYNAMIC HT  -          40.437 (meters)      132.67  (feet)   COMP
DJ9003  MODELED GRAV-     980,093.9   (mgal)                         NAVD 88
DJ9003
DJ9003  HORZ ORDER  -  FIRST
DJ9003  VERT ORDER  -  FIRST     CLASS II
DJ9003  ELLP ORDER  -  SECOND    CLASS II
DJ9003
DJ9003.The horizontal coordinates were established by GPS observations
DJ9003.and adjusted by the JMT ENGINEERING in February 2008.
DJ9003
DJ9003.The datum tag of NAD 83(2007) is equivalent to NAD 83(NSRS2007).
DJ9003.See National Readjustment for more information.
DJ9003.The horizontal coordinates are valid at the epoch date displayed above.
DJ9003.The epoch date for horizontal control is a decimal equivalence
DJ9003.of Year/Month/Day.
DJ9003
DJ9003.The orthometric height was determined by differential leveling
DJ9003.and adjusted in June 2008.
DJ9003.No vertical observational check was made to the station.
DJ9003
DJ9003.The X, Y, and Z were computed from the position and the ellipsoidal ht.
DJ9003
DJ9003.The Laplace correction was computed from DEFLEC99 derived deflections.
DJ9003
DJ9003.The ellipsoidal height was determined by GPS observations
DJ9003.and is referenced to NAD 83.
DJ9003
DJ9003.The geoid height was determined by GEOID03.
DJ9003
DJ9003.The dynamic height is computed by dividing the NAVD 88
DJ9003.geopotential number by the normal gravity value computed on the
DJ9003.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
DJ9003.degrees latitude (g = 980.6199 gals.).
DJ9003
DJ9003.The modeled gravity was interpolated from observed gravity values.
```

SURVEYED BY:	**JMT ENGINEERING**	**SPARKS, MARYLAND**

BWI THURGOOD MARSHALL AIRPORT-PRIMARY SURVEY CONTROL DATA

NAME OF STATION:	BWI H	**DATE ESTABLISHED:**	OCTOBER 2007
NGS PID:	DJ9003		READJUSTED FEBRUARY 2008

