APPENDIX A

AIRPORT CONSTRUCTION PROJECT CHECKLIST





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	
		<u>/</u>	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?
		47 to 1 to 1 to 1	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 Engineering and Construction Management?
			, 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:
		<u></u>	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?
<u> </u>		<u></u>	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:
		80-100 Sound of the	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 Division 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 OFFICE OF ENGINEERING AND CONSTRUCTION MANAGEMENT

AIRPORT CONSTRUCTION PROJECT CHECKLIST DIVISION OF FACILITIES DESIGN <u>SCHEDULE A</u>

	MA.	MAA Project No.:						
	Proj	ect Title	e:					
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?					
			1. Have Mode II runway and taxiway signs been specified?					
			2. Have "switch hitter" runway centerline lights been specified?					

Yes	No	N/A	
		<u></u>	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 Division 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 Eastern Region Order EA 5210.1C been incorporated?
			2. Has FAA Advisory Circular 150/5300-9A been incorporated?
			3. Has FAA Advisory Circular 150/5370-2C been incorporated?
			Aesthetics1. 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?

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

Airj	port: AIP No.:
No	<u>Item</u>
	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:YesNoApproved:YesNo
	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 150/5370-2C, "Operational Safety on Airports During Construction"?

Signature

Title

Date

APPENDIX B

STANDARD FORMS





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 OAT STANDARDS AND SPECIFICATIONS
- CHANGE REQUEST OAT STANDARDS AND SPECIFICATIONS





MEETING MINUTES

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

INVITED PARTICIPANOS	ATTENDEES	REPRESENTING	EMAL ADDRESS	PHONE
				A HOMMER
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14 g	INTRODUCTION AN	D PURPOSE OF T	HE WIDETING	

	NEW ACTION/DISCUSSION ITEMS	ACTON REOURT BY	DATE REQUESTED
B	OUTSTANDING ITEMS REQUIRING ACTION/DISCUSSION FROM PREVIOUS MEETING(S)	ACTION REQUIRED BY	DATE REQUESTED
	Action:		
Distril	oution: 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%		1009	% 🗌 Е
ITEM DESCRIPTION		UNIT	UNIT COST	QUANTITY	TO	TAL	COMMENT
	COI	VSTRUCTION	COST ESTIMATE	Ē			
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 r	not included in Unit Costs)			10%		\$0	
Contractor O&P X% of B (if not i	included in Unit Costs)			15%		\$0	
Construction Security Plan (X%	of B)			5%		\$0	
SUBTOTAL C						\$0	
Construction Quality Control Pla	an (3% of C)			3%		\$0	
SUBTOTAL D						\$0	
Miscellaneous Construction Allo	wance (5% to 10% of C)			10%		\$0	
Construction Quality Control Pla	an (3% of Misc. Construction Allow.)			3%		\$0	
TOTAL CONSTRUCTION COS	TESTIMATE					\$0	
	AD	DITIONAL PR	OGRAM COSTS				
Estimated Design Fee (8% to 12	2% of Construction Cost)			12%		\$0	
Estimated CMI Fee (8% to 12%	of Construction Cost)			12%		\$0	
TOTAL CAPITAL PROGRAM C	COST ESTIMATE					\$0	
Escalation Factor (if applicable)				0%		\$0	
GRAND TOTAL						\$0	
Level of Accuracy	Quantity Take-Off	General	Square Foot		Co	mparisor	with other installations/facilities
List of Sole Source Items	1	3			5		
Included in this Contract	2	4			6		· · · · · · · · · · · · · · · · · · ·
List of Assumptions							