```
DJ9003
DJ9003.The dynamic height is computed by dividing the NAVD 88
DJ9003.geopotential number by the normal gravity value computed on the
DJ9003.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
DJ9003.degrees latitude (g = 980.6199 gals.).
DJ9003
DJ9003.The modeled gravity was interpolated from observed gravity values.
DJ9003
DJ9003;                    North          East      Units Scale Factor Converg.
DJ9003;SPC MD       -   167,227.755   426,790.747    MT  0.99996324   +0 11 40.5
DJ9003;SPC MD       -   548,646.39  1,400,229.31    sFT  0.99996324   +0 11 40.5
DJ9003;UTM  18      - 4,337,305.940   354,015.116    MT  0.99986241   -1 04 03.6
DJ9003
DJ9003!             -  Elev Factor  x  Scale Factor =   Combined Factor
DJ9003!SPC MD       -   0.99999878  x   0.99996324  =   0.99996202
DJ9003!UTM  18      -   0.99999878  x   0.99986241  =   0.99986119
DJ9003
DJ9003                          SUPERSEDED SURVEY CONTROL
DJ9003
DJ9003.No superseded survey control is available for this station.
DJ9003
DJ9003_U.S. NATIONAL GRID SPATIAL ADDRESS: 18SUJ5401537306(NAD 83)
DJ9003_MARKER: DD = SURVEY DISK
DJ9003_SETTING: 7 = SET IN TOP OF CONCRETE MONUMENT
DJ9003_STAMPING: BWI H 2007
DJ9003_MARK LOGO: MDAVIA
DJ9003_PROJECTION: RECESSED 10 CENTIMETERS
DJ9003_MAGNETIC: M = MARKER EQUIPPED WITH BAR MAGNET
DJ9003_STABILITY: C = MAY HOLD, BUT OF TYPE COMMONLY SUBJECT TO
DJ9003+STABILITY: SURFACE MOTION
DJ9003_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
DJ9003+SATELLITE: SATELLITE OBSERVATIONS - November 27, 2007
DJ9003
DJ9003  HISTORY     - Date     Condition        Report By
DJ9003  HISTORY     - 20071127 MONUMENTED       JMTMD
DJ9003
DJ9003                          STATION DESCRIPTION
DJ9003
DJ9003'DESCRIBED BY JMT ENGINEERING 2007
DJ9003'THE MARK IS LOCATED ABOUT 3.9 MI (6.2 KM) SOUTH OF RELAY, 3.0 MI (4.9
DJ9003'KM) SOUTH-SOUTHEAST OF ELKRIDGE AND 2.3 MI (3.7 KM) SOUTHEAST OF
DJ9003'HANOVER AT BALTIMORE WASHINGTON INTERNATIONAL AIRPORT.  CONTACT
DJ9003'AIRPORT OPERATIONS AT 410-859-7018 FOR ACCESS TO THE MARK.
DJ9003'
DJ9003'IT IS 601.7 FT (183.4 M) WEST OF THE NORTHWEST CORNER OF A CHAIN LINK
DJ9003'FENCE, 409.8 FT (124.9 M) WEST-NORTHWEST OF THE NORTHWEST END OF A
DJ9003'36-INCH (91 CM) CONCRETE PIPE AND HEADWALL, 217.6 FT (66.3 M)
DJ9003'EAST-SOUTHEAST OF THE EAST END OF A CONCRETE PIPE AND HEADWALL, 121.4
DJ9003'FT (37.0 M) SOUTHWEST OF A PROPANE CANNON 115.5 FT (35.2 M) SOUTH OF
DJ9003'THE CENTERLINE OF AN EAST-WEST DITCH AND SET IN THE TOP OF A 12-INCH
DJ9003'(30 CM) ROUND CONCRETE POST.
```

SURVEYED BY:	**JMT ENGINEERING**	**SPARKS, MARYLAND**

BWI THURGOOD MARSHALL AIRPORT-SECONDARY SURVEY CONTROL DATA

NAME OF STATION: MON-548
NGS PID:

DATE ESTABLISHED: APRIL 2005
READJUSTED JUNE 2008

MARYLAND STATE PLANE COORDINATES (NAD 83):

NORTHING (Y):	551723.788 US ft.	168165.747 m
EASTING (X):	1404244.744 US ft.	428014.654 m
ORTHOMETRIC HEIGHT (NAVD 88):	132.257 US ft.	40.312 m
CONVERGENCE ANGLE:	00°12'12.61"	
COMBINED SCALE FACTOR:	0.99996914	

GEOGRAPHIC COORDINATES (NAD 83):

LATITUDE:	39°10'52.13611" (N)	
LONGITUDE:	76°40'32.74698" (W)	
ELLIPSOID HT:	25.15 US ft.	7.666 m

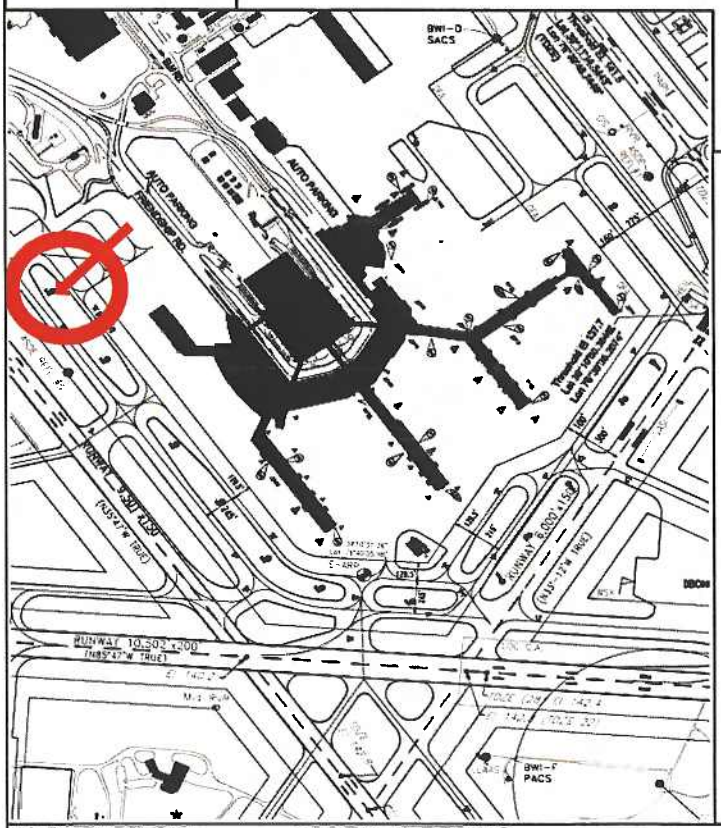
AVAILABLE CONVENTIONAL BACKSIGHT POINTS (COMPUTED DATA):

POINT	GEODETIC AZIMUTH	DISTANCE (US FT.)	DISTANCE (m)
MON-549	144°00'03.2'	629.19	191.778

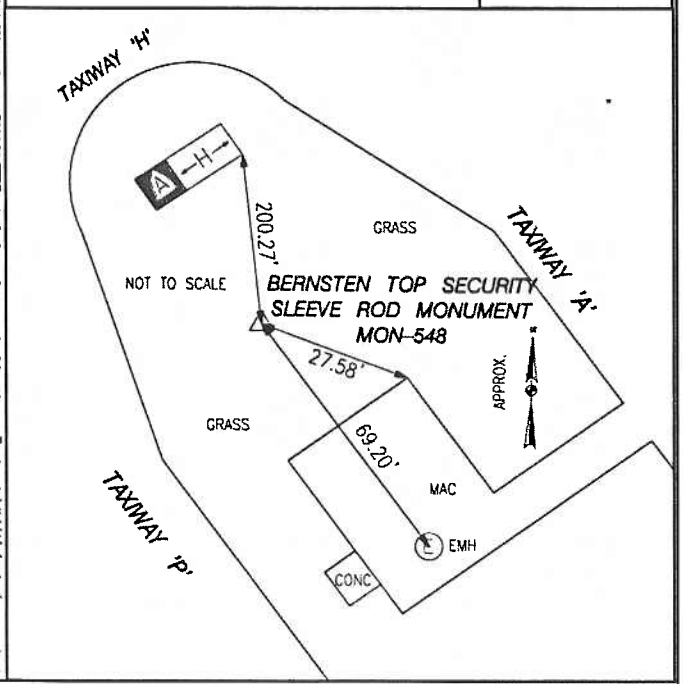
STATION DESCRIPTION:

DRIVEN TO REFUSAL ROD MONUMENT
WITH BERSTEN TOP SECURITY SLEEVE & LID

LOCATION PLAN



DETAIL MAP



SURVEYED BY: JMT ENGINEERING — **SPARKS, MARYLAND**

BWI THURGOOD MARSHALL AIRPORT-PRIMARY SURVEY CONTROL DATA

NAME OF STATION: MON-548	**DATE ESTABLISHED:** APRIL 2005
NGS PID:	

SURVEYED BY: JMT ENGINEERING SPARKS, MARYLAND

BWI THURGOOD MARSHALL AIRPORT-SECONDARY SURVEY CONTROL DATA

NAME OF STATION: MON-549
NGS PID:

DATE ESTABLISHED: APRIL 2005
READJUSTED JUNE 2008

MARYLAND STATE PLANE COORDINATES (NAD 83):

NORTHING (Y):	551216.073 US ft.	168010.995 m
EASTING (X):	1404616.371 US ft.	428127.926 m
ORTHOMETRIC HEIGHT (NAVD 88):	130.387 US ft.	39.742 m
CONVERGENCE ANGLE:	00°12'15.56"	
COMBINED SCALE FACTOR:	0.99996901	

GEOGRAPHIC COORDINATES (NAD 83):

LATITUDE:	39°10'47.10475" (N)	
LONGITUDE:	76°40'28.05043" (W)	
ELLIPSOID HT:	23.27 US ft.	7.091 m

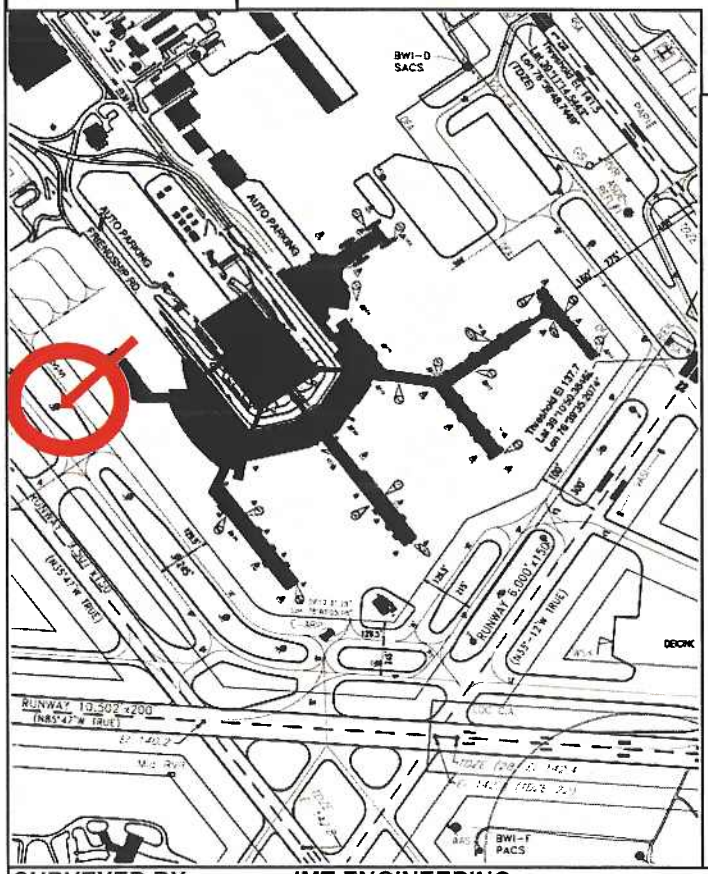
AVAILABLE CONVENTIONAL BACKSIGHT POINTS (COMPUTED DATA):

POINT	GEODETIC AZIMUTH	DISTANCE (US FT.)	DISTANCE (m)
MON-548	324°00'06.2'	629.19	191.778
MON-550	143°28'44.4'	786.86	239.835

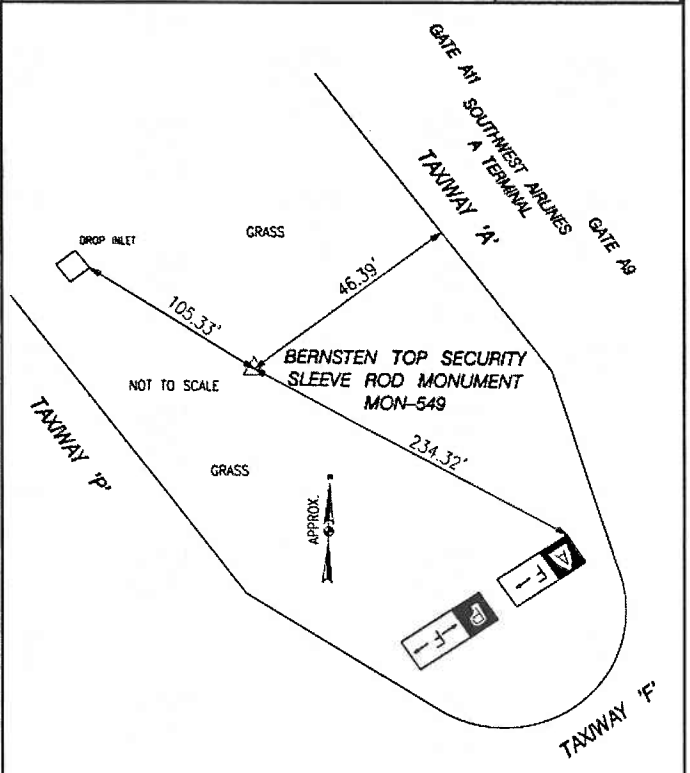
STATION DESCRIPTION:

DRIVEN TO REFUSAL ROD MONUMENT
WITH BERSTEN TOP SECURITY SLEEVE & LID

LOCATION PLAN



DETAIL MAP



SURVEYED BY: JMT ENGINEERING — SPARKS, MARYLAND

BWI THURGOOD MARSHALL AIRPORT-PRIMARY SURVEY CONTROL DATA

NAME OF STATION: MON-549	**DATE ESTABLISHED:** APRIL 2005
NGS PID:	

SURVEYED BY: JMT ENGINEERING SPARKS, MARYLAND

BWI THURGOOD MARSHALL AIRPORT-SECONDARY SURVEY CONTROL DATA

NAME OF STATION: MON-550
NGS PID:

DATE ESTABLISHED: APRIL 2005
READJUSTED JUNE 2008

MARYLAND STATE PLANE COORDINATES (NAD 83):

NORTHING (Y):	550585.396 US ft.	167818.764 m
EASTING (X):	1405086.897 US ft.	428271.343 m
ORTHOMETRIC HEIGHT (NAVD 88):	137.815 US ft.	42.006 m
CONVERGENCE ANGLE:	00°12'19.29"	
COMBINED SCALE FACTOR:	0.99996885	

GEOGRAPHIC COORDINATES (NAD 83):

LATITUDE:	39°10'40.85449" (N)	
LONGITUDE:	76°40'22.10373" (W)	
ELLIPSOID HT:	30.68 US ft.	9.350 m

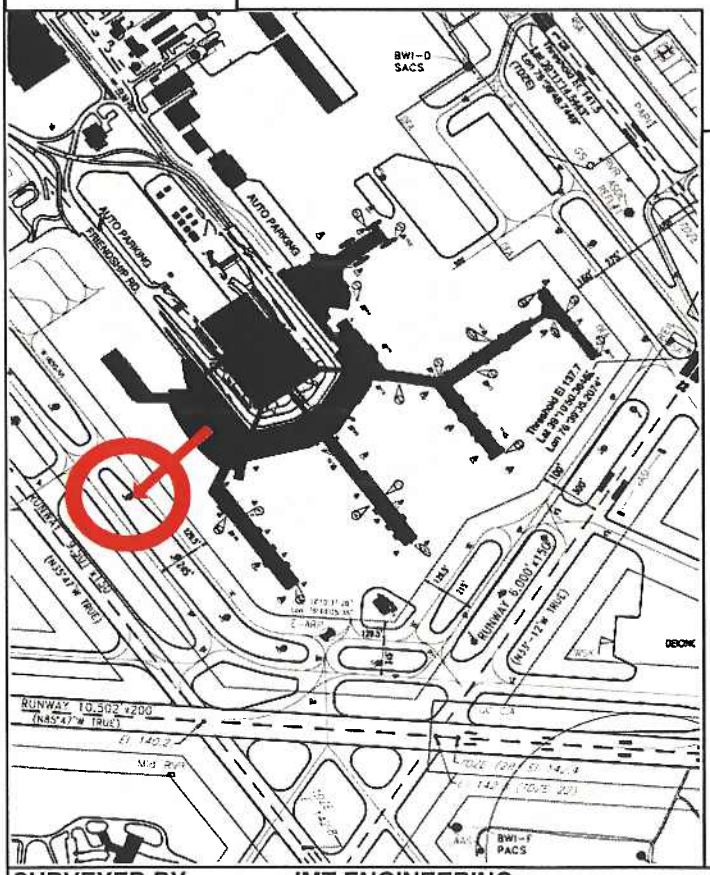
AVAILABLE CONVENTIONAL BACKSIGHT POINTS (COMPUTED DATA):

POINT	GEODETIC AZIMUTH	DISTANCE (US FT.)	DISTANCE (m)
MON-549	323°28'48.2'	786.86	239.835
MON-551	143°57'32.8'	525.42	160.149

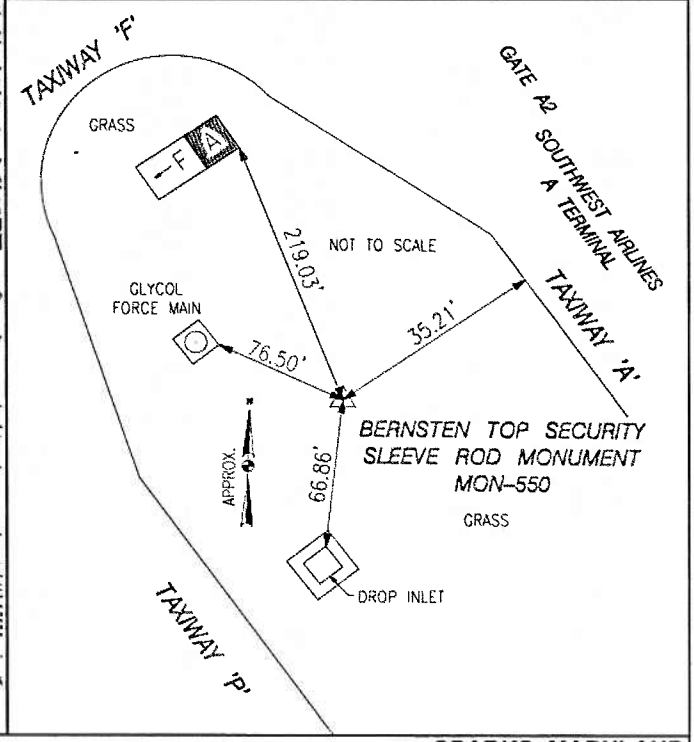
STATION DESCRIPTION:

DRIVEN TO REFUSAL ROD MONUMENT
WITH BERSTEN TOP SECURITY SLEEVE & LID

LOCATION PLAN



DETAIL MAP



SURVEYED BY: JMT ENGINEERING — SPARKS, MARYLAND

BWI THURGOOD MARSHALL AIRPORT-PRIMARY SURVEY CONTROL DATA

NAME OF STATION: MON-550
NGS PID:

DATE ESTABLISHED: APRIL 2005

SURVEYED BY: JMT ENGINEERING — SPARKS, MARYLAND

BWI THURGOOD MARSHALL AIRPORT-SECONDARY SURVEY CONTROL DATA

NAME OF STATION: MON-551
NGS PID:

DATE ESTABLISHED: APRIL 2005
READJUSTED JUNE 2008

MARYLAND STATE PLANE COORDINATES (NAD 83):

NORTHING (Y):	550161.652 US ft.	167689.607 m
EASTING (X):	1405397.556 US ft.	428366.032 m
ORTHOMETRIC HEIGHT (NAVD 88):	141.643 US ft.	43.173 m
CONVERGENCE ANGLE:	00°12'21.75"	
COMBINED SCALE FACTOR:	0.99996874	

GEOGRAPHIC COORDINATES (NAD 83):

LATITUDE:	39°10'36.65516" (N)	
LONGITUDE:	76°40'18.17799" (W)	
ELLIPSOID HT:	34.49 US ft.	10.513 m

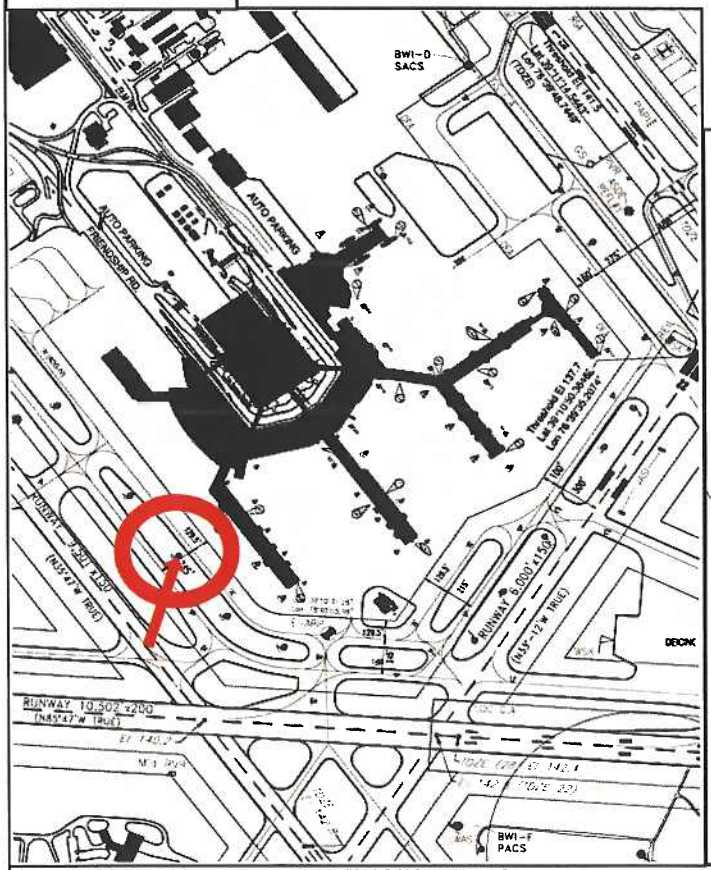
AVAILABLE CONVENTIONAL BACKSIGHT POINTS (COMPUTED DATA):

POINT	GEODETIC AZIMUTH	DISTANCE (US FT.)	DISTANCE (m)
MON-550	323°57'35.2'	525.42	160.149
MON-552	143°42'22.6'	523.01	159.413

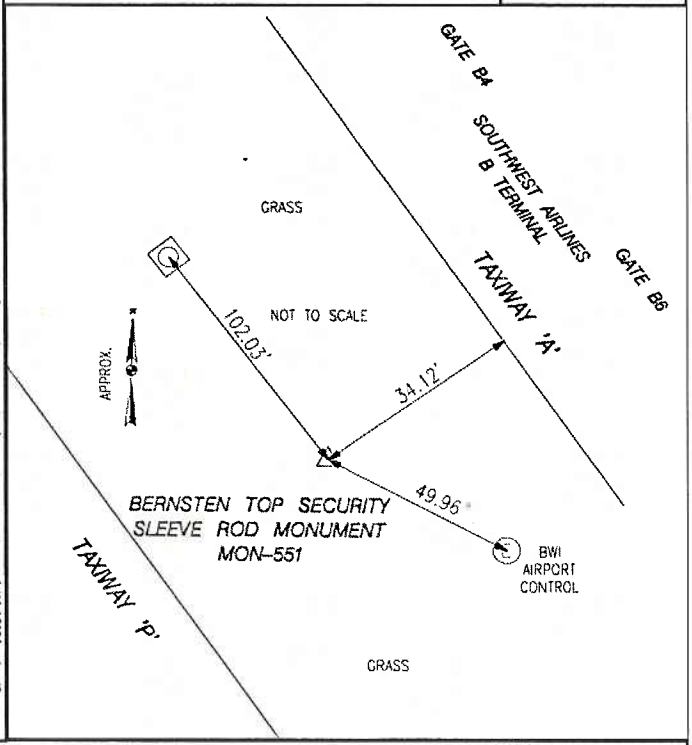
STATION DESCRIPTION:

DRIVEN TO REFUSAL ROD MONUMENT
WITH BERSTEN TOP SECURITY SLEEVE & LID

LOCATION PLAN



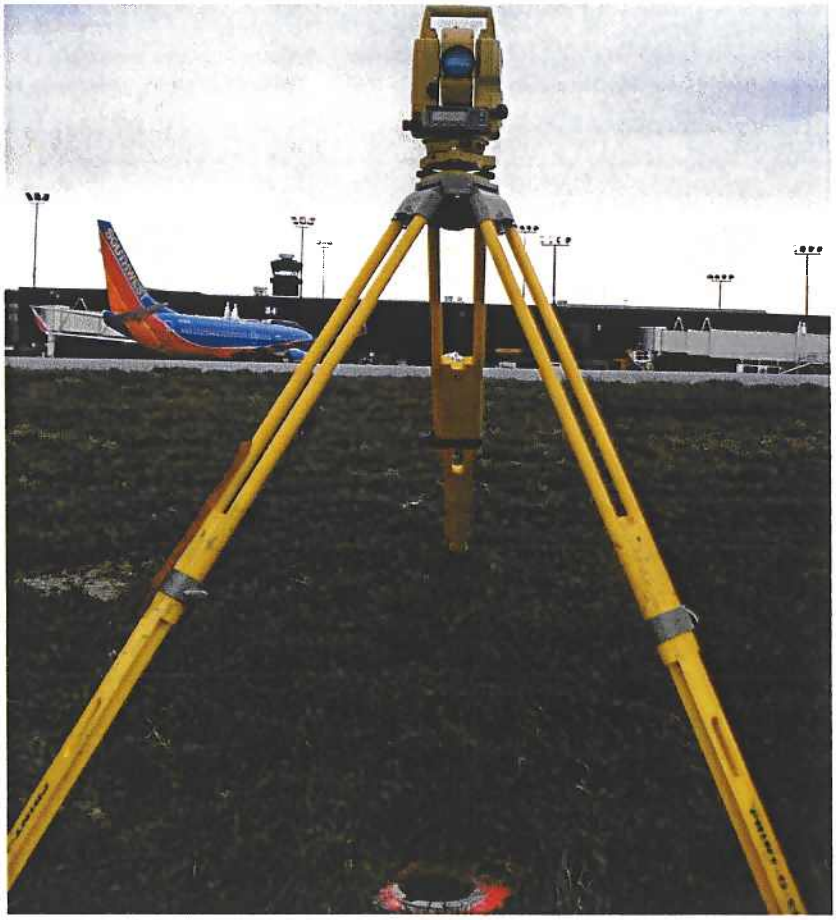
DETAIL MAP



SURVEYED BY: JMT ENGINEERING — **SPARKS, MARYLAND**

BWI THURGOOD MARSHALL AIRPORT-PRIMARY SURVEY CONTROL DATA

NAME OF STATION: MON-551	**DATE ESTABLISHED:** APRIL 2005
NGS PID:	



SURVEYED BY: JMT ENGINEERING SPARKS, MARYLAND

BWI THURGOOD MARSHALL AIRPORT-SECONDARY SURVEY CONTROL DATA

NAME OF STATION: MON-552
NGS PID:

DATE ESTABLISHED: APRIL 2005
READJUSTED JUNE 2008

MARYLAND STATE PLANE COORDINATES (NAD 83):

NORTHING (Y):	549741.229 US ft.	167561.462 m
EASTING (X):	1405708.650 US ft.	428460.854 m
ORTHOMETRIC HEIGHT (NAVD 88):	144.140 US ft.	43.934 m
CONVERGENCE ANGLE:	00°12'24.22"	
COMBINED SCALE FACTOR:	0.99996864	

GEOGRAPHIC COORDINATES (NAD 83):

LATITUDE:	39°10'32.48860" (N)	
LONGITUDE:	76°40'14.24671" (W)	
ELLIPSOID HT:	36.97 US ft.	11.270 m

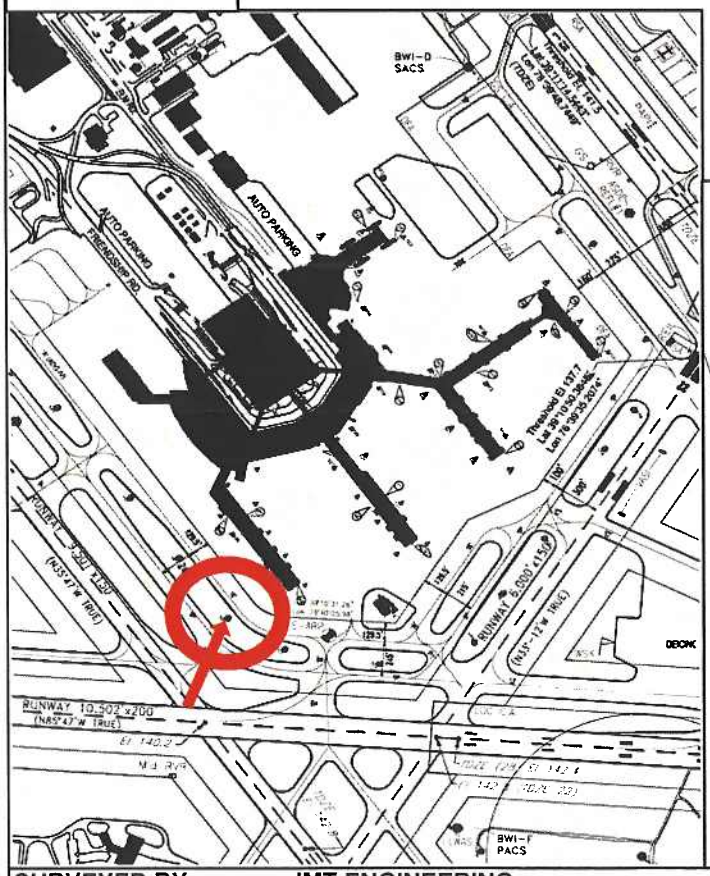
AVAILABLE CONVENTIONAL BACKSIGHT POINTS (COMPUTED DATA):

POINT	GEODETIC AZIMUTH	DISTANCE (US FT.)	DISTANCE (m)
MON-551	323°42'25.1'	523.01	159.413
MON-553	120°58'24.6'	425.31	129.634

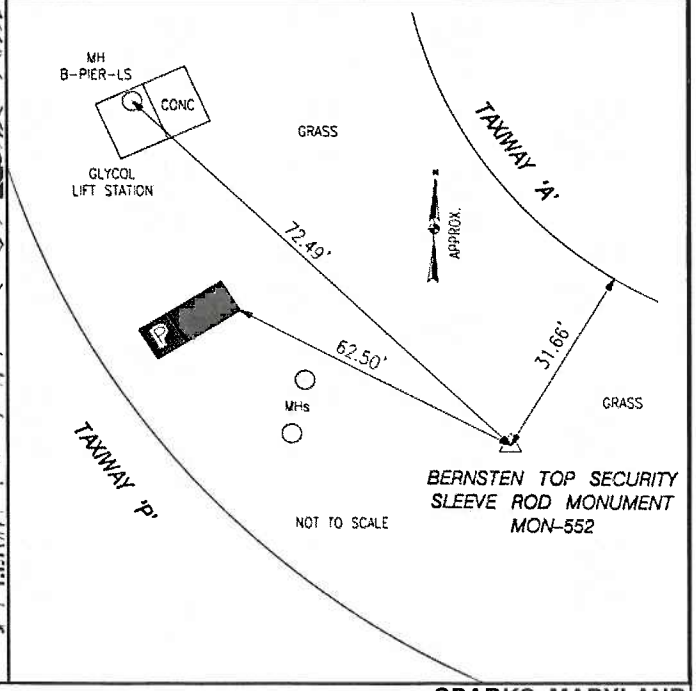
STATION DESCRIPTION:

DRIVEN TO REFUSAL ROD MONUMENT
WITH BERSTEN TOP SECURITY SLEEVE & LID

LOCATION PLAN



DETAIL MAP



SURVEYED BY: JMT ENGINEERING — SPARKS, MARYLAND

BWI THURGOOD MARSHALL AIRPORT-PRIMARY SURVEY CONTROL DATA

NAME OF STATION: MON-552	**DATE ESTABLISHED:** APRIL 2005
NGS PID:	

SURVEYED BY: JMT ENGINEERING — SPARKS, MARYLAND

BWI THURGOOD MARSHALL AIRPORT-SECONDARY SURVEY CONTROL DATA

NAME OF STATION: MON-553
NGS PID:

DATE ESTABLISHED: APRIL 2005
READJUSTED JUNE 2008

MARYLAND STATE PLANE COORDINATES (NAD 83):

NORTHING (Y):	549523.665 US ft.	167495.148 m
EASTING (X):	1406074.097 US ft.	428572.242 m
ORTHOMETRIC HEIGHT (NAVD 88):	143.973 US ft.	43.883 m
CONVERGENCE ANGLE:	00°12'27.13"	
COMBINED SCALE FACTOR:	0.99996858	

GEOGRAPHIC COORDINATES (NAD 83):

LATITUDE:	39°10'30.32514" (N)	
LONGITUDE:	76°40'09.61602" (W)	
ELLIPSOID HT:	36.80 US ft.	11.215 m

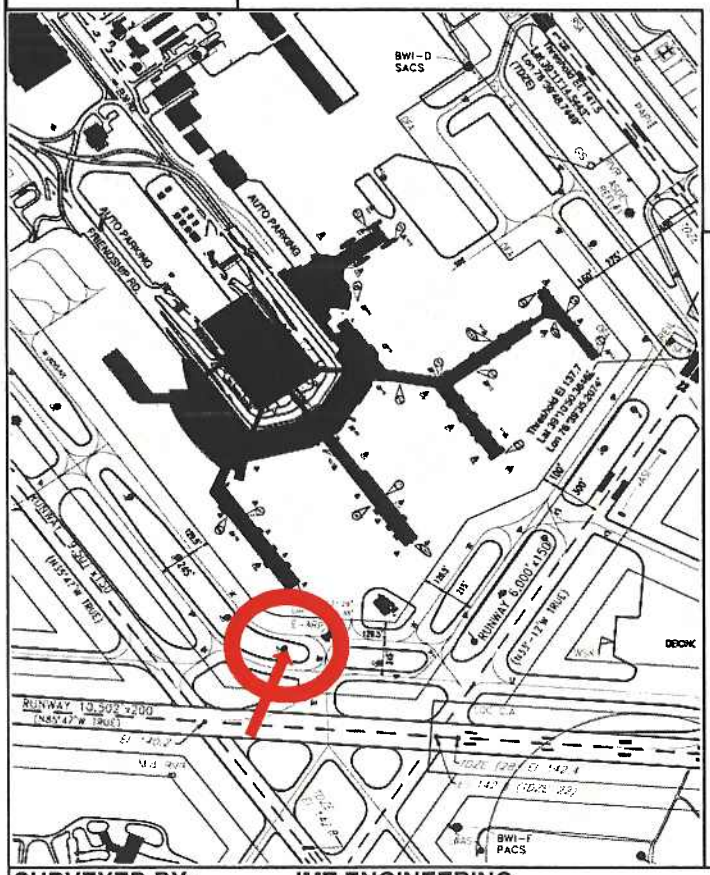
AVAILABLE CONVENTIONAL BACKSIGHT POINTS (COMPUTED DATA):

POINT	GEODETIC AZIMUTH	DISTANCE (US FT.)	DISTANCE (m)
MON-552	300°58'27.6'	425.31	129.634
MON-554	99°36'56.9"	622.71	189.802

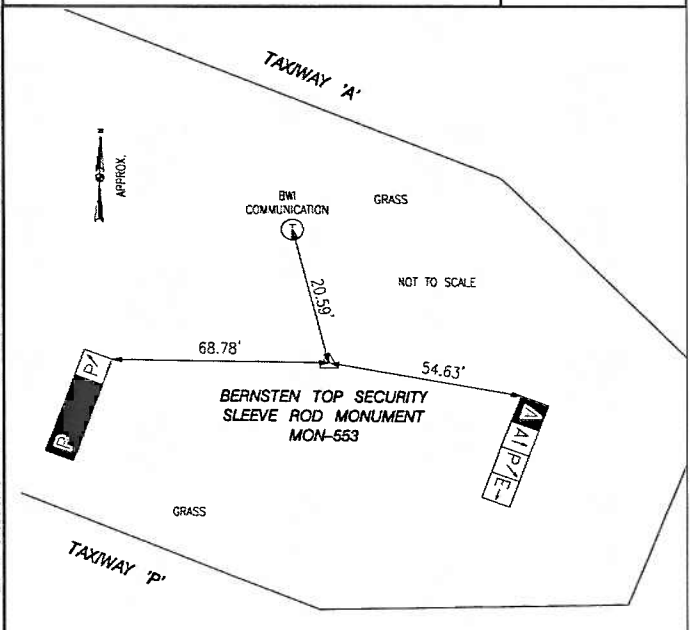
STATION DESCRIPTION:

DRIVEN TO REFUSAL ROD MONUMENT
WITH BERSTEN TOP SECURITY SLEEVE & LID

LOCATION PLAN



DETAIL MAP



SURVEYED BY: JMT ENGINEERING — **SPARKS, MARYLAND**

BWI THURGOOD MARSHALL AIRPORT-PRIMARY SURVEY CONTROL DATA

NAME OF STATION: MON-553	**DATE ESTABLISHED:** APRIL 2005
NGS PID:	

SURVEYED BY: JMT ENGINEERING — SPARKS, MARYLAND

BWI THURGOOD MARSHALL AIRPORT-SECONDARY SURVEY CONTROL DATA

NAME OF STATION: MON-554
NGS PID:

DATE ESTABLISHED: MAY 2003
READJUSTED JUNE 2008

MARYLAND STATE PLANE COORDINATES (NAD 83):

NORTHING (Y):	549421.872 US ft.	167464.122 m
EASTING (X):	1406688.429 US ft.	428759.491 m
ORTHOMETRIC HEIGHT (NAVD 88):	140.259 US ft.	42.751 m
CONVERGENCE ANGLE:	00°12'32.02"	
COMBINED SCALE FACTOR:	0.99996184	

GEOGRAPHIC COORDINATES (NAD 83):

LATITUDE:	39°10'29.29695" (N)		
LONGITUDE:	76°40'01.81960" (W)		
ELLIPSOID HT:	33.06 US ft.	10.077 m	

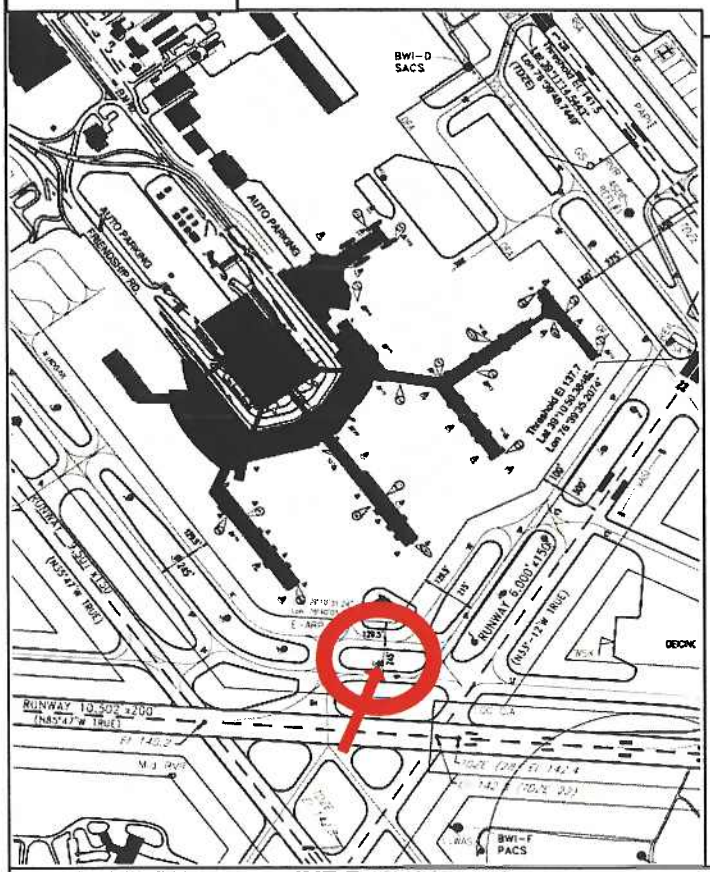
AVAILABLE CONVENTIONAL BACKSIGHT POINTS (COMPUTED DATA):

POINT	GEODETIC AZIMUTH	DISTANCE (US FT.)	DISTANCE (m)
MON-553	279°37'01.8'	622.71	189.802
MON-555	76°23'30.4"	628.06	191.434
MON-556	58°30'07.3"	937.00	285.598
BWI F	156°51'50.7'	1250.99	381.301

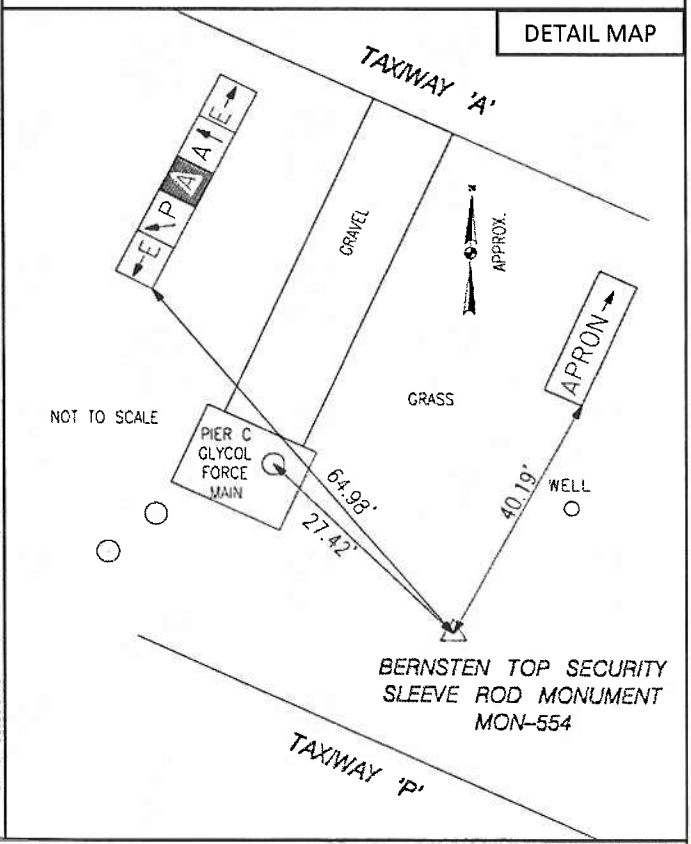
STATION DESCRIPTION:

DRIVEN TO REFUSAL ROD MONUMENT
WITH BERSTEN TOP SECURITY SLEEVE & LID

LOCATION PLAN



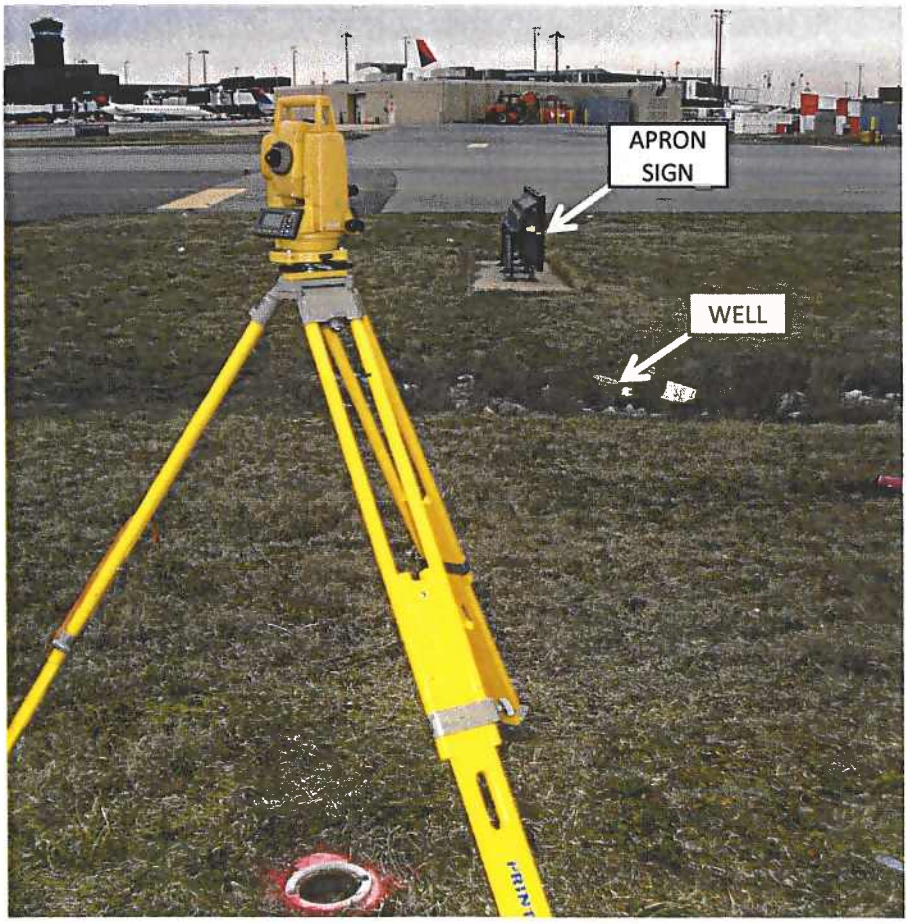
DETAIL MAP



SURVEYED BY: JMT ENGINEERING — SPARKS, MARYLAND

BWI THURGOOD MARSHALL AIRPORT-SECONDARY SURVEY CONTROL DATA

NAME OF STATION: MON-554	**DATE ESTABLISHED:** MAY 2003
NGS PID:	



SURVEYED BY:	**JMT ENGINEERING**	**SPARKS, MARYLAND**

BWI THURGOOD MARSHALL AIRPORT-SECONDARY SURVEY CONTROL DATA

NAME OF STATION: MON-555
NGS PID:

DATE ESTABLISHED: MAY 2003
READJUSTED JUNE 2008

MARYLAND STATE PLANE COORDINATES (NAD 83):

NORTHING (Y):	549571.868 US ft.	167509.840 m
EASTING (X):	1407298.316 US ft.	428945.385 m
ORTHOMETRIC HEIGHT (NAVD 88):	139.741 US ft.	42.593 m
CONVERGENCE ANGLE:	00°12'36.88"	
COMBINED SCALE FACTOR:	0.99996190	

GEOGRAPHIC COORDINATES (NAD 83):

LATITUDE:	39°10'30.75746" (N)	
LONGITUDE:	76°39'54.06795" (W)	
ELLIPSOID HT:	32.52 US ft.	9.913 m

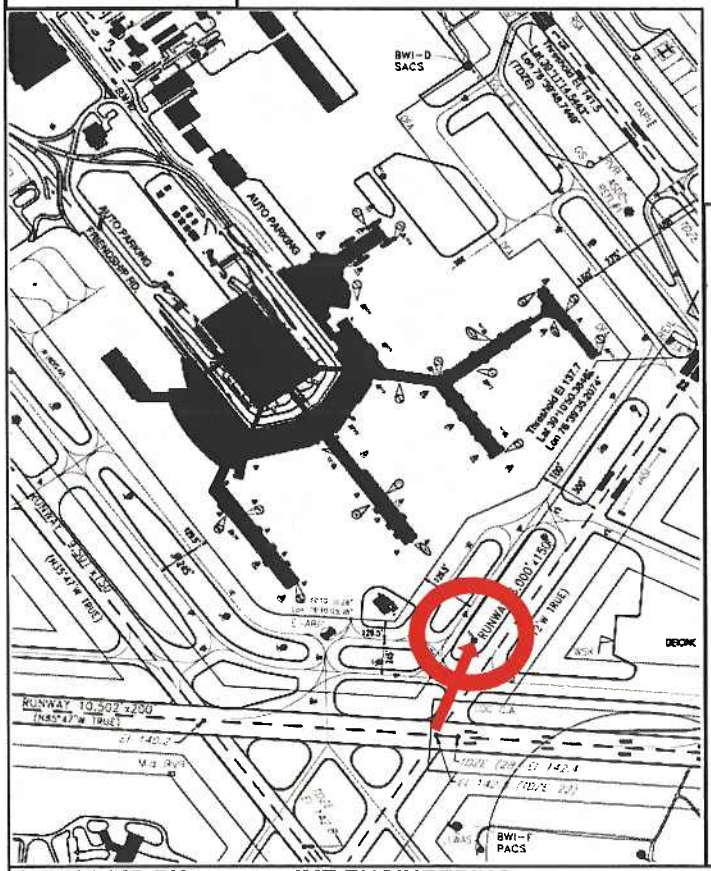
AVAILABLE CONVENTIONAL BACKSIGHT POINTS (COMPUTED DATA):

POINT	GEODETIC AZIMUTH	DISTANCE (US FT.)	DISTANCE (m)
MON-554	256°23'35.3'	628.06	191.434
MON-556	28°52'49.8"	390.32	118.970
BWI F	185°14'04.6'	1303.58	397.332

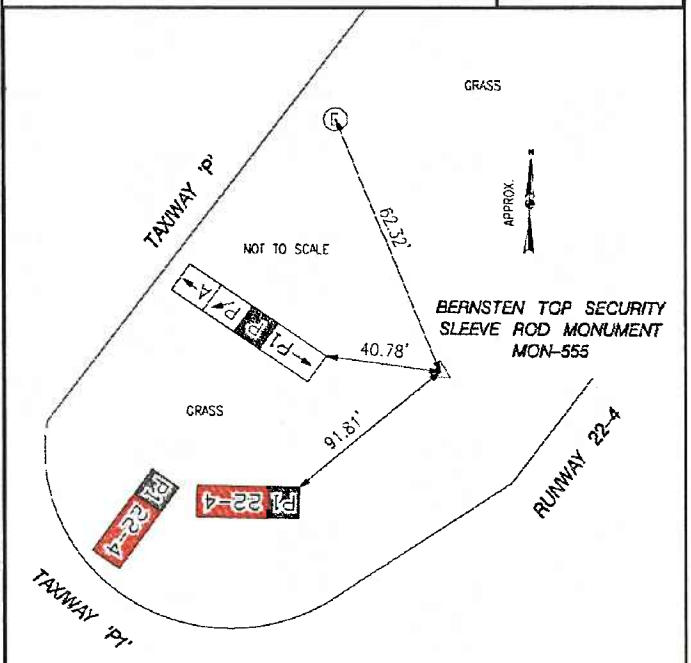
STATION DESCRIPTION:

DRIVEN TO REFUSAL ROD MONUMENT
WITH BERSTEN TOP SECURITY SLEEVE & LID

LOCATION PLAN



DETAIL MAP



SURVEYED BY: JMT ENGINEERING — SPARKS, MARYLAND

BWI THURGOOD MARSHALL AIRPORT-SECONDARY SURVEY CONTROL DATA

NAME OF STATION: MON-555	**DATE ESTABLISHED:** MAY 2003
NGS PID:	

SURVEYED BY:	**JMT ENGINEERING**	**SPARKS, MARYLAND**

BWI THURGOOD MARSHALL AIRPORT-SECONDARY SURVEY CONTROL DATA

NAME OF STATION: MON-556
NGS PID:
DATE ESTABLISHED: MAY 2003
READJUSTED JUNE 2008

MARYLAND STATE PLANE COORDINATES (NAD 83):

NORTHING (Y):	549914.335 US ft.	167614.225 m
EASTING (X):	1407485.581 US ft.	429002.463 m
ORTHOMETRIC HEIGHT (NAVD 88):	137.635 US ft.	41.951 m
CONVERGENCE ANGLE:	00°12'38.39"	
COMBINED SCALE FACTOR:	0.99996209	

GEOGRAPHIC COORDINATES (NAD 83):

LATITUDE:	39°10'34.13562" (N)	
LONGITUDE:	76°39'51.67397" (W)	
ELLIPSOID HT:	30.42 US ft.	9.271 m

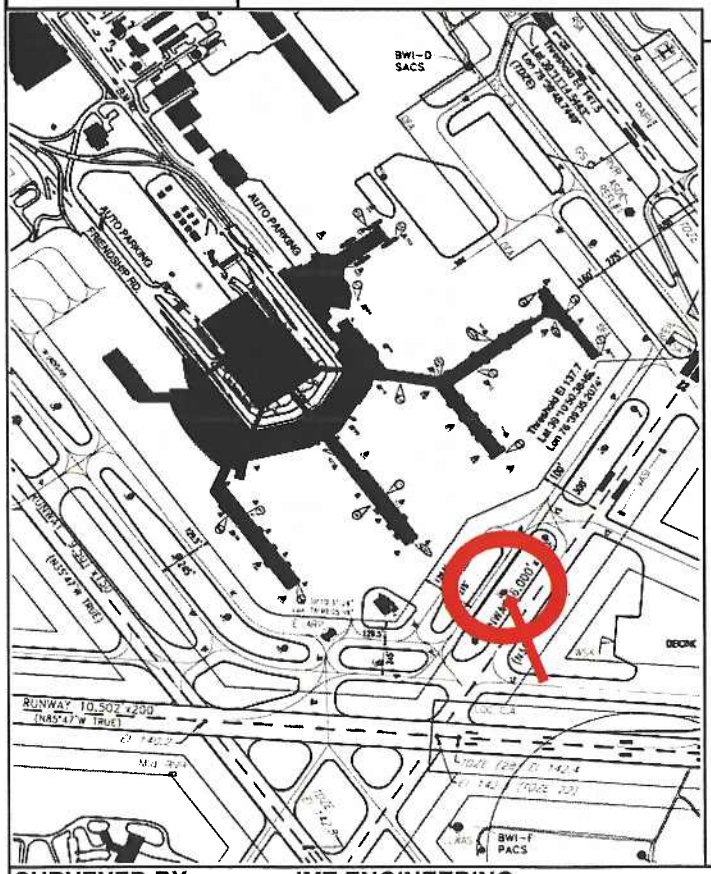
AVAILABLE CONVENTIONAL BACKSIGHT POINTS (COMPUTED DATA):

POINT	GEODETIC AZIMUTH	DISTANCE (US FT.)	DISTANCE (m)
MON-555	208°52'51.3'	390.32	118.970
MON-557	35°11'00.6"	467.20	142.404
BWI F	190°37'08.1'	1668.49	508.558

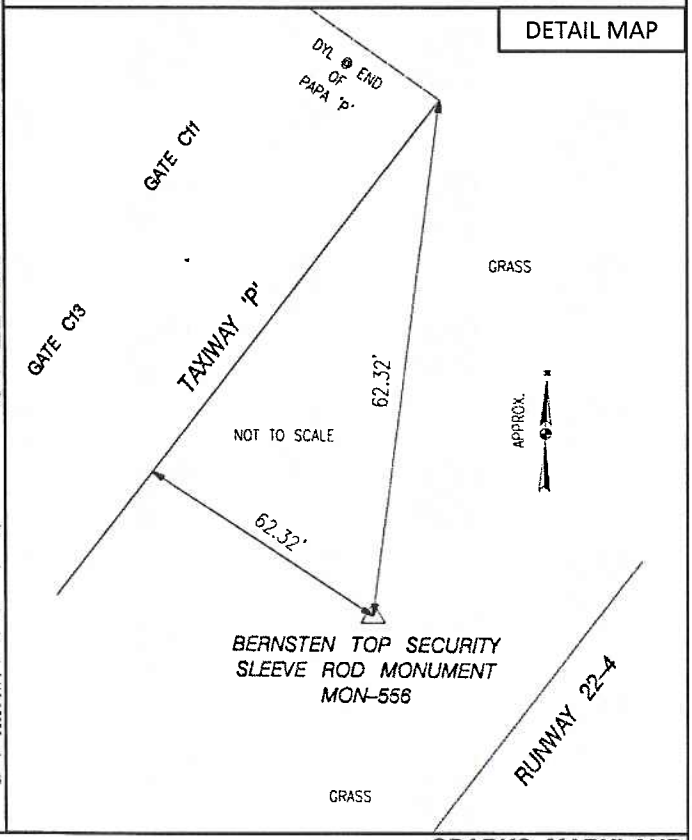
STATION DESCRIPTION:

DRIVEN TO REFUSAL ROD MONUMENT
WITH BERSTEN TOP SECURITY SLEEVE & LID

LOCATION PLAN



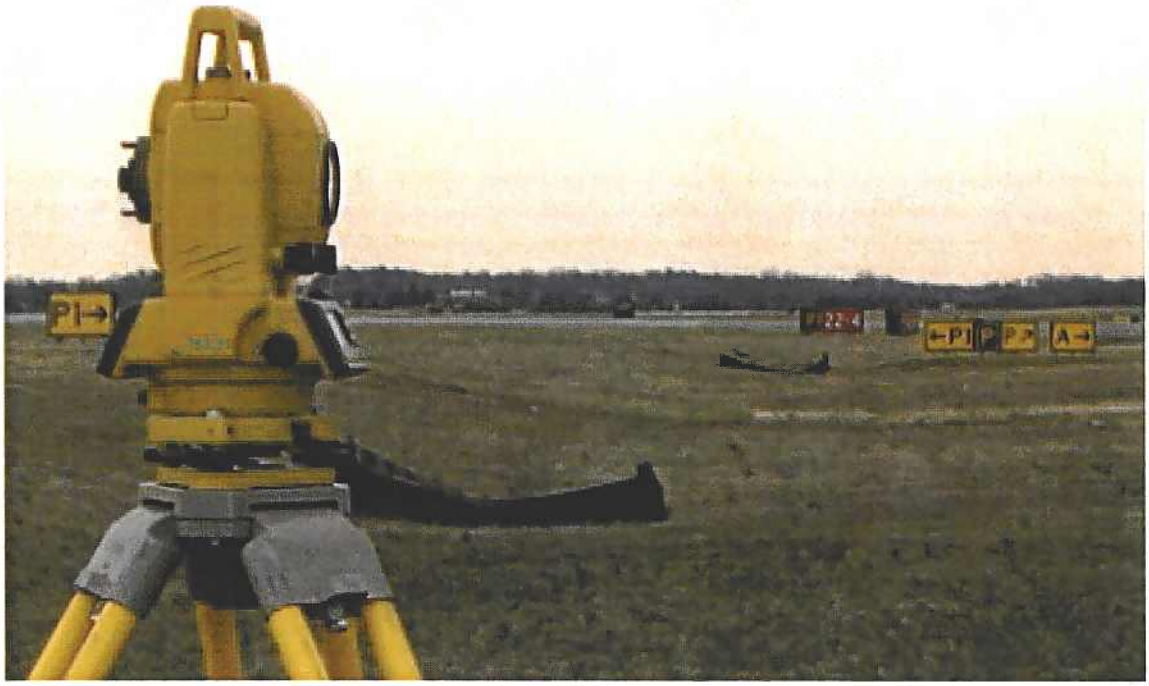
DETAIL MAP



SURVEYED BY: JMT ENGINEERING — SPARKS, MARYLAND

BWI THURGOOD MARSHALL AIRPORT-SECONDARY SURVEY CONTROL DATA

NAME OF STATION: MON-556	**DATE ESTABLISHED:** MAY 2003
NGS PID:	



SURVEYED BY:	**JMT ENGINEERING**	**SPARKS, MARYLAND**

BWI THURGOOD MARSHALL AIRPORT-SECONDARY SURVEY CONTROL DATA

NAME OF STATION: MON-557
NGS PID:

DATE ESTABLISHED: MAY 2003
READJUSTED JUNE 2008

MARYLAND STATE PLANE COORDINATES (NAD 83):

NORTHING (Y):	550297.172 US ft.	167730.914 m
EASTING (X):	1407753.375 US ft.	429084.087 m
ORTHOMETRIC HEIGHT (NAVD 88):	140.420 US ft.	42.800 m
CONVERGENCE ANGLE:	00°12'40.53"	
COMBINED SCALE FACTOR:	0.99996205	

GEOGRAPHIC COORDINATES (NAD 83):

LATITUDE:	39°10'37.90985" (N)	
LONGITUDE:	76°39'48.25537" (W)	
ELLIPSOID HT:	33.19 US ft.	10.118 m

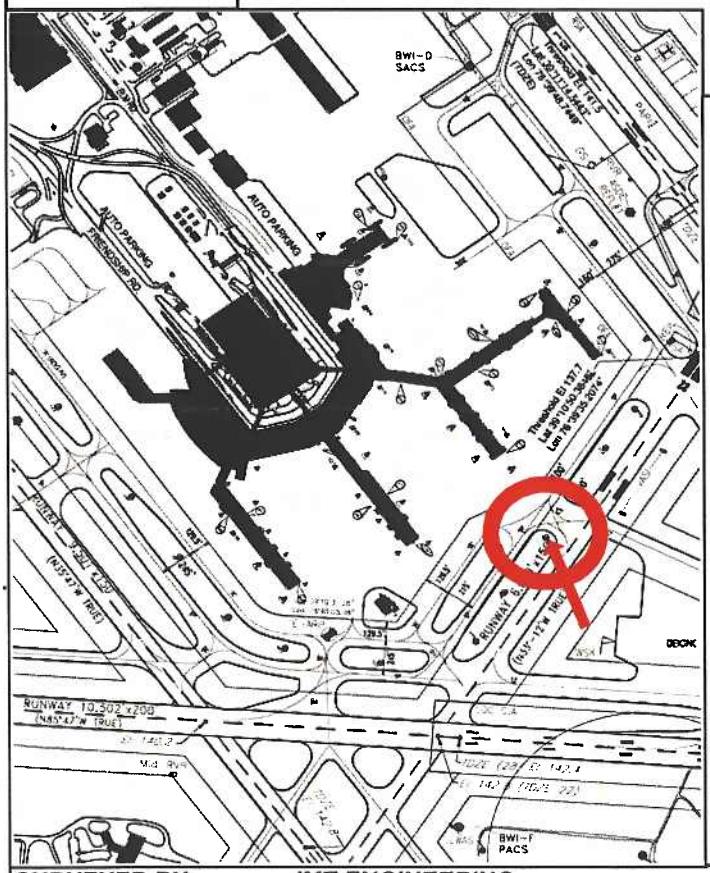
AVAILABLE CONVENTIONAL BACKSIGHT POINTS (COMPUTED DATA):

POINT	GEODETIC AZIMUTH	DISTANCE (US FT.)	DISTANCE (m)
MON-556	215°11'02.8'	467.20	142.404
MON-558	31°47'53.9"	737.87	224.903

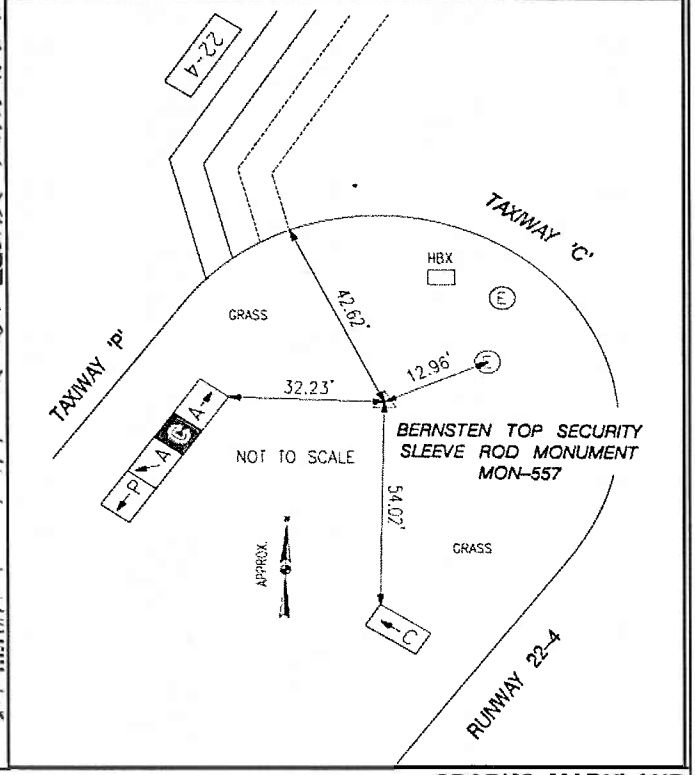
STATION DESCRIPTION:

DRIVEN TO REFUSAL ROD MONUMENT
WITH BERSTEN TOP SECURITY SLEEVE & LID

LOCATION PLAN



DETAIL MAP



SURVEYED BY: JMT ENGINEERING — SPARKS, MARYLAND

BWI THURGOOD MARSHALL AIRPORT-SECONDARY SURVEY CONTROL DATA

NAME OF STATION: MON-557	**DATE ESTABLISHED:** MAY 2003
NGS PID:	

SURVEYED BY:	**JMT ENGINEERING**	**SPARKS, MARYLAND**

BWI THURGOOD MARSHALL AIRPORT-SECONDARY SURVEY CONTROL DATA

NAME OF STATION: MON-558
NGS PID: DJ9001
DATE ESTABLISHED: MAY 2003
READJUSTED JUNE 2008

MARYLAND STATE PLANE COORDINATES (NAD 83):

NORTHING (Y):	550925.724 US ft.	167922.497 m
EASTING (X):	1408139.867 US ft.	429201.890 m
* **ORTHOMETRIC HEIGHT (NAVD 88):**	137.487 US ft.	41.906 m
CONVERGENCE ANGLE:	00°12'43.63"	
COMBINED SCALE FACTOR:	0.99996235	

GEOGRAPHIC COORDINATES (NAD 83):

LATITUDE:	39°10'44.10837" (N)	
LONGITUDE:	76°39'43.31779" (W)	
ELLIPSOID HT:	30.26 US ft.	9.222 m

AVAILABLE CONVENTIONAL BACKSIGHT POINTS (COMPUTED DATA):

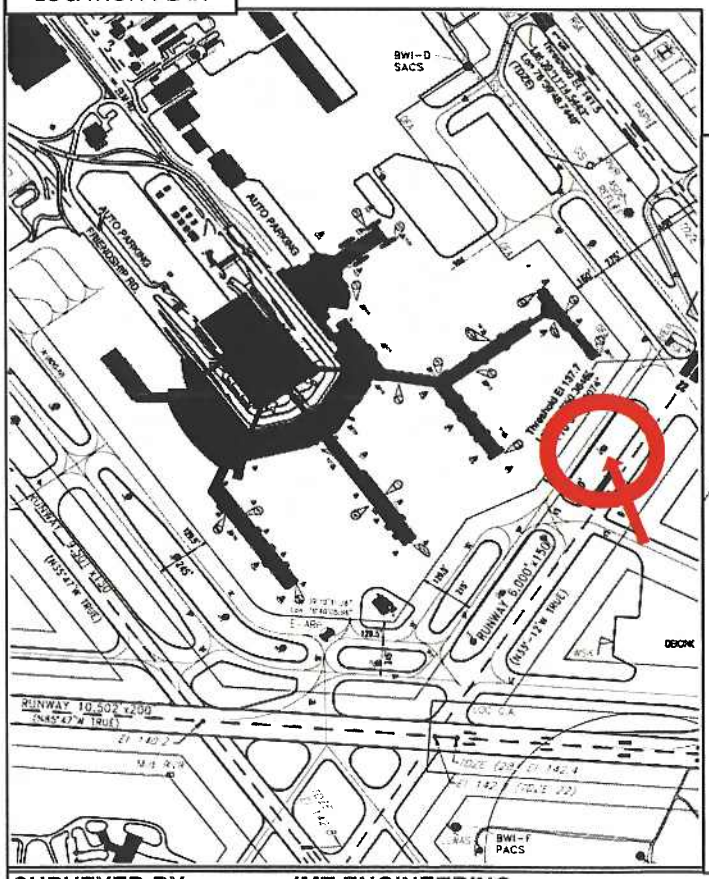
POINT	GEODETIC AZIMUTH	DISTANCE (US FT.)	DISTANCE (m)
MON-557	211°47'57.0'	737.87	224.903
MON-559	34°40'53.5"	332.95	101.483

STATION DESCRIPTION:

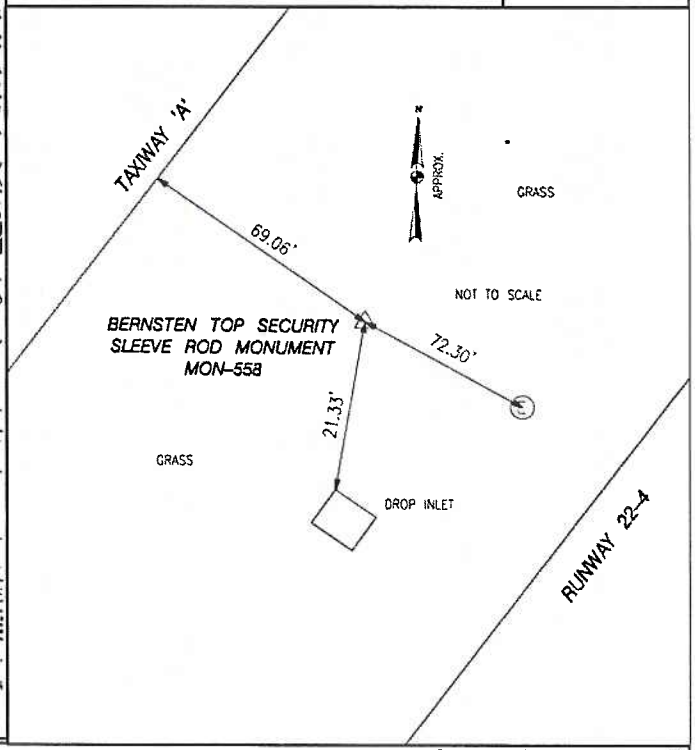
DRIVEN TO REFUSAL ROD MONUMENT
WITH BERSTEN TOP SECURITY SLEEVE & LID

* SEE ATTACHED NGS DATASHEETS

LOCATION PLAN



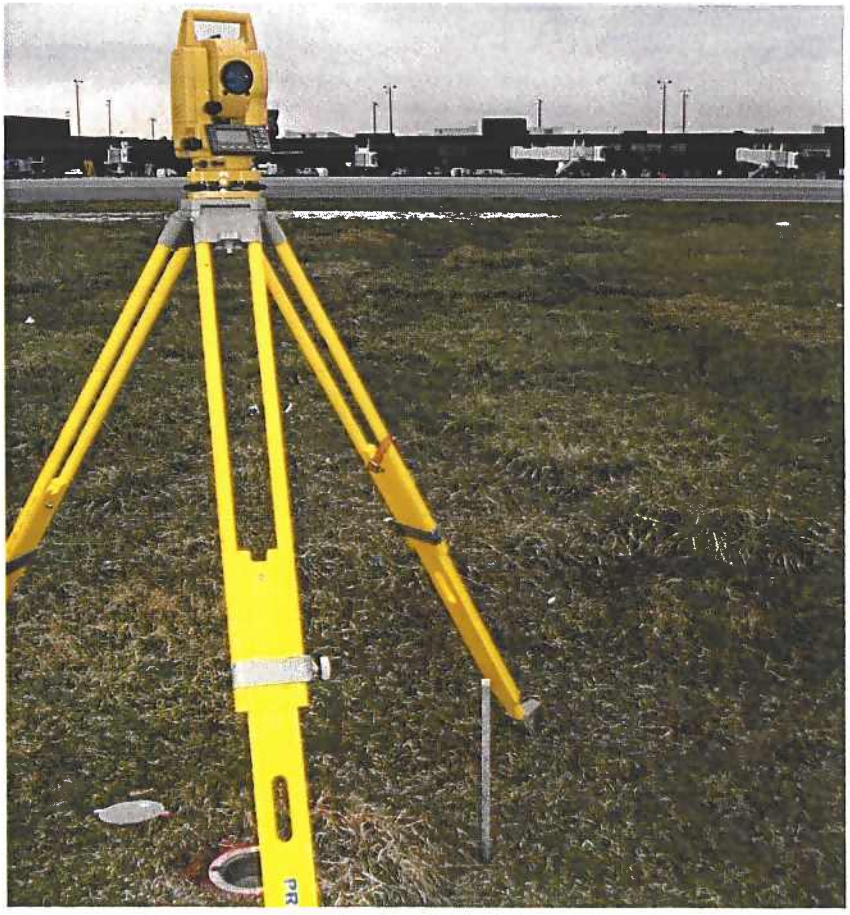
DETAIL MAP



SURVEYED BY: JMT ENGINEERING — SPARKS, MARYLAND

BWI THURGOOD MARSHALL AIRPORT-SECONDARY SURVEY CONTROL DATA

NAME OF STATION:	MON-558	**DATE ESTABLISHED:**	MAY 2003
NGS PID:	**DJ9001**		



SURVEYED BY:	**JMT ENGINEERING**	**SPARKS, MARYLAND**

BWI THURGOOD MARSHALL AIRPORT-SECONDARY SURVEY CONTROL DATA

NAME OF STATION:	MON-558	**DATE ESTABLISHED:**	MAY 2003
NGS PID:	**DJ9001**		READJUSTED JUNE 2008