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KNOX'	Fire/Law En	forcement Rapid	Entry System	(
2006	AUTHORIZ	ATION O	RDER FOR	CHEASTERY Effective
	800-552-5669 • 623-687-23	300 • Fax: 623-687-2	290 • WWW.KNOXBOX.	COM January 1, 2006
Section 1 BILLIN	NG INFORMATION - N	NUST MATCH C	REDIT CARD INFO	DRMATION IF USED.
		TTTTTTTTTTTTT		
STREET (NO P.O. BOXES)				SUITE / BUILDING
			STATE	ZIP CODE
		11111		Send this form with payment to:
PHÔNE NUMBER	P.0	NUMBER (GOV. AGENCIES ON		KNOX COMPANY
	-			1601 W. Deer Valley Road,
				Phoenix, AZ 85027
ORDER W	ILL NOT BE PROCE	ESSED	Section 3 ORD	DER PRODUCT HERE
Section 2 Witho	ut Authonzen Signatur		Quantity Part Number	
				Total \$
Baltimore - U	lash Inti Airport F/P	95		Total S
State Aviatio	IN BWI Fire/Res			
Baltimore, MD	21240	I		
			Shipping & Handling	por submastered item \$
Authorized Fire Agency Sig	gnature and Date Pr	int Name Clearly	1 lb. to 7 lbs. \$7.00	Shipping and
<u>PS-39-026-02-8</u>	System Code		26 lbs. to 50 lbs. \$30.00	
IMPORTANT NOTE - Knox** M	aster Keys are provided to author	prized fire departments	51 lbs. to 75 lbs. \$40.00	
Entry System. No other use o	of the keys or their associated co	des is authorized. Key	75 lbs.+ call Knox for quote. Alaska Nawall Canada or	Sales Tax \$
Knox Company and are main	px Master Keys and Keyways rem Itained by the Knox Company in	nain the property of the Phoenix, Arizona. For	Priority Shipping, please	Pre-payment
questions regarding this polic	by, contact Knox at 800-552-566	<u>59.</u>	cell for rates.	
PRE-P	AYMENT INFORMATIO	N REQUIRED	USE PRI	ICE LIST ON LAST PAGE
			<u>"</u>	7-7
MC DISC CARD NUMB				Cardholder Signature
Section 4 INSTAL	LLATION ADDRESS - RI	EQUIRED BY FIR	E DEPARTMENT	Eira Danartmant Anntoval
BUILDING NAME (WHERE ITEM WILL I	BE INSTALLED) = PLEASE TYPE ADDITION	AL INSTALLATION ADDRESSES	ON A SEPARATE SHEET (REQUIRED	BY FIRE DEPT.) Signature Required to
				Submaster Items
ADDRESS		1 1 1 1 1 1		
				Authorized Fire Agency Signature
				Submastor fee \$7.00 per keyed item.
Section 5				
SHIP TO CONTACT NAME	SHIP TO ADDRI	255 IS REQUIRED		RECTO
COMPANY NAME	┺═╍┇╌┙┇╌╌┇╼╌╗ ┲╴┍╶╴┍╶┑╍╗╸╕╺┱╍╖╸			
STREET AUDRESS (NO P.O. BOXES)		11111		
				STATE 710 DODE
E-MAIL ADDRESS		·····		
		استعداد المحادثان		

BWIFRD

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 solcly 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

- 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-BOX® 3200 Series w/ Hinged Door





#3275 Recessed

- 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-VAULT™ 4400 Series - Heavy Duty



10 2

- 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® 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 ٠
- ٠ 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. 4
- Color: Black
- Finish: - Knox-Coat® Weather resistant proprietary coating system
- Option: - Over-the-Door Hanger



Exterior - All Weather Conditions

equipment

Secures perimeter and

fire access gates, and

other fire department

Heavy duty brass body,



#3753

stainless steel 3/8" diameter shackle Protective EPDM boot

with shackle seal Metal keyhole cover

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.

#3754

w/ Door Hanger

(Lock Core)

Interior - Light Duty

Steel body and

hardened

steel 5/16"

diameter

shackle

Ship Weight: 1.5 lbs

Knox Rapid Entry System Product Catalog



#1307 Dual Lock



#1100 Not suitable for key storage.



#1308 w/ Optional Back Panel and Swing Panels.



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

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



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

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 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



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.

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Prices and availability subject to change.

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

					cluded			
KNOX-B	0X® rias w/ Lift_Aff Da	or Surface Mour	ited	No	at Included			
Part #	<u>Cojor</u>	Tamper Switch	<u>Alumini</u>	ration*	<u>Price</u>			
3201	Black	-	-		\$189.00			
3202	Black	•			\$229.00			
3203	Black	_	<u> </u>		\$229.00			
3204	Black	٠	÷. •		\$269.00			
3205	Aluminum	-	¥ -		\$199.0 0			
3206	Aluminum	•			\$239.00			
3207	Dark Bronze	-	- Ĩ		\$199.00			
3208	Dark Bronze	٠	1 -		\$239.00			
3200 Series w/ Litt-Off Door Recess Mounted								
Part #	<u>Color</u>	Tamper Switch	<u>Alumini</u>	zation*	<u>Price</u>			
3220	Black		1 -		\$229.00			

3220	DIACK				Q LL0100
3221	Black	•	ļ	-	\$269.00
3222	Black	-	q	٠	\$269.00
3223	Black	•	F .	•	\$309.00
3224	Aluminum	-	M	-	\$239.00
3225	Aluminum	•	hip	-	\$279.00
3226	Dark Bronze	-	ŝ	-	\$239.00
3227	Dark Bronze	۲			\$279.00
3240	3200 Lift-Off Door	Recessed Mou	nting Ki	it	\$69.00

3200 Series w/ Hinged Door Surface Mounted

<u>Part #</u>	<u>Color</u>	<u>Tamper Switch</u>	Aluminization*	Price
3261	Black	-	-	\$229.00
3262	Black	•	· -	\$269.00
3267	Black		•	\$269.00
3268	Black	• 7	•	\$309.00
3263	Aluminum	- 8		\$239.00
3264	Aluminum	•		\$279.00
3265	Dark Bronze	- 1	-	\$239.00
3266	Dark Bronze	•	-	\$279.00

3200 Series w/ Hinged Door Recess Mounted

<u>Part #</u>	Color	Tamper Switch	Aluminization*	Price
3270	Black		-	\$269.00
3271	Black	•		\$309.00
3276	Black	- 4		\$309.00
3277	Black	• Ť	-	\$349.00
3272	Aluminum	- 60	-	\$279.00
3273	Aluminum	•		\$319.00
3274	Dark Bronze	- 0		\$279.00
3275	Dark Bronze	•	_	\$319.00
3290	3200 Hinged R	ecessed Mounting Kit		\$69.00

KNOX-									
4400 0 Part #	Color Color	Lock	Tamper Switch	Aluminization*	Price				
4401	Black	Single	- 1	-	\$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	- 4	•	\$435.00				
4408	Black	Dual	•		\$475.00				
4409	Aluminum	Single			\$335.00				
4410	Aluminum	Single	•	≟ -	\$375.00				
4411	Aluminum	Dual	Č	î -	\$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	•	- 1	\$435.00				
4400	Series Reces	s Mour	nted						
Part #	<u>Color</u>	Lock	<u>Tamper Switch</u>	<u>Aluminization*</u>	Price				
4430	Black	Single		-	\$375.00				
4431	Black	Single	•	-	\$415.00				
4432	Black	Dual	-	-	\$435.00				
4433	Black	Dual	٠	-	\$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	-	X -	\$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 Bronzo	Single		-	\$425.00				
4445	Dark Bronze	Dual	-	-	\$445.00				
4446	Dark Bronze	Dual	•	-	\$485.00				
4470	4400 Recess	ed Mou	nting Kit		\$85.00				
	@ VEV 611177	4.1							
Part #	Part (inclu	ides all	stainless steel du	ist cover)	Price				
3501	Key Switch	=		/	\$62.00				
- 3502	Key Switch	on Mou	inting Plate		\$79.00				
3503	Double Key	Switch	on Mounting Plat	e	\$129.00				
	,		•						

DO6 Price List - Order Online at www.knoxbox.com Prices and availability subject to change.