```
1        National Geodetic Survey,   Retrieval Date = JUNE 24, 2008
 DJ9001 ***********************************************************************
 DJ9001  DESIGNATION -  558
 DJ9001  PID         -  DJ9001
 DJ9001  STATE/COUNTY-  MD/ANNE ARUNDEL
 DJ9001  USGS QUAD   -  RELAY (1974)
 DJ9001
 DJ9001                          *CURRENT SURVEY CONTROL
 DJ9001
 DJ9001* NAD 83(1986)-  39 10 44.      (N)     076 39 43.      (W)      SCALED
 DJ9001* NAVD 88     -         41.906  (meters)      137.49    (feet)   ADJUSTED
 DJ9001
 DJ9001  GEOID HEIGHT-          -32.69  (meters)                         GEOID03
 DJ9001  DYNAMIC HT  -           41.884 (meters)      137.41    (feet)   COMP
 DJ9001  MODELED GRAV-      980,093.5   (mgal)                           NAVD 88
 DJ9001
 DJ9001  VERT ORDER  -  FIRST     CLASS II
 DJ9001
 DJ9001.The horizontal coordinates were scaled from a topographic map and have
 DJ9001.an estimated accuracy of +/- 6 seconds.
 DJ9001
 DJ9001.The orthometric height was determined by differential leveling
 DJ9001.and adjusted in June 2008.
 DJ9001.No vertical observational check was made to the station.
 DJ9001
 DJ9001.The geoid height was determined by GEOID03.
 DJ9001
 DJ9001.The dynamic height is computed by dividing the NAVD 88
 DJ9001.geopotential number by the normal gravity value computed on the
 DJ9001.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
 DJ9001.degrees latitude (g = 980.6199 gals.).
 DJ9001
 DJ9001.The modeled gravity was interpolated from observed gravity values.
 DJ9001
 DJ9001;                    North         East     Units  Estimated Accuracy
 DJ9001;SPC MD       -   167,920.      429,210.      MT  (+/- 180 meters Scaled)
 DJ9001
 DJ9001                          SUPERSEDED SURVEY CONTROL
 DJ9001
 DJ9001.No superseded survey control is available for this station.
 DJ9001
 DJ9001_U.S. NATIONAL GRID SPATIAL ADDRESS: 18SUJ564379(NAD 83)
 DJ9001_MARKER: F = FLANGE-ENCASED ROD
 DJ9001_SETTING: 49 = STAINLESS STEEL ROD W/O SLEEVE (10 FT.+)
 DJ9001_STAMPING: 558 2003
 DJ9001_PROJECTION: FLUSH
 DJ9001_MAGNETIC: I = MARKER IS A STEEL ROD
 DJ9001_STABILITY: B = PROBABLY HOLD POSITION/ELEVATION WELL
 DJ9001_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
 DJ9001+SATELLITE: SATELLITE OBSERVATIONS - November 01, 2007
```

SURVEYED BY:	**JMT ENGINEERING**	**SPARKS, MARYLAND**

BWI THURGOOD MARSHALL AIRPORT-SECONDARY SURVEY CONTROL DATA

NAME OF STATION:	MON-558	**DATE ESTABLISHED:**	MAY 2003
NGS PID:	**DJ9001**		READJUSTED JUNE 2008

```
DJ9001
DJ9001  HISTORY      - Date      Condition        Report By
DJ9001  HISTORY      - 200305    MONUMENTED       WHBCXM
DJ9001  HISTORY      - 20071101  GOOD             JARICE
DJ9001
DJ9001                            STATION DESCRIPTION
DJ9001
DJ9001'DESCRIBED BY J A RICE INC 2007 (MRA)
DJ9001'THE MARK IS LOCATED ABOUT 4.0 MI (6.5 KM) SOUTH-SOUTHEAST OF RELAY,
DJ9001'3.6 MI (5.8 KM) SOUTHEAST OF ELKRIDGE AND 3.5 MI (5.6 KM)
DJ9001'EAST-SOUTHEAST OF HANOVER AT BALTIMORE WASHINGTON INTERNATIONAL
DJ9001'AIRPORT.  CONTACT AIRPORT OPERATIONS AT 410-859-7018 FOR ACCESS TO THE
DJ9001'MARK.
DJ9001'
DJ9001'IT IS IN THE CENTER OF A GRASS ISLAND BETWEEN TAXIWAY 'A' AND RUNWAY
DJ9001'4/22, 69.3 FT (21.1 M) EAST-SOUTHEAST OF THE EAST-SOUTHEAST EDGE OF
DJ9001'TAXIWAY 'A', 186.0 FT (56.7 M) NORTHWEST OF THE CENTERLINE OF RUNWAY
DJ9001'4/22, 72.4 FT (22.1 M) NORTHWEST OF AN ELECTRICAL MANHOLE, 60.5 FT
DJ9001'(18.4 M) NORTH OF AN ELECTRICAL MANHOLE AND 24.5 FT (7.5 M) NORTH OF A
DJ9001'DRAINAGE INLET.
DJ9001'
DJ9001'NOTE--ACCESS TO THE DATUM POINT IS THROUGH A 5-INCH (13 CM) LOGO CAP.
```

SURVEYED BY:	**JMT ENGINEERING**	**SPARKS, MARYLAND**

BWI THURGOOD MARSHALL AIRPORT-SECONDARY SURVEY CONTROL DATA

NAME OF STATION: MON-559
NGS PID: DJ9000
DATE ESTABLISHED: MAY 2003
READJUSTED JUNE 2008

MARYLAND STATE PLANE COORDINATES (NAD 83):

	NORTHING (Y):	551200.216 US ft.	168006.162 m
	EASTING (X):	1408328.305 US ft.	429259.326 m
*	**ORTHOMETRIC HEIGHT (NAVD 88):**	137.080 US ft.	41.782 m
	CONVERGENCE ANGLE:	00°12'45.14"	
	COMBINED SCALE FACTOR:	0.99996244	

GEOGRAPHIC COORDINATES (NAD 83):

LATITUDE:	39°10'46.81455" (N)	
LONGITUDE:	76°39'40.91185" (W)	
ELLIPSOID HT:	29.85 US ft.	9.098 m

AVAILABLE CONVENTIONAL BACKSIGHT POINTS (COMPUTED DATA):

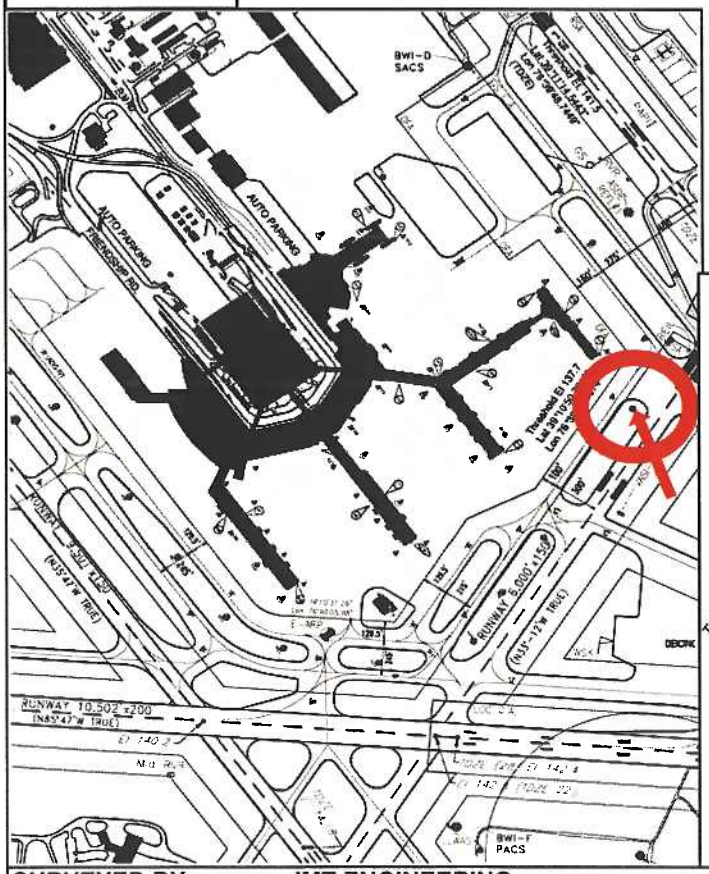
POINT	GEODETIC AZIMUTH	DISTANCE (US FT.)	DISTANCE (m)
MON-558	214°40'55.0'	332.95	101.483
MON-560	27°03'36.7"	541.05	164.913

STATION DESCRIPTION:

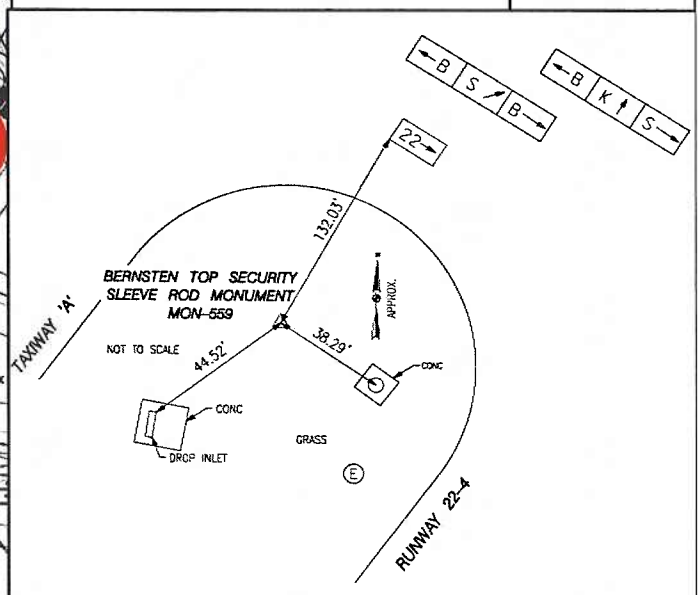
DRIVEN TO REFUSAL ROD MONUMENT
WITH BERSTEN TOP SECURITY SLEEVE & LID

* SEE ATTACHED NGS DATASHEETS

LOCATION PLAN



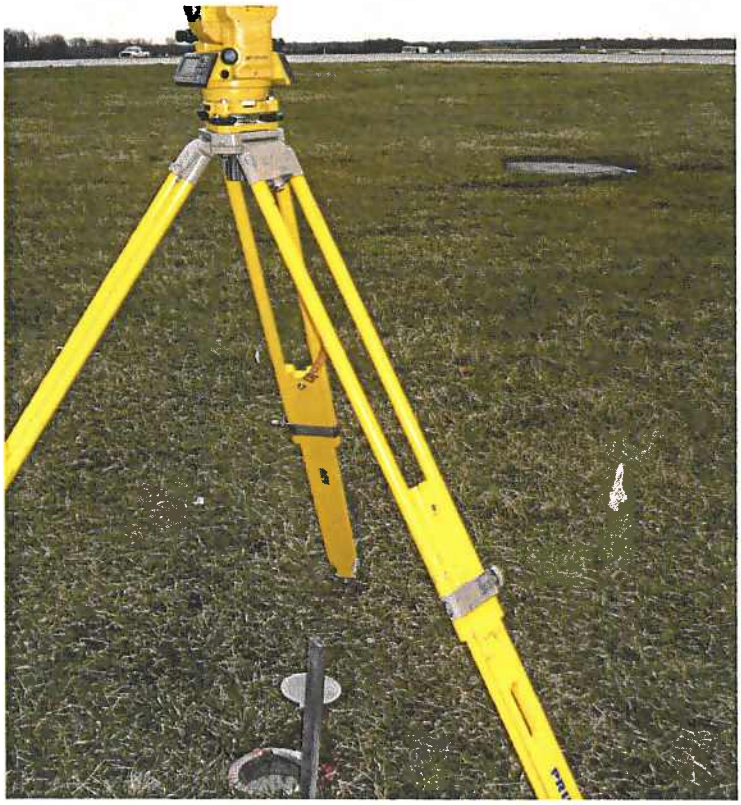
DETAIL MAP



SURVEYED BY: JMT ENGINEERING — **SPARKS, MARYLAND**

BWI THURGOOD MARSHALL AIRPORT-SECONDARY SURVEY CONTROL DATA

NAME OF STATION: MON-559	**DATE ESTABLISHED:** MAY 2003
NGS PID: DJ9000	



SURVEYED BY: JMT ENGINEERING — SPARKS, MARYLAND

BWI THURGOOD MARSHALL AIRPORT-SECONDARY SURVEY CONTROL DATA

NAME OF STATION:	MON-559	**DATE ESTABLISHED:**	MAY 2003
NGS PID:	**DJ9000**		READJUSTED JUNE 2008

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1        National Geodetic Survey,   Retrieval Date = JUNE 24, 2008
 DJ9000 ***********************************************************************
 DJ9000  DESIGNATION -  559
 DJ9000  PID         -  DJ9000
 DJ9000  STATE/COUNTY-  MD/ANNE ARUNDEL
 DJ9000  USGS QUAD   -  RELAY (1974)
 DJ9000
 DJ9000                          *CURRENT SURVEY CONTROL
 DJ9000
 DJ9000* NAD 83(1986)-  39 10 46.      (N)     076 39 40.      (W)      SCALED
 DJ9000* NAVD 88     -         41.782  (meters)      137.08    (feet)   ADJUSTED
 DJ9000
 DJ9000  GEOID HEIGHT-          -32.69  (meters)                         GEOID03
 DJ9000  DYNAMIC HT  -           41.760 (meters)      137.01    (feet)   COMP
 DJ9000  MODELED GRAV-      980,093.5   (mgal)                           NAVD 88
 DJ9000
 DJ9000  VERT ORDER  -  FIRST     CLASS II
 DJ9000
 DJ9000.The horizontal coordinates were scaled from a topographic map and have
 DJ9000.an estimated accuracy of +/- 6 seconds.
 DJ9000
 DJ9000.The orthometric height was determined by differential leveling
 DJ9000.and adjusted in June 2008.
 DJ9000.No vertical observational check was made to the station.
 DJ9000
 DJ9000.The geoid height was determined by GEOID03.
 DJ9000
 DJ9000.The dynamic height is computed by dividing the NAVD 88
 DJ9000.geopotential number by the normal gravity value computed on the
 DJ9000.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
 DJ9000.degrees latitude (g = 980.6199 gals.).
 DJ9000
 DJ9000.The modeled gravity was interpolated from observed gravity values.
 DJ9000
 DJ9000;                     North         East     Units  Estimated Accuracy
 DJ9000;SPC MD       -   167,980.      429,280.       MT  (+/- 180 meters Scaled)
 DJ9000
 DJ9000                           SUPERSEDED SURVEY CONTROL
 DJ9000
 DJ9000.No superseded survey control is available for this station.
 DJ9000
 DJ9000_U.S. NATIONAL GRID SPATIAL ADDRESS: 18SUJ565380(NAD 83)
 DJ9000_MARKER: F = FLANGE-ENCASED ROD
 DJ9000_SETTING: 49 = STAINLESS STEEL ROD W/O SLEEVE (10 FT.+)
 DJ9000_STAMPING: 559 2003
 DJ9000_PROJECTION: FLUSH
 DJ9000_MAGNETIC: I = MARKER IS A STEEL ROD
 DJ9000_STABILITY: B = PROBABLY HOLD POSITION/ELEVATION WELL
 DJ9000_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
 DJ9000+SATELLITE: SATELLITE OBSERVATIONS - November 01, 2007
 DJ9000
 DJ9000  HISTORY     - Date      Condition         Report By
 DJ9000  HISTORY     - 200305    MONUMENTED        WHBCXM
 DJ9000  HISTORY     - 20071101  GOOD              JARICE
```

SURVEYED BY:	**JMT ENGINEERING**		**SPARKS, MARYLAND**

BWI THURGOOD MARSHALL AIRPORT-SECONDARY SURVEY CONTROL DATA

NAME OF STATION:	MON-559	**DATE ESTABLISHED:**	MAY 2003
NGS PID:	**DJ9000**		READJUSTED JUNE 2008

DJ9000
DJ9000 STATION DESCRIPTION
DJ9000
DJ9000'DESCRIBED BY J A RICE INC 2007 (MRA)
DJ9000'THE MARK IS LOCATED ABOUT 4.0 MI (6.5 KM) SOUTHEAST OF RELAY, 3.6 MI
DJ9000'(5.8 KM) SOUTHEAST OF ELKRIDGE AND 3.5 MI (5.6 KM) EAST-SOUTHEAST OF
DJ9000'HANOVER AT THE BALTIMORE WASHINGTON INTERNATIONAL AIRPORT. CONTACT
DJ9000'AIRPORT OPERATIONS AT 410-859-7018 FOR ACCESS TO THE MARK.
DJ9000'
DJ9000'IT IS IN THE NORTHEAST END OF A GRASS ISLAND BETWEEN RUNWAY 4/22 AND
DJ9000'TAXIWAY 'A', 178.6 FT (54.4 M) NORTHWEST OF THE CENTERLINE OF RUNWAY
DJ9000'4/22, 67.5 FT (20.6 M) NORTH OF AN ELECTRICAL MANHOLE, 61.4 FT (18.7
DJ9000'M) SOUTHWEST OF A RECTANGULAR ELECTRICAL HAND BOX, 47.5 FT (14.5 M)
DJ9000'NORTHEAST OF A DRAINAGE INLET AND 38.2 FT (11.6 M) NORTH-NORTHWEST OF
DJ9000'AN UNMARKED MANHOLE.
DJ9000'
DJ9000'NOTE--ACCESS TO THE DATUM POINT IS THROUGH A 5-INCH (13 CM) LOGO CAP.

SURVEYED BY:	**JMT ENGINEERING**	**SPARKS, MARYLAND**

BWI THURGOOD MARSHALL AIRPORT-SECONDARY SURVEY CONTROL DATA

NAME OF STATION: MON-560
NGS PID: DJ8999
DATE ESTABLISHED: MAY 2003
READJUSTED JUNE 2008

MARYLAND STATE PLANE COORDINATES (NAD 83):

	NORTHING (Y):	551682.947 US ft.	168153.299 m
	EASTING (X):	1408572.654 US ft.	429333.804 m
*	**ORTHOMETRIC HEIGHT (NAVD 88):**	137.031 US ft.	41.767 m
	CONVERGENCE ANGLE:	00°12'47.10"	
	COMBINED SCALE FACTOR:	0.99996256	

GEOGRAPHIC COORDINATES (NAD 83):

LATITUDE:	39°10'51.57691" (N)	
LONGITUDE:	76°39'37.78596" (W)	
ELLIPSOID HT:	29.78 US ft.	9.078 m

AVAILABLE CONVENTIONAL BACKSIGHT POINTS (COMPUTED DATA):

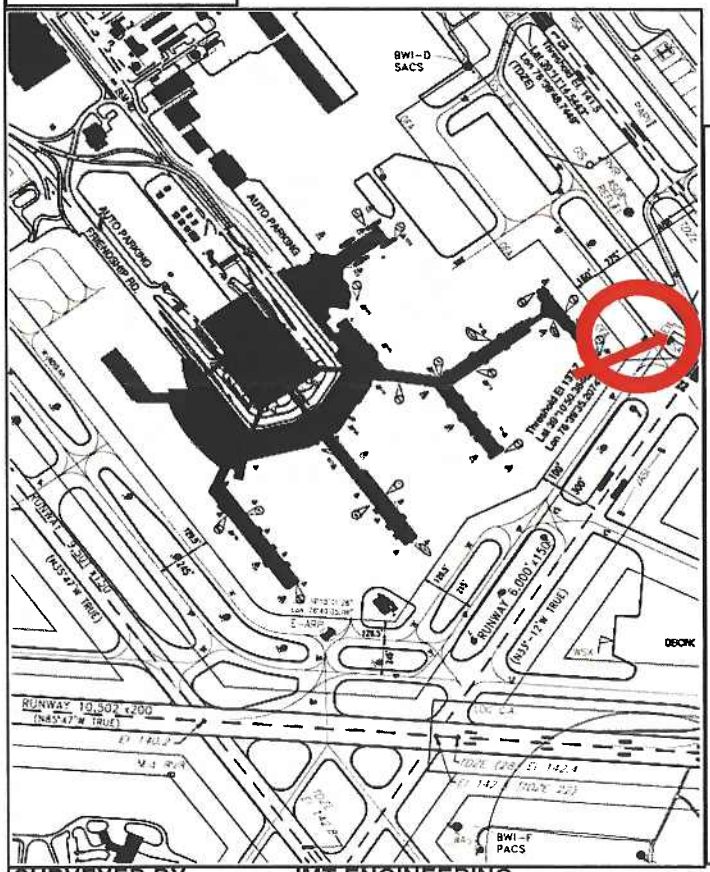
POINT	GEODETIC AZIMUTH	DISTANCE (US FT.)	DISTANCE (m)
MON-559	207°03'38.7"	541.05	164.913
MON-561	323°47'24.7"	840.79	256.273

STATION DESCRIPTION:

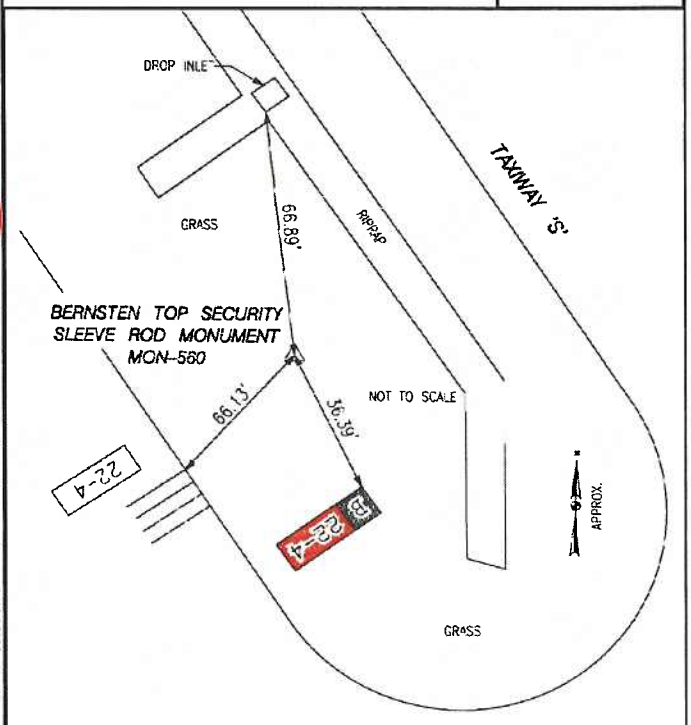
DRIVEN TO REFUSAL ROD MONUMENT
WITH BERSTEN TOP SECURITY SLEEVE & LID

* SEE ATTACHED NGS DATASHEETS

LOCATION PLAN



DETAIL MAP



SURVEYED BY: JMT ENGINEERING — **SPARKS, MARYLAND**

BWI THURGOOD MARSHALL AIRPORT-SECONDARY SURVEY CONTROL DATA

NAME OF STATION: MON-560	**DATE ESTABLISHED:** MAY 2003
NGS PID: DJ8999	

SURVEYED BY: JMT ENGINEERING — SPARKS, MARYLAND

BWI THURGOOD MARSHALL AIRPORT-SECONDARY SURVEY CONTROL DATA

NAME OF STATION: MON-560	**DATE ESTABLISHED:** MAY 2003
NGS PID: DJ8999	READJUSTED JUNE 2008

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1        National Geodetic Survey,   Retrieval Date = JUNE 24, 2008
 DJ8999 ***********************************************************************
 DJ8999  DESIGNATION -  560
 DJ8999  PID         -  DJ8999
 DJ8999  STATE/COUNTY-  MD/ANNE ARUNDEL
 DJ8999  USGS QUAD   -  RELAY (1974)
 DJ8999
 DJ8999                          *CURRENT SURVEY CONTROL
 DJ8999
 DJ8999* NAD 83(1986)-  39 10 51.      (N)     076 39 37.      (W)      SCALED
 DJ8999* NAVD 88     -         41.767  (meters)      137.03    (feet)   ADJUSTED
 DJ8999
 DJ8999  GEOID HEIGHT-          -32.69  (meters)                         GEOID03
 DJ8999  DYNAMIC HT  -           41.745 (meters)      136.96    (feet)   COMP
 DJ8999  MODELED GRAV-      980,093.7   (mgal)                           NAVD 88
 DJ8999
 DJ8999  VERT ORDER  -  FIRST     CLASS II
 DJ8999
 DJ8999.The horizontal coordinates were scaled from a topographic map and have
 DJ8999.an estimated accuracy of +/- 6 seconds.
 DJ8999
 DJ8999.The orthometric height was determined by differential leveling
 DJ8999.and adjusted in June 2008.
 DJ8999.No vertical observational check was made to the station.
 DJ8999
 DJ8999.The geoid height was determined by GEOID03.
 DJ8999
 DJ8999.The dynamic height is computed by dividing the NAVD 88
 DJ8999.geopotential number by the normal gravity value computed on the
 DJ8999.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
 DJ8999.degrees latitude (g = 980.6199 gals.).
 DJ8999
 DJ8999.The modeled gravity was interpolated from observed gravity values.
 DJ8999
 DJ8999;                     North         East     Units  Estimated Accuracy
 DJ8999;SPC MD       -   168,140.      429,350.      MT  (+/- 180 meters Scaled)
 DJ8999
 DJ8999                          SUPERSEDED SURVEY CONTROL
 DJ8999
 DJ8999.No superseded survey control is available for this station.
 DJ8999
 DJ8999_U.S. NATIONAL GRID SPATIAL ADDRESS: 18SUJ565381(NAD 83)
 DJ8999_MARKER: F = FLANGE-ENCASED ROD
 DJ8999_SETTING: 49 = STAINLESS STEEL ROD W/O SLEEVE (10 FT.+)
 DJ8999_STAMPING: 560 2003
 DJ8999_PROJECTION: FLUSH
 DJ8999_MAGNETIC: I = MARKER IS A STEEL ROD
 DJ8999_STABILITY: B = PROBABLY HOLD POSITION/ELEVATION WELL
 DJ8999_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
 DJ8999+SATELLITE: SATELLITE OBSERVATIONS - November 27, 2007
 DJ8999
 DJ8999  HISTORY     - Date     Condition        Report By
 DJ8999  HISTORY     - 200305   MONUMENTED       WHBCXM
 DJ8999  HISTORY     - 20071127 GOOD             JARICE
```

SURVEYED BY:	**JMT ENGINEERING**	**SPARKS, MARYLAND**

BWI THURGOOD MARSHALL AIRPORT-SECONDARY SURVEY CONTROL DATA

NAME OF STATION:	MON-560	**DATE ESTABLISHED:**	MAY 2003
NGS PID:	**DJ8999**		READJUSTED JUNE 2008

DJ8999
DJ8999 STATION DESCRIPTION
DJ8999
DJ8999'DESCRIBED BY J A RICE INC 2007 (MRA)
DJ8999'THE MARK IS LOCATED ABOUT 4.0 MI (6.4 KM) SOUTHEAST OF RELAY, 3.6 MI
DJ8999'(5.8 KM) SOUTHEAST OF ELKRIDGE AND 3.5 MI (5.6 KM) EAST-SOUTHEAST OF
DJ8999'HANOVER AT BALTIMORE WASHINGTON INTERNATIONAL AIRPORT. CONTACT
DJ8999'AIRPORT OPERATIONS AT 410-859-7018 FOR ACCESS TO THE MARK.
DJ8999'
DJ8999'IT IS IN THE SOUTHEAST END OF A GRASS ISLAND BETWEEN TWO TAXIWAYS,
DJ8999'103.1 FT (31.4 M) NORTH-NORTHWEST OF A UTILITY MANHOLE, 92.5 FT (28.2
DJ8999'M) SOUTH-SOUTHEAST OF A SIGN, 67.3 FT (20.5 M) SOUTH OF A DRAINAGE
DJ8999'INLET, 59.0 FT (18.0 M) NORTHEAST OF THE NORTHEAST EDGE OF TAXIWAY 'A'
DJ8999'AND 37.2 FT (11.3 M) NORTH OF A SIGN.
DJ8999'
DJ8999'NOTE--ACCESS TO THE DATUM POINT IS THROUGH A 5-INCH (13 CM) LOGO CAP.

SURVEYED BY:	**JMT ENGINEERING**	**SPARKS, MARYLAND**

BWI THURGOOD MARSHALL AIRPORT-SECONDARY SURVEY CONTROL DATA

NAME OF STATION: MON-561
NGS PID: DJ8998
DATE ESTABLISHED: MAY 2003
READJUSTED JUNE 2008

MARYLAND STATE PLANE COORDINATES (NAD 83):

	NORTHING (Y):	552359.494 US ft.	168359.511 m
	EASTING (X):	1408073.444 US ft.	429181.644 m
*	**ORTHOMETRIC HEIGHT (NAVD 88):**	140.584 US ft.	42.850 m
	CONVERGENCE ANGLE:	00°12'43.14"	
	COMBINED SCALE FACTOR:	0.99996257	

GEOGRAPHIC COORDINATES (NAD 83):

LATITUDE:	39°10'58.28222" (N)		
LONGITUDE:	76°39'44.09397" (W)		
ELLIPSOID HT:	33.36 US ft.	10.168 m	

AVAILABLE CONVENTIONAL BACKSIGHT POINTS (COMPUTED DATA):

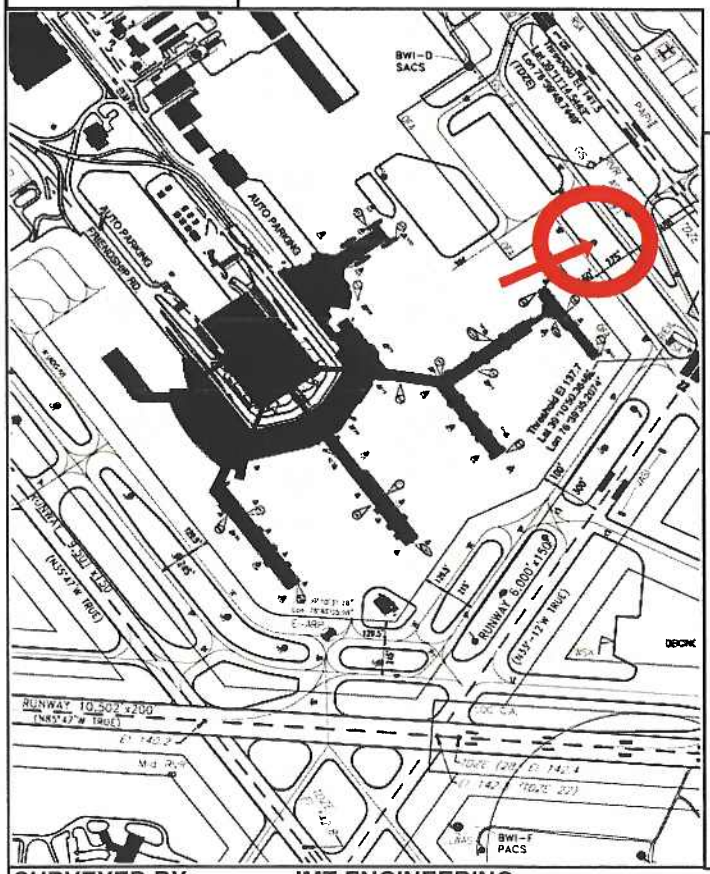
POINT	GEODETIC AZIMUTH	DISTANCE (US FT.)	DISTANCE (m)
MON-560	143°47'20.7'	840.79	256.273
MON-562	288°58'08.9'	1425.29	434.429
BWI D	327°19'25.6'	1473.10	449.003

STATION DESCRIPTION:

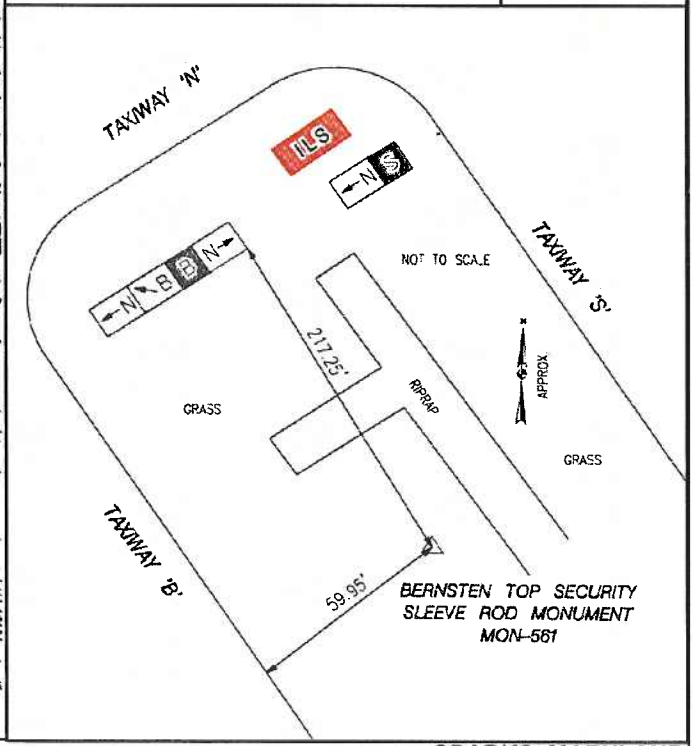
DRIVEN TO REFUSAL ROD MONUMENT
WITH BERSTEN TOP SECURITY SLEEVE & LID

* SEE ATTACHED NGS DATASHEETS

LOCATION PLAN



DETAIL MAP



SURVEYED BY: JMT ENGINEERING — SPARKS, MARYLAND

BWI THURGOOD MARSHALL AIRPORT-SECONDARY SURVEY CONTROL DATA

NAME OF STATION:	MON-561	**DATE ESTABLISHED:**	MAY 2003
NGS PID:	**DJ8998**		

SURVEYED BY:	**JMT ENGINEERING**	**SPARKS, MARYLAND**

BWI THURGOOD MARSHALL AIRPORT-SECONDARY SURVEY CONTROL DATA

NAME OF STATION:	MON-561	**DATE ESTABLISHED:**	MAY 2003
NGS PID:	**DJ8998**		READJUSTED JUNE 2008

```
1        National Geodetic Survey,   Retrieval Date = JUNE 24, 2008
 DJ8998 ***********************************************************************
 DJ8998  DESIGNATION -  561
 DJ8998  PID         -  DJ8998
 DJ8998  STATE/COUNTY-  MD/ANNE ARUNDEL
 DJ8998  USGS QUAD   -  RELAY (1974)
 DJ8998
 DJ8998                          *CURRENT SURVEY CONTROL
 DJ8998
 DJ8998* NAD 83(1986)-  39 10 58.      (N)     076 39 44.      (W)      SCALED
 DJ8998* NAVD 88      -         42.850  (meters)      140.58   (feet)   ADJUSTED
 DJ8998
 DJ8998  GEOID HEIGHT-          -32.68  (meters)                          GEOID03
 DJ8998  DYNAMIC HT  -           42.827 (meters)      140.51   (feet)   COMP
 DJ8998  MODELED GRAV-      980,094.1   (mgal)                            NAVD 88
 DJ8998
 DJ8998  VERT ORDER  -  FIRST     CLASS II
 DJ8998
 DJ8998.The horizontal coordinates were scaled from a topographic map and have
 DJ8998.an estimated accuracy of +/- 6 seconds.
 DJ8998
 DJ8998.The orthometric height was determined by differential leveling
 DJ8998.and adjusted in June 2008.
 DJ8998.No vertical observational check was made to the station.
 DJ8998
 DJ8998.The geoid height was determined by GEOID03.
 DJ8998
 DJ8998.The dynamic height is computed by dividing the NAVD 88
 DJ8998.geopotential number by the normal gravity value computed on the
 DJ8998.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
 DJ8998.degrees latitude (g = 980.6199 gals.).
 DJ8998
 DJ8998.The modeled gravity was interpolated from observed gravity values.
 DJ8998
 DJ8998;                      North         East      Units  Estimated Accuracy
 DJ8998;SPC MD        -   168,350.      429,180.       MT  (+/- 180 meters Scaled)
 DJ8998
 DJ8998                          SUPERSEDED SURVEY CONTROL
 DJ8998
 DJ8998.No superseded survey control is available for this station.
 DJ8998
 DJ8998_U.S. NATIONAL GRID SPATIAL ADDRESS: 18SUJ564383(NAD 83)
 DJ8998_MARKER: F = FLANGE-ENCASED ROD
 DJ8998_SETTING: 49 = STAINLESS STEEL ROD W/O SLEEVE (10 FT.+)
 DJ8998_STAMPING: 561 2003
 DJ8998_PROJECTION: FLUSH
 DJ8998_MAGNETIC: I = MARKER IS A STEEL ROD
 DJ8998_STABILITY: B = PROBABLY HOLD POSITION/ELEVATION WELL
 DJ8998_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
 DJ8998+SATELLITE: SATELLITE OBSERVATIONS - November 07, 2007
 DJ8998
 DJ8998  HISTORY     - Date     Condition        Report By
 DJ8998  HISTORY     - 200305   MONUMENTED       WHBCXM
 DJ8998  HISTORY     - 20071107 GOOD             JARICE
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SURVEYED BY:	**JMT ENGINEERING**		**SPARKS, MARYLAND**

BWI THURGOOD MARSHALL AIRPORT-SECONDARY SURVEY CONTROL DATA

NAME OF STATION:	MON-561	**DATE ESTABLISHED:**	MAY 2003
NGS PID:	**DJ8998**		READJUSTED JUNE 2008

DJ8998
DJ8998 STATION DESCRIPTION
DJ8998
DJ8998'DESCRIBED BY J A RICE INC 2007 (MRA)
DJ8998'THE MARK IS LOCATED ABOUT 3.8 MI (6.1 KM) SOUTHEAST OF RELAY, 3.4 MI
DJ8998'(5.5 KM) SOUTHEAST OF ELKRIDGE AND 3.4 MI (5.4 KM) EAST-SOUTHEAST OF
DJ8998'HANOVER AT BALTIMORE WASHINGTON INTERNATIONAL AIRPORT. CONTACT
DJ8998'AIRPORT OPERATIONS AT 410-859-7018 FOR ACCESS TO THE MARK.
DJ8998'
DJ8998'IT IS IN A GRASS ISLAND BETWEEN TWO TAXIWAYS AT THE WEST EDGE OF A
DJ8998'DITCH, 217.0 FT (66.1 M) SOUTH-SOUTHEAST OF A SIGN, 139.5 FT (42.5 M)
DJ8998'WEST-SOUTHWEST OF THE WEST-SOUTHWEST EDGE OF TAXIWAY 'S', 64.0 FT
DJ8998'(19.5 M) SOUTH-SOUTHEAST OF THE CENTERLINE OF RIPRAP, 59.6 FT (18.2 M)
DJ8998'EAST-NORTHEAST OF THE EAST-NORTHEAST EDGE OF TAXIWAY 'A' AND 53.4 FT
DJ8998'(16.3 M) WEST-SOUTHWEST OF THE WEST-SOUTHWEST CENTER OF A DRAINAGE
DJ8998'DITCH.
DJ8998'
DJ8998'NOTE--ACCESS TO THE DATUM POINT IS THROUGH A 5-INCH (13 CM) LOGO CAP.

SURVEYED BY:	**JMT ENGINEERING**	**SPARKS, MARYLAND**

BWI THURGOOD MARSHALL AIRPORT-SECONDARY SURVEY CONTROL DATA

NAME OF STATION: MON-562
NGS PID: DJ8997
DATE ESTABLISHED: MAY 2003
READJUSTED JUNE 2008

MARYLAND STATE PLANE COORDINATES (NAD 83):

NORTHING (Y):	552817.806 US ft.	168499.204 m
EASTING (X):	1406723.852 US ft.	428770.288 m
* **ORTHOMETRIC HEIGHT (NAVD 88):**	153.920 US ft.	46.915 m
CONVERGENCE ANGLE:	00°12'32.40"	
COMBINED SCALE FACTOR:	0.99996204	

GEOGRAPHIC COORDINATES (NAD 83):

LATITUDE:	39°11'02.86119" (N)	
LONGITUDE:	76°40'01.21248" (W)	
ELLIPSOID HT:	46.74 US ft.	14.246 m

AVAILABLE CONVENTIONAL BACKSIGHT POINTS (COMPUTED DATA):

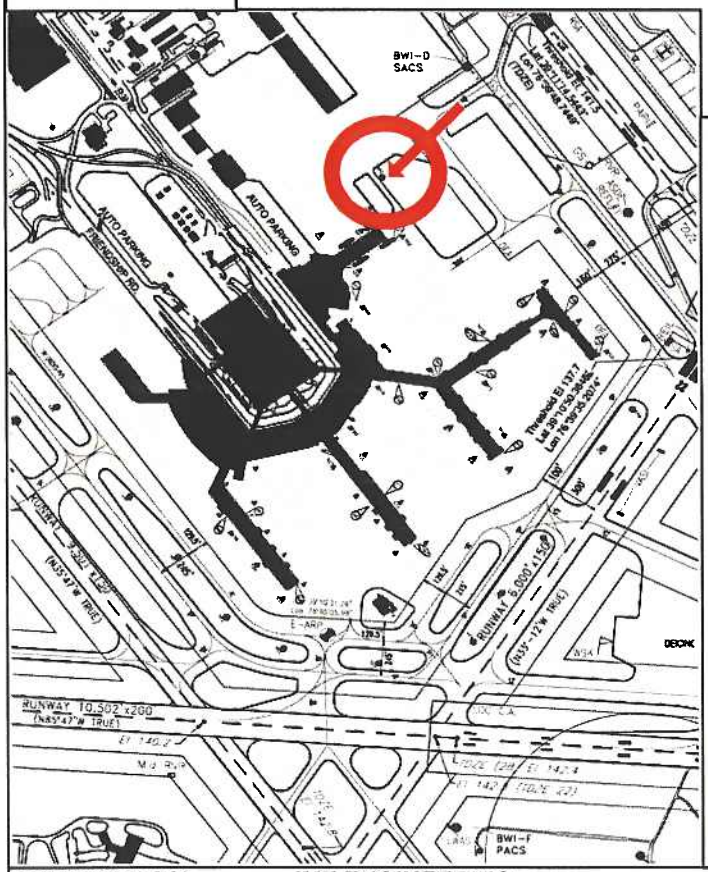
POINT	GEODETIC AZIMUTH	DISTANCE (US FT.)	DISTANCE (m)
MON-561	108°57'58.0'	1425.29	434.429
BWI D	35°25'39.6"	953.17	290.527

STATION DESCRIPTION:

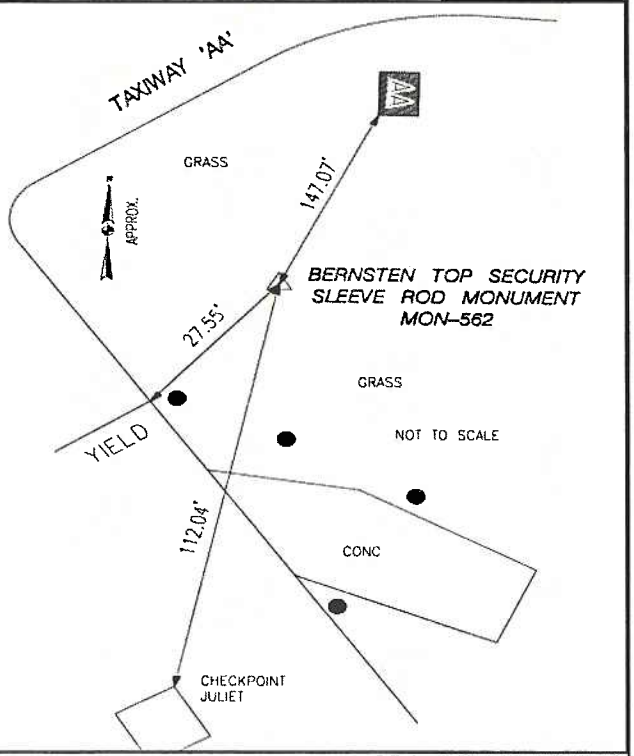
DRIVEN TO REFUSAL ROD MONUMENT
WITH BERSTEN TOP SECURITY SLEEVE & LID

* SEE ATTACHED NGS DATASHEETS

LOCATION PLAN



DETAIL MAP



SURVEYED BY: JMT ENGINEERING — **SPARKS, MARYLAND**

BWI THURGOOD MARSHALL AIRPORT-SECONDARY SURVEY CONTROL DATA

NAME OF STATION: MON-562	**DATE ESTABLISHED:** MAY 2003
NGS PID: DJ8997	

SURVEYED BY:	**JMT ENGINEERING**	**SPARKS, MARYLAND**

BWI THURGOOD MARSHALL AIRPORT-SECONDARY SURVEY CONTROL DATA

NAME OF STATION:	MON-562	**DATE ESTABLISHED:**	MAY 2003
NGS PID:	**DJ8997**		READJUSTED JUNE 2008

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1        National Geodetic Survey,   Retrieval Date = JUNE 24, 2008
 DJ8997 ***********************************************************************
 DJ8997  DESIGNATION -  562
 DJ8997  PID         -  DJ8997
 DJ8997  STATE/COUNTY-  MD/ANNE ARUNDEL
 DJ8997  USGS QUAD   -  RELAY (1974)
 DJ8997
 DJ8997                          *CURRENT SURVEY CONTROL
 DJ8997
 DJ8997* NAD 83(1986)-  39 11 02.      (N)     076 40 01.      (W)      SCALED
 DJ8997* NAVD 88     -         46.915  (meters)      153.92    (feet)   ADJUSTED
 DJ8997
 DJ8997  GEOID HEIGHT-          -32.67  (meters)                         GEOID03
 DJ8997  DYNAMIC HT  -           46.890 (meters)      153.84   (feet)   COMP
 DJ8997  MODELED GRAV-      980,094.6   (mgal)                           NAVD 88
 DJ8997
 DJ8997  VERT ORDER  -  FIRST     CLASS II
 DJ8997
 DJ8997.The horizontal coordinates were scaled from a topographic map and have
 DJ8997.an estimated accuracy of +/- 6 seconds.
 DJ8997
 DJ8997.The orthometric height was determined by differential leveling
 DJ8997.and adjusted in June 2008.
 DJ8997.No vertical observational check was made to the station.
 DJ8997
 DJ8997.The geoid height was determined by GEOID03.
 DJ8997
 DJ8997.The dynamic height is computed by dividing the NAVD 88
 DJ8997.geopotential number by the normal gravity value computed on the
 DJ8997.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
 DJ8997.degrees latitude (g = 980.6199 gals.).
 DJ8997
 DJ8997.The modeled gravity was interpolated from observed gravity values.
 DJ8997
 DJ8997;                    North         East     Units  Estimated Accuracy
 DJ8997;SPC MD        -   168,470.      428,780.      MT  (+/- 180 meters Scaled)
 DJ8997
 DJ8997                           SUPERSEDED SURVEY CONTROL
 DJ8997
 DJ8997.No superseded survey control is available for this station.
 DJ8997
 DJ8997_U.S. NATIONAL GRID SPATIAL ADDRESS: 18SUJ560385(NAD 83)
 DJ8997_MARKER: F = FLANGE-ENCASED ROD
 DJ8997_SETTING: 49 = STAINLESS STEEL ROD W/O SLEEVE (10 FT.+)
 DJ8997_STAMPING: 562 2003
 DJ8997_PROJECTION: FLUSH
 DJ8997_MAGNETIC: I = MARKER IS A STEEL ROD
 DJ8997_STABILITY: B = PROBABLY HOLD POSITION/ELEVATION WELL
 DJ8997_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
 DJ8997+SATELLITE: SATELLITE OBSERVATIONS - November 07, 2007
 DJ8997
 DJ8997  HISTORY     - Date     Condition        Report By
 DJ8997  HISTORY     - 200305   MONUMENTED       WHBCXM
 DJ8997  HISTORY     - 20071107 GOOD             JARICE
```

SURVEYED BY:	**JMT ENGINEERING**		**SPARKS, MARYLAND**

BWI THURGOOD MARSHALL AIRPORT-SECONDARY SURVEY CONTROL DATA

NAME OF STATION:	MON-562	**DATE ESTABLISHED:**	MAY 2003
NGS PID:	**DJ8997**		READJUSTED JUNE 2008

DJ8997
DJ8997 STATION DESCRIPTION
DJ8997
DJ8997'DESCRIBED BY J A RICE INC 2007 (MRA)
DJ8997'THE MARK IS LOCATED ABOUT 3.6 MI (5.8 KM) SOUTH-SOUTHEAST OF RELAY,
DJ8997'3.2 MI (5.1 KM) SOUTHEAST OF ELKRIDGE AND 3.1 MI (5.0 KM) EAST OF
DJ8997'HANOVER AT BALTIMORE WASHINGTON INTERNATIONAL AIRPORT. CONTACT
DJ8997'AIRPORT OPERATIONS AT 410-859-7018 FOR ACCESS TO THE MARK.
DJ8997'
DJ8997'IT IS 112.5 FT (34.3 M) NORTH OF THE NORTH CORNER OF THE GUARD SHACK
DJ8997'(CHECK POINT JULIET), 107.0 FT (32.6 M) NORTHWEST OF A CHAIN LINK
DJ8997'FENCE, 93.8 FT (28.6 M) NORTH-NORTHWEST OF AN ELECTRICAL TRANSFORMER
DJ8997'NUMBERED 86-035 30 021 A, 37.5 FT (11.4 M) NORTHEAST OF THE CENTERLINE
DJ8997'OF A SERVICE ROAD, 36.4 FT (11.1 M) WEST OF THE NORTHEAST END OF A
DJ8997'CONCRETE DRAINAGE PIPE AND ABOUT LEVEL WITH THE SERVICE ROAD.
DJ8997'
DJ8997'NOTE--ACCESS TO THE DATUM POINT IS THROUGH A 5-INCH (13 CM) LOGO CAP.

SURVEYED BY:	**JMT ENGINEERING**	**SPARKS, MARYLAND**

BWI THURGOOD MARSHALL AIRPORT-RUNWAY CENTERLINE MONUMENTS

NAME OF STATION: MAA-100
NGS PID:

DATE ESTABLISHED: OCTOBER 2007

MARYLAND STATE PLANE COORDINATES (NAD 83):

NORTHING (Y):
EASTING (X):
ORTHOMETRIC HEIGHT (NAVD 88):
CONVERGENCE ANGLE:
COMBINED SCALE FACTOR:

GEOGRAPHIC COORDINATES (NAD 83):

LATITUDE:	39° 11' 08.26" (N)	
LONGITUDE:	76° 40' 56.17" (W)	
ELLIPSOID HT:	29 US ft.	8.9 m

AVAILABLE CONVENTIONAL BACKSIGHT POINTS (COMPUTED DATA):

POINT	GEODETIC AZIMUTH	DISTANCE (US FT.)	DISTANCE (m)
MAA-101		245	74.7

RUNWAY 15R-33L

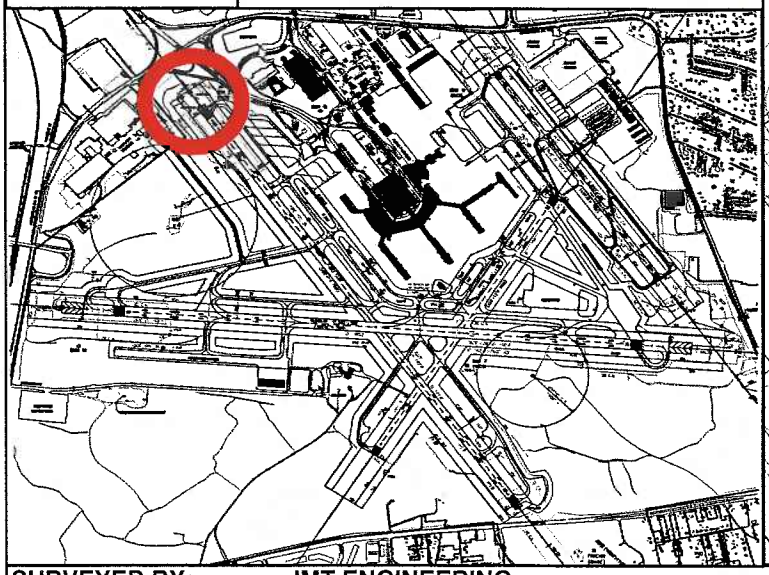
STATION DESCRIPTION:

*** SHALL NOT BE OCCUPIED FOR SURVEY CONTROL. THIS POINT IS INTENDED FOR RECOVERY OF THE RUNWAY CENTERLINE ONLY ***

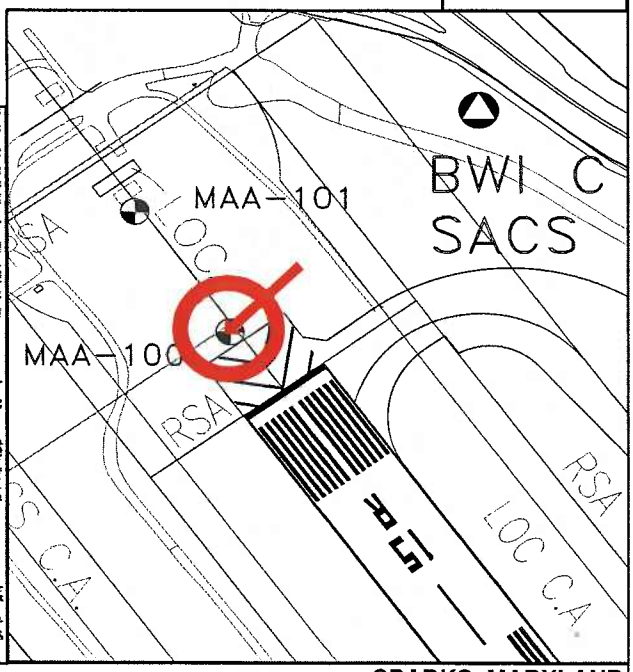
OFFSET 10' RIGHT
RUNWAY 15R
±25' FROM END OF
RUNWAY PAVING

FOR NAVGATION PURPOSES ONLY
NORTHING 553348.7 US ft.+/-
EASTING 1402394.4 US ft.+/-

LOCATION PLAN



DETAIL MAP



SURVEYED BY: JMT ENGINEERING

SPARKS, MARYLAND

BWI THURGOOD MARSHALL AIRPORT-RUNWAY CENTERLINE MONUMENTS

NAME OF STATION: MAA-101
NGS PID:

DATE ESTABLISHED: OCTOBER 2007

MARYLAND STATE PLANE COORDINATES (NAD 83):

NORTHING (Y):
EASTING (X):
ORTHOMETRIC HEIGHT (NAVD 88):
CONVERGENCE ANGLE:
COMBINED SCALE FACTOR:

GEOGRAPHIC COORDINATES (NAD 83):

LATITUDE:	39° 11' 10.23" (N)	
LONGITUDE:	76° 40' 57.99" (W)	
ELLIPSOID HT:	23 US ft.	6.9 m

AVAILABLE CONVENTIONAL BACKSIGHT POINTS (COMPUTED DATA):

POINT	GEODETIC AZIMUTH	DISTANCE (US FT.)	DISTANCE (m)
MAA-100		245	74.7

RUNWAY 15R-33L

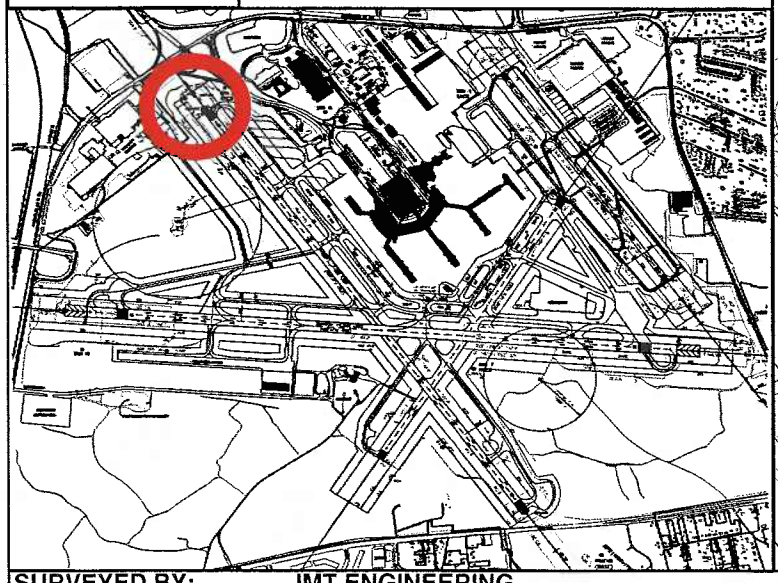
STATION DESCRIPTION:

***** SHALL NOT BE OCCUPIED FOR SURVEY CONTROL. THIS POINT IS INTENDED FOR RECOVERY OF THE RUNWAY CENTERLINE ONLY *****

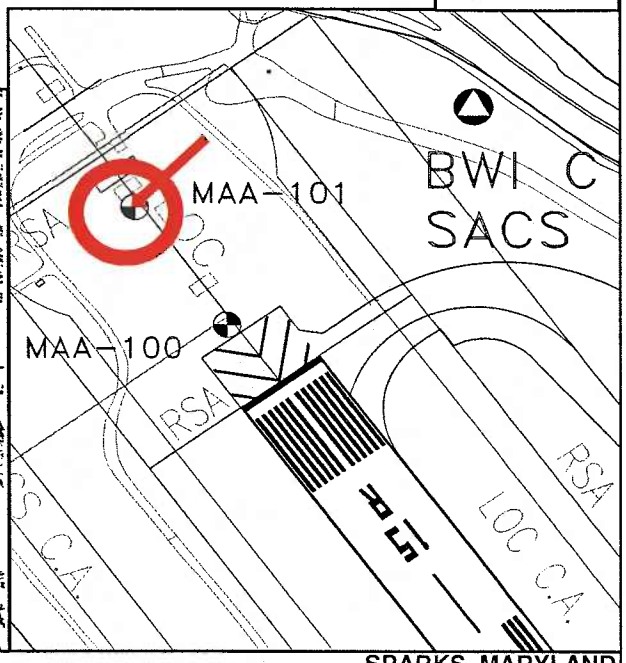
OFFSET 10' RIGHT
RUNWAY 15R
±270' FROM END OF
RUNWAY PAVING

FOR NAVGATION PURPOSES ONLY
NORTHING 553547.0 US ft.+/-
EASTING 1402250.5 US ft.+/-

LOCATION PLAN



DETAIL MAP



SURVEYED BY: JMT ENGINEERING — SPARKS, MARYLAND

BWI THURGOOD MARSHALL AIRPORT-RUNWAY CENTERLINE MONUMENTS

NAME OF STATION: MAA-102
NGS PID:
DATE ESTABLISHED: OCTOBER 2007

MARYLAND STATE PLANE COORDINATES (NAD 83):

NORTHING (Y):
EASTING (X):
ORTHOMETRIC HEIGHT (NAVD 88):
CONVERGENCE ANGLE:
COMBINED SCALE FACTOR:

GEOGRAPHIC COORDINATES (NAD 83):

LATITUDE:	39° 09' 50.17" (N)	
LONGITUDE:	76° 39' 43.67" (W)	
ELLIPSOID HT:	21 US ft.	6.4 m

AVAILABLE CONVENTIONAL BACKSIGHT POINTS (COMPUTED DATA):

POINT	GEODETIC AZIMUTH	DISTANCE (US FT.)	DISTANCE (m)
MAA-103		200	61.0

RUNWAY 15R-33L

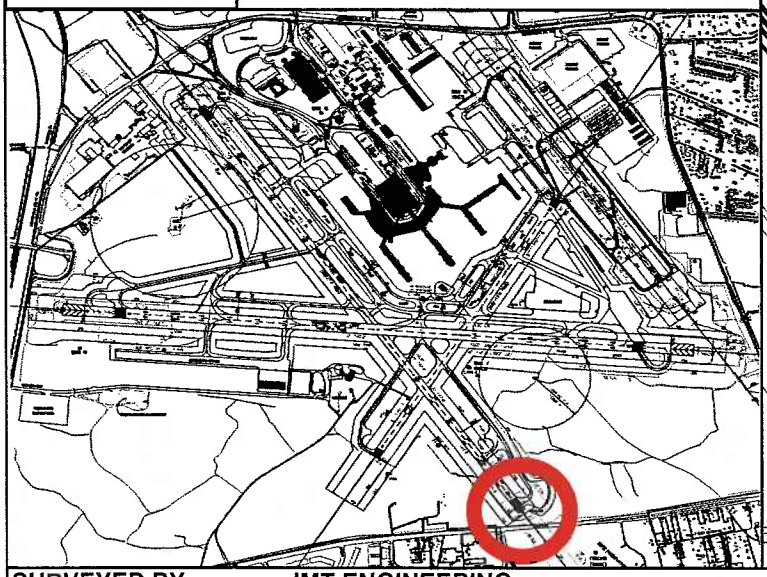
STATION DESCRIPTION:

***** SHALL NOT BE OCCUPIED FOR SURVEY CONTROL. THIS POINT IS INTENDED FOR RECOVERY OF THE RUNWAY CENTERLINE ONLY *****

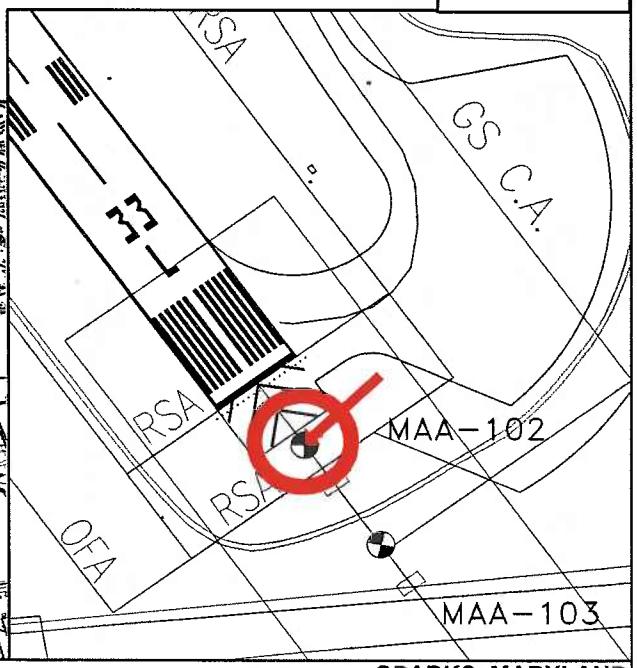
CENTERLINE
RUNWAY 33L
±50' FROM END OF
RUNWAY PAVING

LOCATION PLAN

FOR NAVGATION PURPOSES ONLY
NORTHING 545468.4 US ft.+/-
EASTING 1408132.0 US ft.+/-



DETAIL MAP



SURVEYED BY: JMT ENGINEERING — SPARKS, MARYLAND

BWI THURGOOD MARSHALL AIRPORT-RUNWAY CENTERLINE MONUMENTS

NAME OF STATION: MAA-103
NGS PID:

DATE ESTABLISHED: OCTOBER 2007

MARYLAND STATE PLANE COORDINATES (NAD 83):

NORTHING (Y):
EASTING (X):
ORTHOMETRIC HEIGHT (NAVD 88):
CONVERGENCE ANGLE:
COMBINED SCALE FACTOR:

GEOGRAPHIC COORDINATES (NAD 83):

LATITUDE:	39° 09' 48.56" (N)	
LONGITUDE:	76° 39' 42.19" (W)	
ELLIPSOID HT:	13 US ft.	3.9 m

AVAILABLE CONVENTIONAL BACKSIGHT POINTS (COMPUTED DATA):

POINT	GEODETIC AZIMUTH	DISTANCE (US FT.)	DISTANCE (m)
MAA-102		200	61.0

RUNWAY 15R-33L

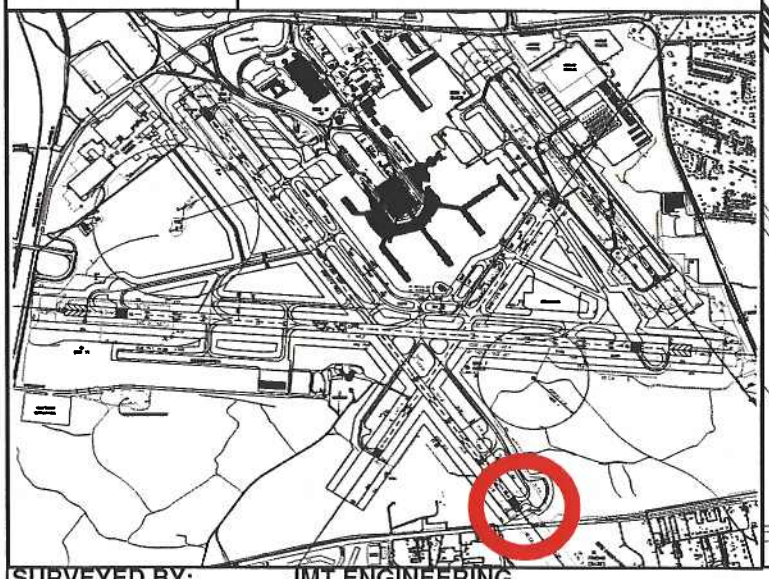
STATION DESCRIPTION:

***** SHALL NOT BE OCCUPIED FOR SURVEY CONTROL. THIS POINT IS INTENDED FOR RECOVERY OF THE RUNWAY CENTERLINE ONLY *****

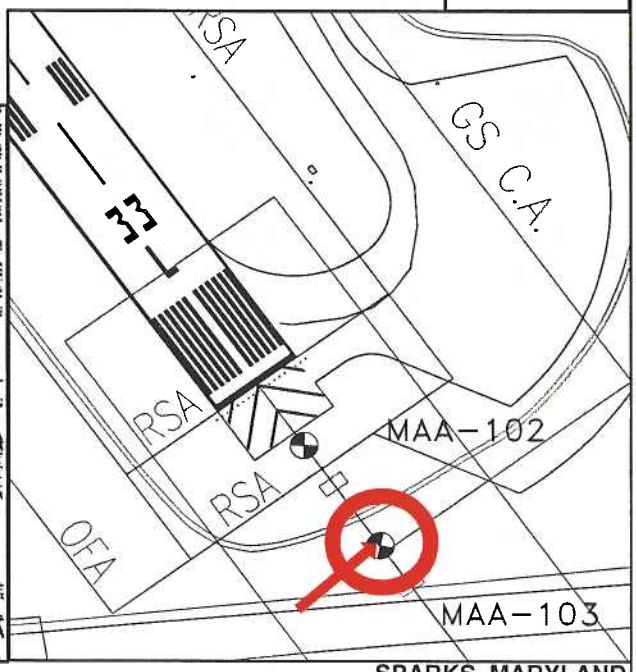
CENTERLINE
RUNWAY 33L
±250' FROM END OF
RUNWAY PAVING

FOR NAVGATION PURPOSES ONLY
NORTHING 545306.6 US ft.+/-
EASTING 1408249.5 US ft.+/-

LOCATION PLAN



DETAIL MAP



SURVEYED BY: JMT ENGINEERING

SPARKS, MARYLAND

BWI THURGOOD MARSHALL AIRPORT-RUNWAY CENTERLINE MONUMENTS

NAME OF STATION: MAA-104
NGS PID:
DATE ESTABLISHED: OCTOBER 2007

MARYLAND STATE PLANE COORDINATES (NAD 83):

NORTHING (Y):
EASTING (X):
ORTHOMETRIC HEIGHT (NAVD 88):
CONVERGENCE ANGLE:
COMBINED SCALE FACTOR:

GEOGRAPHIC COORDINATES (NAD 83):

LATITUDE:	39° 10' 21.26" (N)	
LONGITUDE:	76° 39' 04.24" (W)	
ELLIPSOID HT:	14 US ft.	4.2 m

AVAILABLE CONVENTIONAL BACKSIGHT POINTS (COMPUTED DATA):

POINT	GEODETIC AZIMUTH	DISTANCE (US FT.)	DISTANCE (m)
MAA-105		350	106.7

RUNWAY 10-28

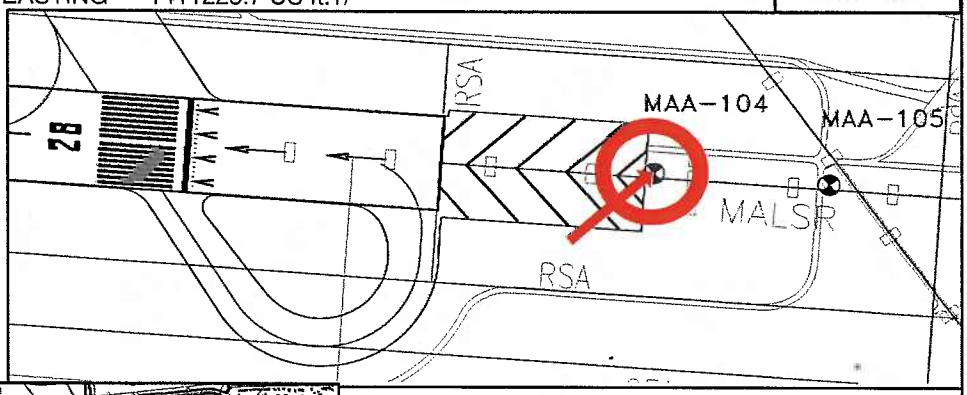
STATION DESCRIPTION:

***** SHALL NOT BE OCCUPIED FOR SURVEY CONTROL. THIS POINT IS INTENDED FOR RECOVERY OF THE RUNWAY CENTERLINE ONLY *****

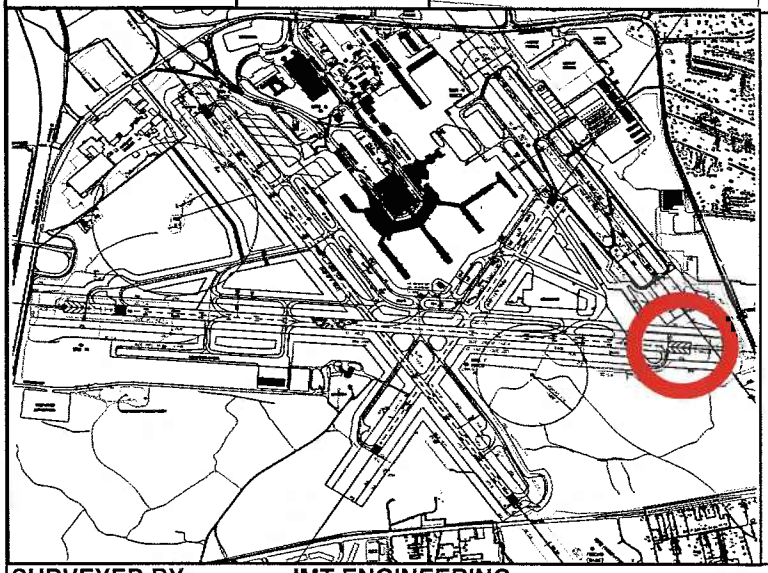
FOR NAVG/ FOR NAVGATION PURPOSES ONLY
NORTHING 548626.2 US ft.+/-
EASTING 1411225.7 US ft.+/-

OFFSET 10' RIGHT RUNWAY 28 ±16' FROM END OF RUNWAY PAVING

DETAIL MAP



LOCATION PLAN



SURVEYED BY: JMT ENGINEERING — SPARKS, MARYLAND

BWI THURGOOD MARSHALL AIRPORT-RUNWAY CENTERLINE MONUMENTS

NAME OF STATION: MAA-105 | **DATE ESTABLISHED:** OCTOBER 2007

NGS PID:

MARYLAND STATE PLANE COORDINATES (NAD 83):

NORTHING (Y):

EASTING (X):

ORTHOMETRIC HEIGHT (NAVD 88):

CONVERGENCE ANGLE:

COMBINED SCALE FACTOR:

GEOGRAPHIC COORDINATES (NAD 83):

LATITUDE:	39° 10' 21.01" (N)	
LONGITUDE:	76° 38' 59.81" (W)	
ELLIPSOID HT:	10 US ft.	3.1 m

AVAILABLE CONVENTIONAL BACKSIGHT POINTS (COMPUTED DATA):

POINT	GEODETIC AZIMUTH	DISTANCE (US FT.)	DISTANCE (m)
MAA-104		350	106.7

RUNWAY 10-28

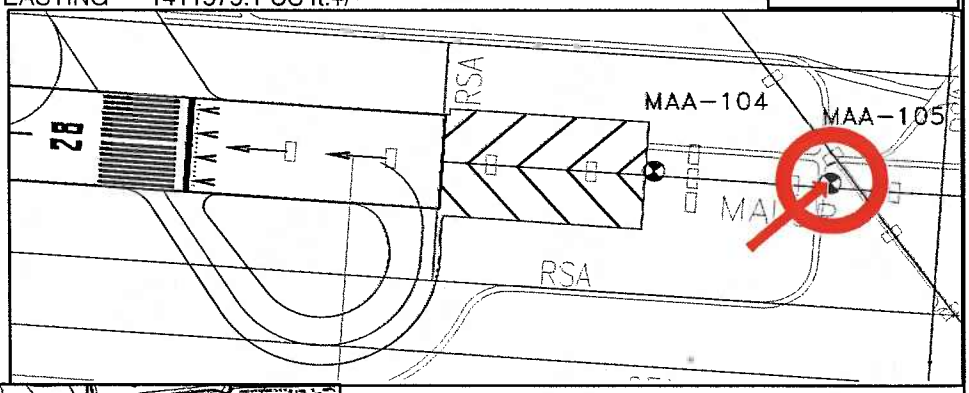
STATION DESCRIPTION:

***** SHALL NOT BE OCCUPIED FOR SURVEY CONTROL. THIS POINT IS INTENDED FOR RECOVERY OF THE RUNWAY CENTERLINE ONLY *****

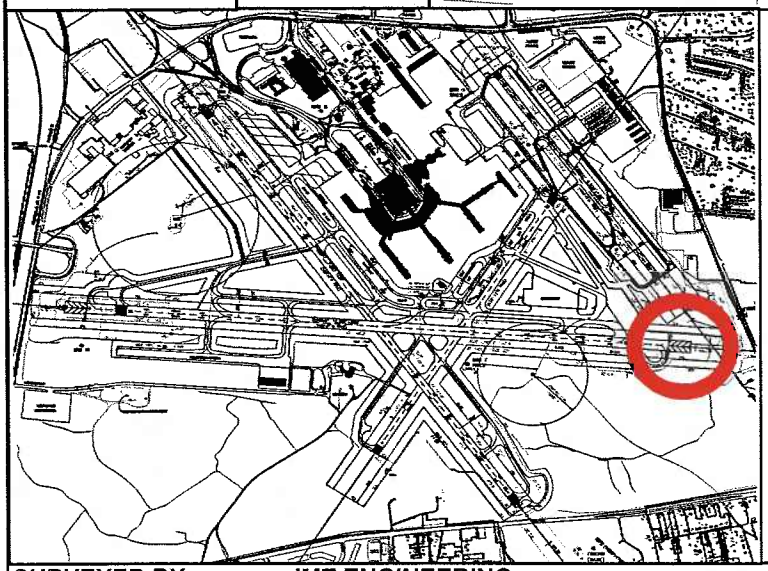
FOR NAVGATION PURPOSES ONLY
NORTHING 548601.8 US ft.+/-
EASTING 1411575.1 US ft.+/-

OFFSET 10' RIGHT RUNWAY 28 ±366' FROM END OF RUNWAY PAVING

DETAIL MAP



LOCATION PLAN



SURVEYED BY: JMT ENGINEERING — SPARKS, MARYLAND

BWI THURGOOD MARSHALL AIRPORT-RUNWAY CENTERLINE MONUMENTS

NAME OF STATION: MAA-106
NGS PID:

DATE ESTABLISHED: OCTOBER 2007

MARYLAND STATE PLANE COORDINATES (NAD 83):

NORTHING (Y):
EASTING (X):
ORTHOMETRIC HEIGHT (NAVD 88):
CONVERGENCE ANGLE:
COMBINED SCALE FACTOR:

GEOGRAPHIC COORDINATES (NAD 83):

LATITUDE:	39° 10' 29.71" (N)	
LONGITUDE:	76° 41' 27.98" (W)	
ELLIPSOID HT:	29 US ft.	8.9 m

AVAILABLE CONVENTIONAL BACKSIGHT POINTS (COMPUTED DATA):

POINT	GEODETIC AZIMUTH	DISTANCE (US FT.)	DISTANCE (m)
MAA-107		250	76.2

RUNWAY 10-28

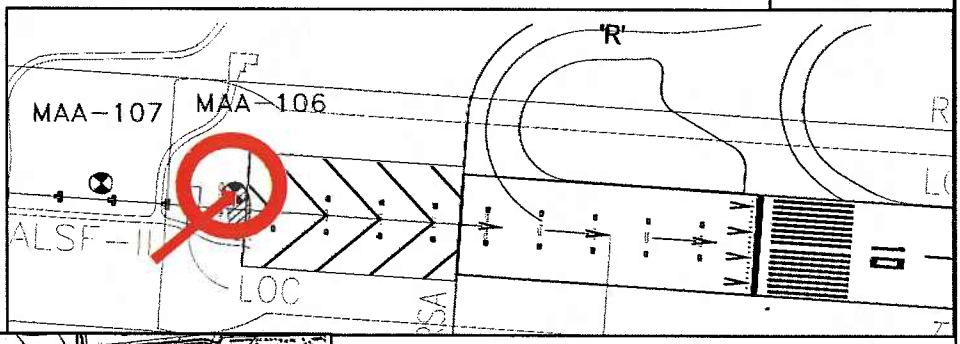
STATION DESCRIPTION:

***** SHALL NOT BE OCCUPIED FOR SURVEY CONTROL. THIS POINT IS INTENDED FOR RECOVERY OF THE RUNWAY CENTERLINE ONLY *****

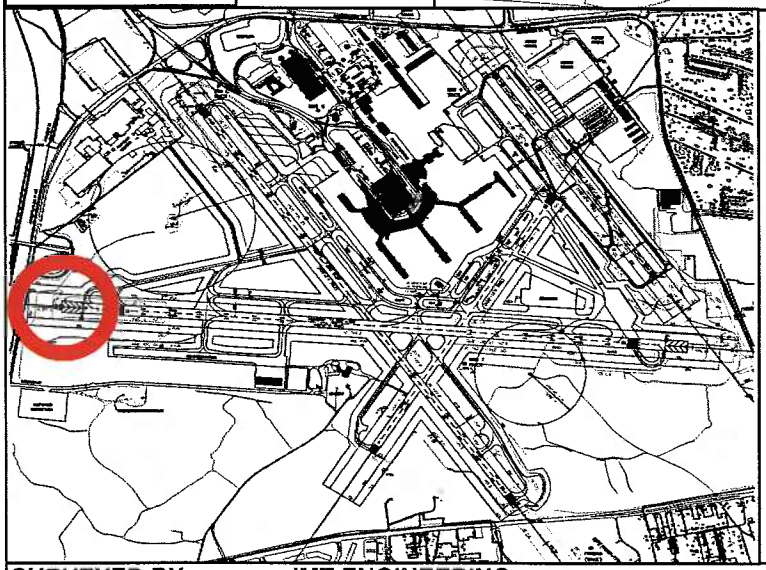
FOR NAVGATION PURPOSES ONLY
NORTHING 549440.1 US ft.+/-
EASTING 1399902.9 US ft.+/-

OFFSET 32' LEFT RUNWAY 10 ±23' FROM END OF RUNWAY PAVING

DETAIL MAP



LOCATION PLAN



SURVEYED BY: JMT ENGINEERING — SPARKS, MARYLAND

BWI THURGOOD MARSHALL AIRPORT-RUNWAY CENTERLINE MONUMENTS

NAME OF STATION: MAA-107
NGS PID:
DATE ESTABLISHED: OCTOBER 2007

MARYLAND STATE PLANE COORDINATES (NAD 83):

NORTHING (Y):
EASTING (X):
ORTHOMETRIC HEIGHT (NAVD 88):
CONVERGENCE ANGLE:
COMBINED SCALE FACTOR:

GEOGRAPHIC COORDINATES (NAD 83):

LATITUDE:	39° 10' 29.89" (N)	
LONGITUDE:	76° 41' 31.15" (W)	
ELLIPSOID HT:	25 US ft.	7.7 m

AVAILABLE CONVENTIONAL BACKSIGHT POINTS (COMPUTED DATA):

POINT	GEODETIC AZIMUTH	DISTANCE (US FT.)	DISTANCE (m)
MAA-106		250	76.2

RUNWAY 10-28

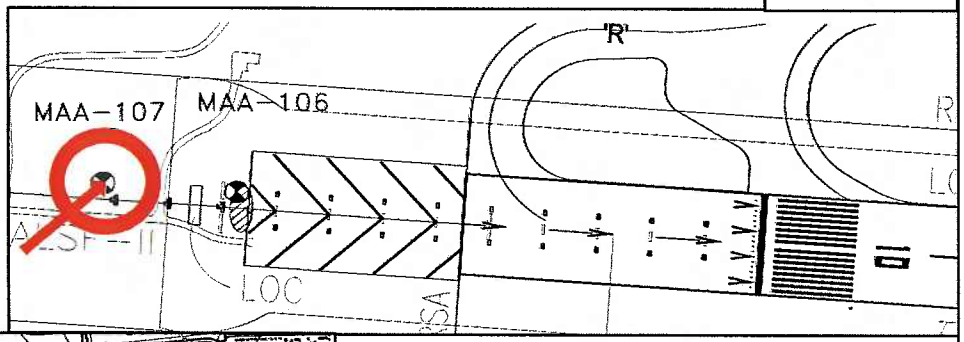
STATION DESCRIPTION:

***** SHALL NOT BE OCCUPIED FOR SURVEY CONTROL. THIS POINT IS INTENDED FOR RECOVERY OF THE RUNWAY CENTERLINE ONLY *****

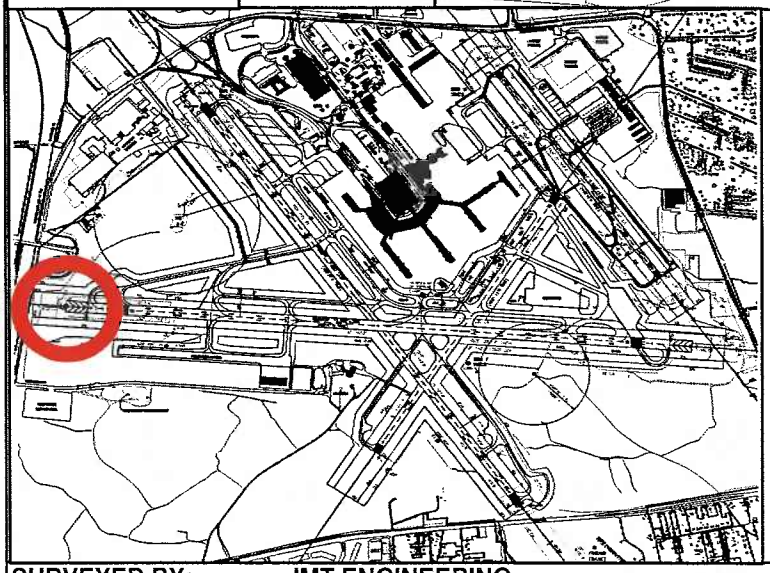
FOR NAVGATION PURPOSES ONLY
NORTHING 549457.5 US ft.+/-
EASTING 1399653.6 US ft.+/-

OFFSET 32'LEFT
RUNWAY 10
±273' FROM END OF
RUNWAY PAVING

DETAIL MAP



LOCATION PLAN



SURVEYED BY: JMT ENGINEERING — SPARKS, MARYLAND

BWI THURGOOD MARSHALL AIRPORT-RUNWAY CENTERLINE MONUMENTS

NAME OF STATION: MAA-108
NGS PID:
DATE ESTABLISHED: OCTOBER 2007

MARYLAND STATE PLANE COORDINATES (NAD 83):

NORTHING (Y):
EASTING (X):
ORTHOMETRIC HEIGHT (NAVD 88):
CONVERGENCE ANGLE:
COMBINED SCALE FACTOR:

GEOGRAPHIC COORDINATES (NAD 83):

LATITUDE:	39° 10' 00.46" (N)	
LONGITUDE:	76° 40' 17.17" (W)	
ELLIPSOID HT:	38 US ft.	11.6 m

AVAILABLE CONVENTIONAL BACKSIGHT POINTS (COMPUTED DATA):

POINT	GEODETIC AZIMUTH	DISTANCE (US FT.)	DISTANCE (m)
MAA-109		225	68.5

RUNWAY 4-22

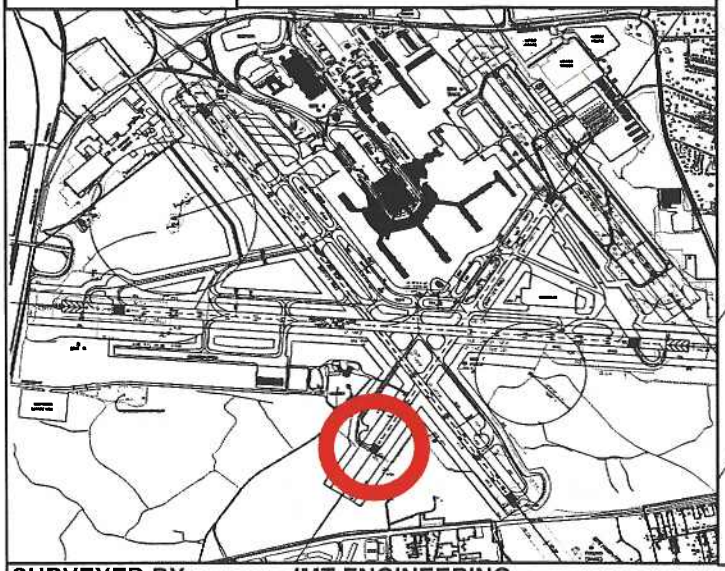
STATION DESCRIPTION:

***** SHALL NOT BE OCCUPIED FOR SURVEY CONTROL. THIS POINT IS INTENDED FOR RECOVERY OF THE RUNWAY CENTERLINE ONLY *****

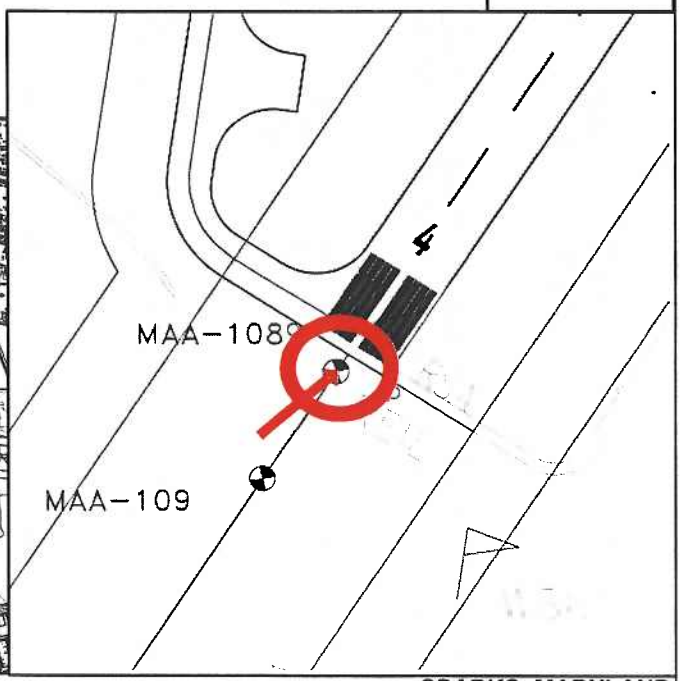
CENTERLINE
RUNWAY 4
±36' FROM END OF
RUNWAY PAVING

FOR NAVGATION PURPOSES ONLY
NORTHING 546500.3 US ft.+/-
EASTING 1405489.7 US ft.+/-

LOCATION PLAN



DETAIL MAP



SURVEYED BY: JMT ENGINEERING — SPARKS, MARYLAND

BWI THURGOOD MARSHALL AIRPORT-RUNWAY CENTERLINE MONUMENTS

NAME OF STATION: MAA-109
NGS PID:
DATE ESTABLISHED: OCTOBER 2007

MARYLAND STATE PLANE COORDINATES (NAD 83):

NORTHING (Y):
EASTING (X):
ORTHOMETRIC HEIGHT (NAVD 88):
CONVERGENCE ANGLE:
COMBINED SCALE FACTOR:

GEOGRAPHIC COORDINATES (NAD 83):

LATITUDE:	39° 09' 58.60" (N)	
LONGITUDE:	76° 40' 18.74" (W)	
ELLIPSOID HT:	37 US ft.	11.2 m

AVAILABLE CONVENTIONAL BACKSIGHT POINTS (COMPUTED DATA):

POINT	GEODETIC AZIMUTH	DISTANCE (US FT.)	DISTANCE (m)
MAA-108		225	68.5

RUNWAY 4-22

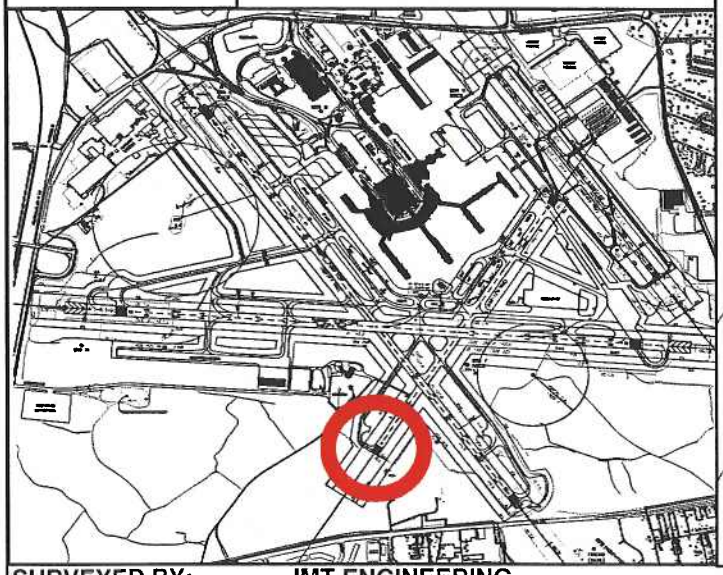
STATION DESCRIPTION:

*** SHALL NOT BE OCCUPIED FOR SURVEY CONTROL. THIS POINT IS INTENDED FOR RECOVERY OF THE RUNWAY CENTERLINE ONLY ***

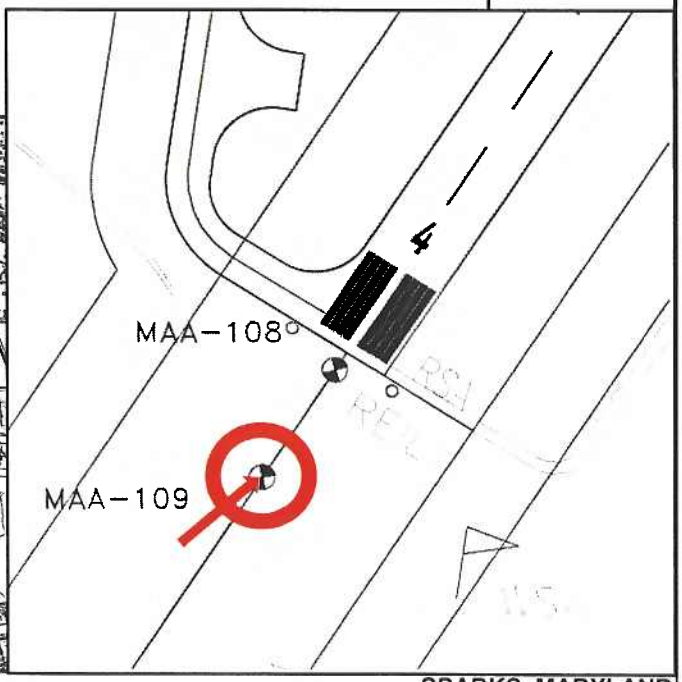
CENTERLINE
RUNWAY 4
±261' FROM END OF
RUNWAY PAVING

FOR NAVGATION PURPOSES ONLY
NORTHING 546311.7 US ft.+/-
EASTING 1405367.4 US ft.+/-

LOCATION PLAN



DETAIL MAP



SURVEYED BY: JMT ENGINEERING — SPARKS, MARYLAND

BWI THURGOOD MARSHALL AIRPORT-RUNWAY CENTERLINE MONUMENTS

NAME OF STATION: MAA-110
NGS PID:
DATE ESTABLISHED: OCTOBER 2007

MARYLAND STATE PLANE COORDINATES (NAD 83):

NORTHING (Y):
EASTING (X):
ORTHOMETRIC HEIGHT (NAVD 88):
CONVERGENCE ANGLE:
COMBINED SCALE FACTOR:

GEOGRAPHIC COORDINATES (NAD 83):

LATITUDE:	39° 10' 34.19" (N)	
LONGITUDE:	76° 39' 11.39" (W)	
ELLIPSOID HT:	5 US ft.	1.7 m

AVAILABLE CONVENTIONAL BACKSIGHT POINTS (COMPUTED DATA):

POINT	GEODETIC AZIMUTH	DISTANCE (US FT.)	DISTANCE (m)
MAA-111		250	76.2

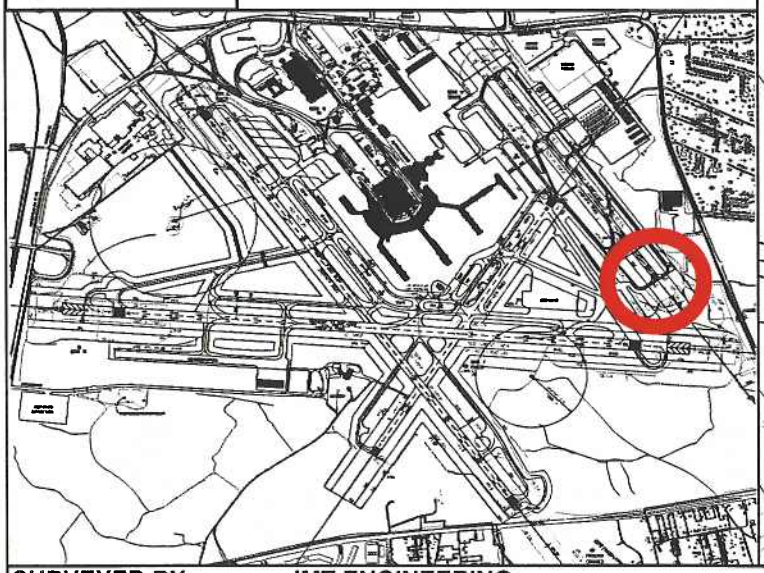
RUNWAY 15L-33R

STATION DESCRIPTION:

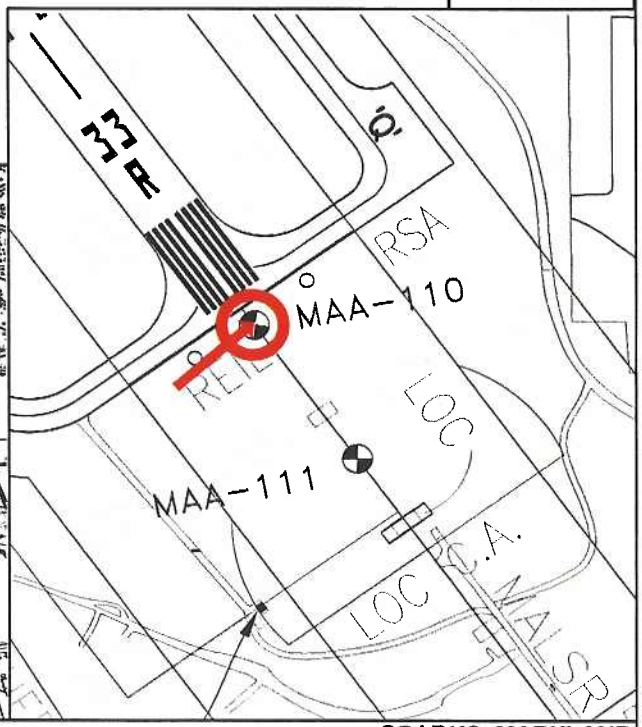
***** SHALL NOT BE OCCUPIED FOR SURVEY CONTROL. THIS POINT IS INTENDED FOR RECOVERY OF THE RUNWAY CENTERLINE ONLY *****

FOR NAVGATION PURPOSES ONLY
NORTHING 549931.3 US ft.+/-
EASTING 1410658.0 US ft.+/-

LOCATION PLAN



DETAIL MAP



SURVEYED BY: JMT ENGINEERING — SPARKS, MARYLAND

BWI THURGOOD MARSHALL AIRPORT-RUNWAY CENTERLINE MONUMENTS

NAME OF STATION: MAA-111
NGS PID:
DATE ESTABLISHED: OCTOBER 2007

MARYLAND STATE PLANE COORDINATES (NAD 83):

NORTHING (Y):
EASTING (X):
ORTHOMETRIC HEIGHT (NAVD 88):
CONVERGENCE ANGLE:
COMBINED SCALE FACTOR:

GEOGRAPHIC COORDINATES (NAD 83):

LATITUDE:	39° 10' 32.18" (N)	
LONGITUDE:	76° 39' 09.53" (W)	
ELLIPSOID HT:	0 US ft.	0.1 m

AVAILABLE CONVENTIONAL BACKSIGHT POINTS (COMPUTED DATA):

POINT	GEODETIC AZIMUTH	DISTANCE (US FT.)	DISTANCE (m)
MAA-110		250	76.2

RUNWAY 15L-33R

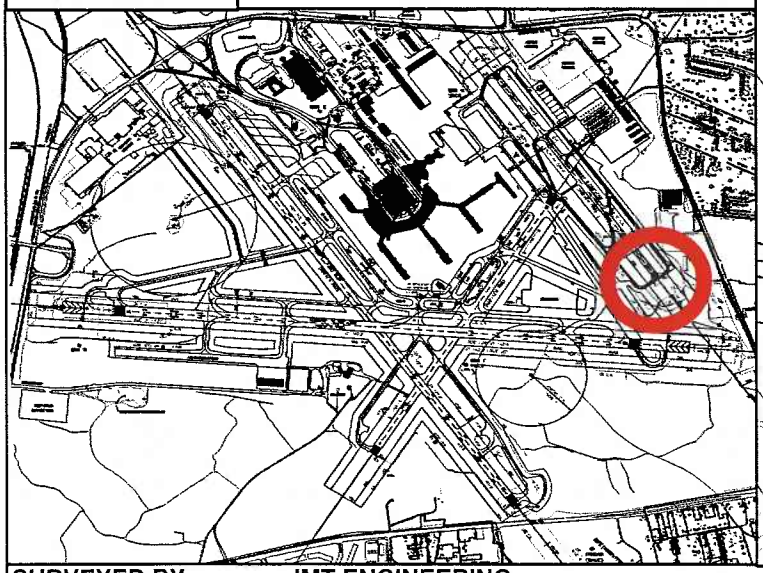
STATION DESCRIPTION:

***** SHALL NOT BE OCCUPIED FOR SURVEY CONTROL. THIS POINT IS INTENDED FOR RECOVERY OF THE RUNWAY CENTERLINE ONLY *****

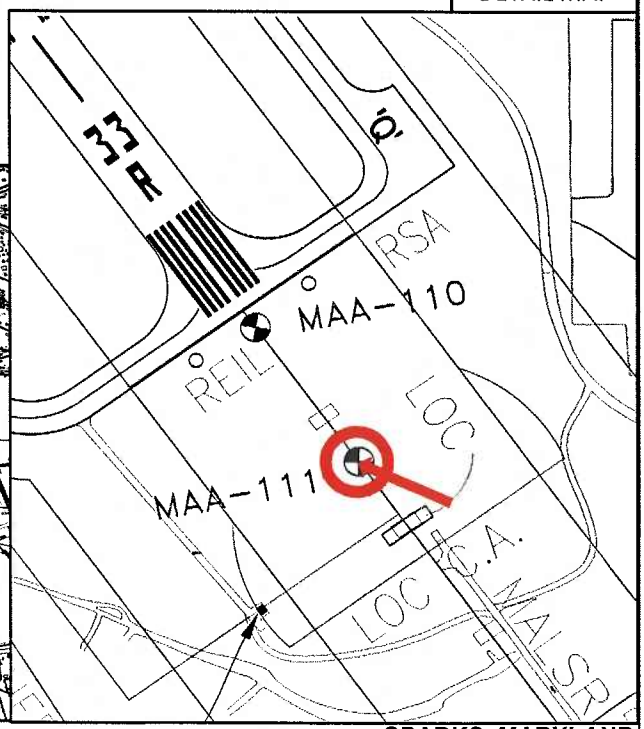
CENTERLINE RUNWAY 33R ±280' FROM END OF RUNWAY PAVING

FOR NAVGATION PURPOSES ONLY
NORTHING 549729.0 US ft.+/-
EASTING 1410804.9 US ft.+/-

LOCATION PLAN



DETAIL MAP



SURVEYED BY: JMT ENGINEERING — **SPARKS, MARYLAND**

BWI THURGOOD MARSHALL AIRPORT-RUNWAY CENTERLINE MONUMENTS

NAME OF STATION: MAA-112
NGS PID:
DATE ESTABLISHED: OCTOBER 2007

MARYLAND STATE PLANE COORDINATES (NAD 83):

NORTHING (Y):
EASTING (X):
ORTHOMETRIC HEIGHT (NAVD 88):
CONVERGENCE ANGLE:
COMBINED SCALE FACTOR:

GEOGRAPHIC COORDINATES (NAD 83):

LATITUDE:	39° 11' 14.80" (N)	
LONGITUDE:	76° 39' 48.98" (W)	
ELLIPSOID HT:	33 US ft.	10.0 m

AVAILABLE CONVENTIONAL BACKSIGHT POINTS (COMPUTED DATA):

POINT	GEODETIC AZIMUTH	DISTANCE (US FT.)	DISTANCE (m)
MAA-113		240	73.1

RUNWAY 15L-33R

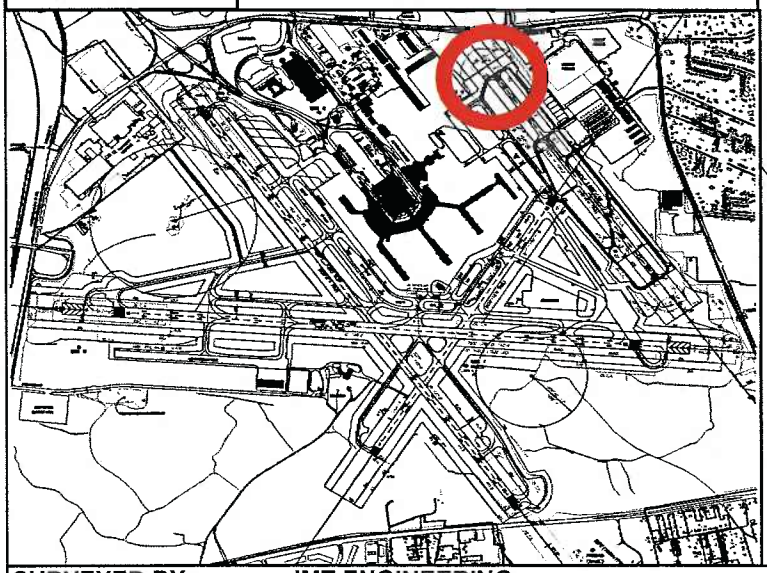
STATION DESCRIPTION:

***** SHALL NOT BE OCCUPIED FOR SURVEY CONTROL. THIS POINT IS INTENDED FOR RECOVERY OF THE RUNWAY CENTERLINE ONLY *****

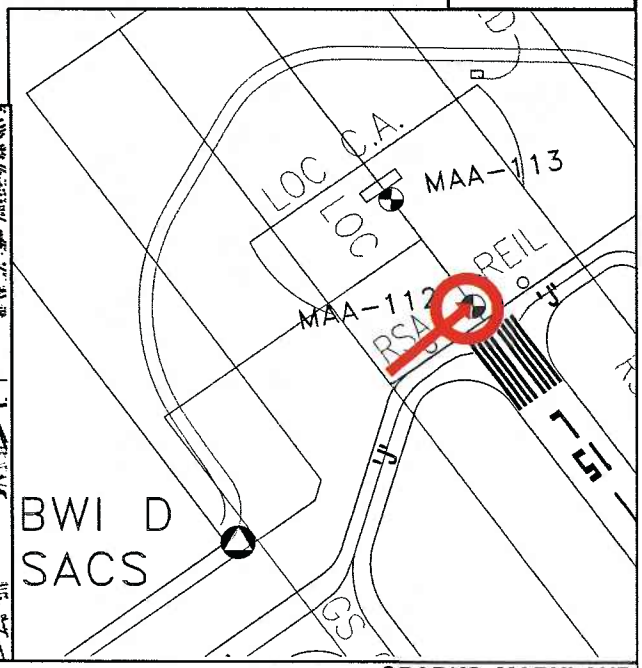
CENTERLINE RUNWAY 15L ±32' FROM END OF RUNWAY PAVING

FOR NAVGATION PURPOSES ONLY
NORTHING 554029.3 US ft.+/-
EASTING 1407682.4 US ft.+/-

LOCATION PLAN



DETAIL MAP



SURVEYED BY: JMT ENGINEERING — SPARKS, MARYLAND

BWI THURGOOD MARSHALL AIRPORT-RUNWAY CENTERLINE MONUMENTS

NAME OF STATION: MAA-113
NGS PID:
DATE ESTABLISHED: OCTOBER 2007

MARYLAND STATE PLANE COORDINATES (NAD 83):

NORTHING (Y):
EASTING (X):
ORTHOMETRIC HEIGHT (NAVD 88):
CONVERGENCE ANGLE:
COMBINED SCALE FACTOR:

GEOGRAPHIC COORDINATES (NAD 83):

LATITUDE:	39° 11' 16.72" (N)	
LONGITUDE:	76° 39' 50.76" (W)	
ELLIPSOID HT:	28 US ft.	8.6 m

AVAILABLE CONVENTIONAL BACKSIGHT POINTS (COMPUTED DATA):

POINT	GEODETIC AZIMUTH	DISTANCE (US FT.)	DISTANCE (m)
MAA-112		240	73.1

RUNWAY 15L-33R

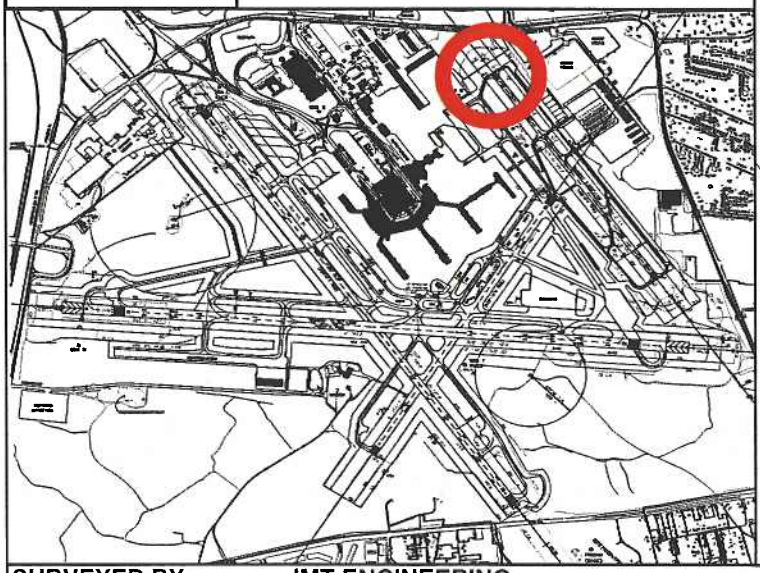
STATION DESCRIPTION:

***** SHALL NOT BE OCCUPIED FOR SURVEY CONTROL. THIS POINT IS INTENDED FOR RECOVERY OF THE RUNWAY CENTERLINE ONLY *****

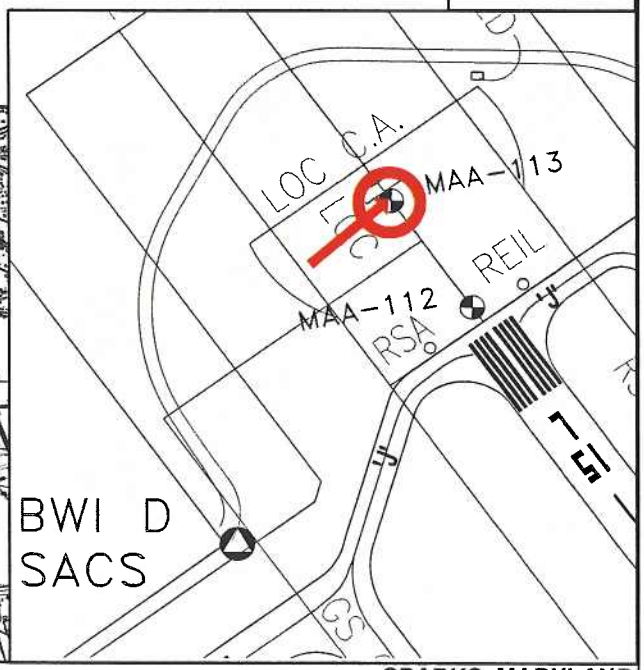
CENTERLINE RUNWAY 15L ±272' FROM END OF RUNWAY PAVING

FOR NAVGATION PURPOSES ONLY
NORTHING 554223.4 US ft.+/-
EASTING 1407541.4 US ft.+/-

LOCATION PLAN



DETAIL MAP



SURVEYED BY: JMT ENGINEERING — SPARKS, MARYLAND

BWI THURGOOD MARSHALL AIRPORT-RUNWAY CENTERLINE MONUMENTS

NAME OF STATION: MAA-114
NGS PID:
DATE ESTABLISHED: OCTOBER 2007

MARYLAND STATE PLANE COORDINATES (NAD 83):
NORTHING (Y):
EASTING (X):
ORTHOMETRIC HEIGHT (NAVD 88):
CONVERGENCE ANGLE:
COMBINED SCALE FACTOR:

GEOGRAPHIC COORDINATES (NAD 83):
LATITUDE: 39° 10' 52.40" (N)
LONGITUDE: 76° 39' 33.51" (W)
ELLIPSOID HT: 25 US ft. 7.7 m

AVAILABLE CONVENTIONAL BACKSIGHT POINTS (COMPUTED DATA):

POINT	GEODETIC AZIMUTH	DISTANCE (US FT.)	DISTANCE (m)
MAA-115		830	252.9

RUNWAY 4-22

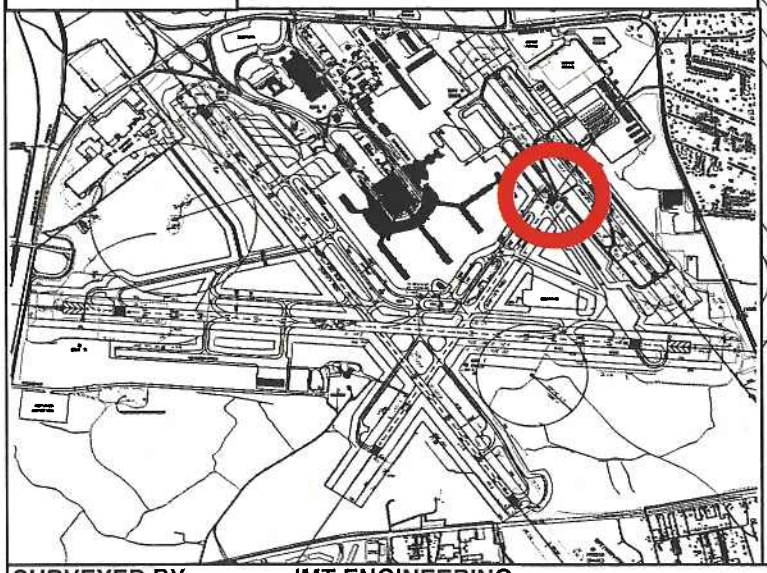
STATION DESCRIPTION:

*** SHALL NOT BE OCCUPIED FOR SURVEY CONTROL. THIS POINT IS INTENDED FOR RECOVERY OF THE RUNWAY CENTERLINE ONLY ***

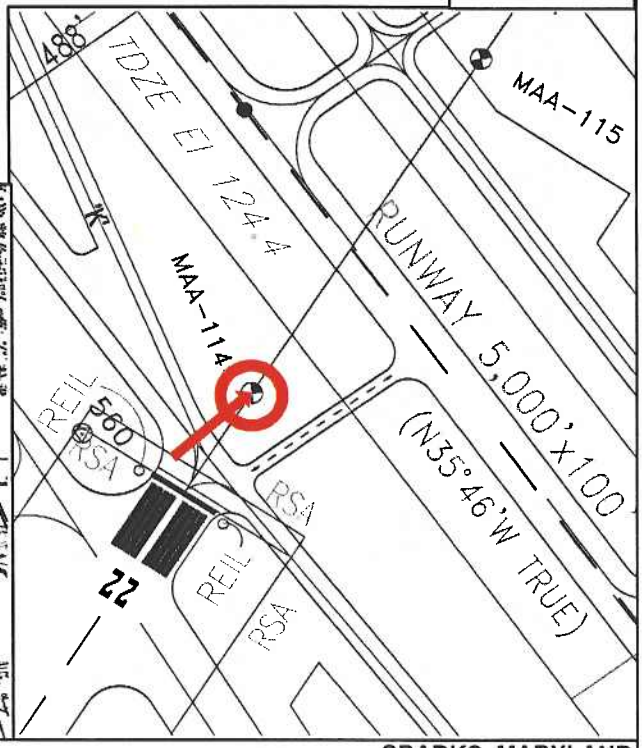
CENTERLINE RUNWAY 22 ±244' FROM END OF THRESHOLD

FOR NAVGATION PURPOSES ONLY
NORTHING 551767.9 US ft.+/-
EASTING 1408909.1 US ft.+/-

LOCATION PLAN



DETAIL MAP



SURVEYED BY: JMT ENGINEERING SPARKS, MARYLAND

BWI THURGOOD MARSHALL AIRPORT-RUNWAY CENTERLINE MONUMENTS

NAME OF STATION: MAA-115
NGS PID:
DATE ESTABLISHED: OCTOBER 2007

MARYLAND STATE PLANE COORDINATES (NAD 83):

NORTHING (Y):
EASTING (X):
ORTHOMETRIC HEIGHT (NAVD 88):
CONVERGENCE ANGLE:
COMBINED SCALE FACTOR:

GEOGRAPHIC COORDINATES (NAD 83):

LATITUDE:	39° 10' 59.27" (N)	
LONGITUDE:	76° 39' 37.74" (W)	
ELLIPSOID HT:	13 US ft.	4.1 m

AVAILABLE CONVENTIONAL BACKSIGHT POINTS (COMPUTED DATA):

POINT	GEODETIC AZIMUTH	DISTANCE (US FT.)	DISTANCE (m)
MAA-114		830	252.9

RUNWAY 4-22

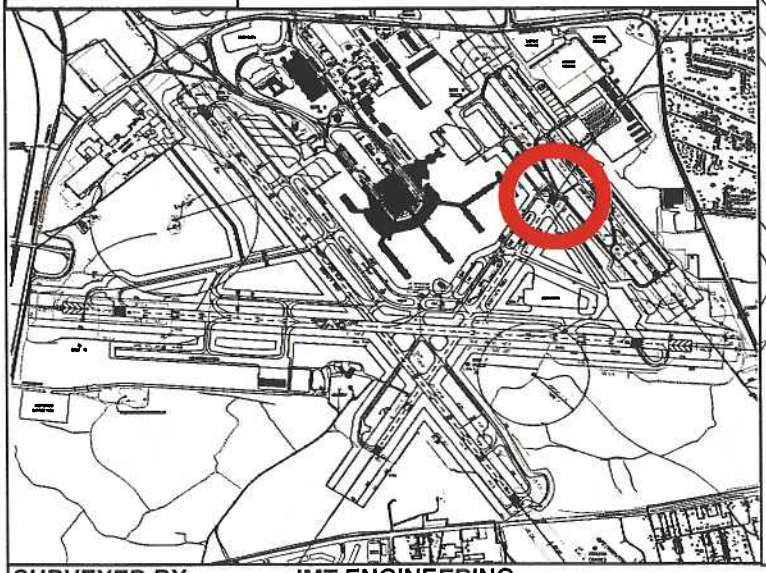
STATION DESCRIPTION:

***** SHALL NOT BE OCCUPIED FOR SURVEY CONTROL. THIS POINT IS INTENDED FOR RECOVERY OF THE RUNWAY CENTERLINE ONLY *****

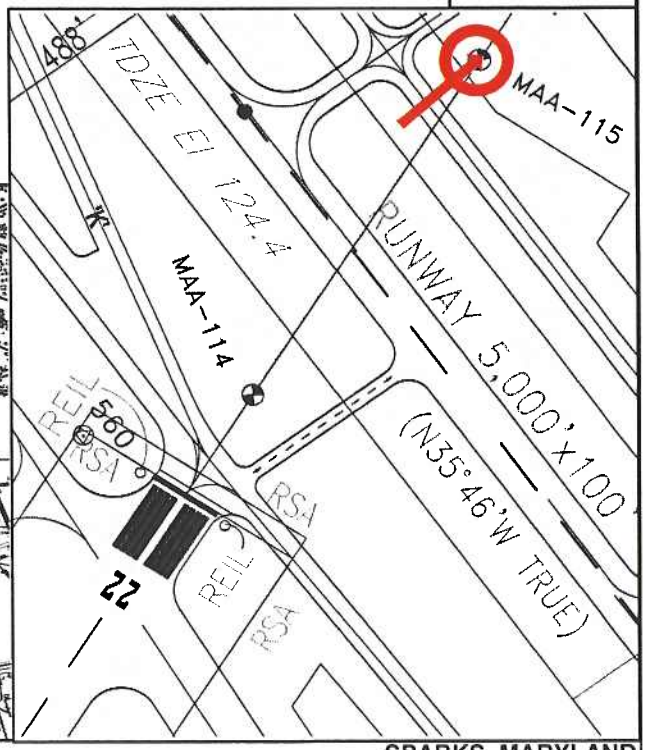
CENTERLINE RUNWAY 22 ±1074' FROM END OF THRESHOLD

FOR NAVGATION PURPOSES ONLY
NORTHING 552463.8 US ft.+/-
EASTING · 1409360.9 US ft.+/-

LOCATION PLAN



DETAIL MAP



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