BWIFRD

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					● Ir - N	icluded	ACCESS	ORIES	
Part #	PAULUUK				Least	Price	Part #	Part	Price
	Exterior - A	ll Weather	Conditions				1001	Fire Dept. Reflective Alert Decal	\$1.50
3753	2-1/8"H si	tainless st	ackle clearance.	3/8" dia	ameter	\$79.00	1002	Fire Dept. Reflective Single Key Switch Decal (Red)	\$3.00
3754	2"H barde	igni Duiy med steel.	shackle clearance	. 5/16"	diameter	\$58.00	1003	Sheriff Dept. Reflective Single Key Switch Decal (Gold)	\$3.00
())0)/0	DEGIDENT		• • • • • • • • • •				1004	Police Dept. Reflective Single Key Switch Decal (Blue)	\$3.00
ANUX [®] Part #	RESIDENT Color	IAL (Hol Part	ds two keys ma	ximu	n)	Price	1005	Pre-Fire Plan Reflective Decal (8" x 8")	\$12.00
1650	Black	Surfa	ce Mount, Lift-Off	Door		\$139.00	1006	Key Tags (Package of 10)	\$3.00
1651	Black	Surfa	e Mount, Lift-Off	Door,		A+== == =	1007	One Inch Key Rings (Package of 10)	\$3.50
1659	Black	with E Surfa	oor Hanger Brac	ket Door		\$150.00	1008	Tamper Seals (Package of 50)	\$10.00
1660	Black	Surfa	se Mount, Hinged	Door		0100.00	1009	Tamper Evident Bags (Package of 10)	\$3.00
1000	DIGUN	with I	oor Hanger Brac	ket		\$176.00	KNOX®	LOCKING FDC PLUGS	
KNOX®	CABINET						Part #	Part Charles Charles Charles Free	Price
1300 S	eries - UL	Listed	T 0		Dawth	Delon	3011	All stainless Steel with Bright Stainless Face	\$115.00
1201	Lt Crev	<u>LOCK</u> Single	Tamper Switch	1	Perio 5"	9545 00	3010	All stainless Steel with Polished, Chrome-like Stainless Face	\$125.00
1302	Lt Grev	Single	_	Ļ	3 7"	\$585.00	FDC Pluga	s listed are 2-1/2" male plogs with National Standard Threads. In and threads evaluable. Call for details	
1303	Lt. Grev	Single	•	lhs	, 5"	\$585.00	KNOVO		
1304	Lt. Grev	Single	•	65	7"	\$625.00	Part #	Part	<u>Price</u>
1305	Lt. Grey	Dual	_	ž	5"	\$605.00	3080	4" Storz Cap - Dark, Hard Anodized Aluminum	\$225.00
1306	Lt. Groy	Dual	-	hip	7"	\$645.00	3090	5" Storz Cap - Dark, Hard Anodized Aluminum	\$245.00
1307	Lt. Grey	Dual	٠	ŝ	5"	\$645.00	3099	6" Storz Cap - Dark, Hard Anodizød Aluminum	\$295.00
1308	Lt, Grey	Dual	٠	1	7"	\$685.00			
1300 C	abinet Opt	ions							
Part #	Part					Price			
1351	Back Key	Hook Pan	el - 48 Keys			\$50.00			
1352	Swing Ke Mounting	y Hook Pa Assembly	nel & / - 78 Keys			\$140.00			
1353	2nd Swin (must aire	g Key Hoc eadv have	k Panel for 7" De mounting assem	ep Mo blv)	del Only	\$110.00			
1201	Non Lock	ing Weath	er Housing/Rain	Shield				ANST-1015 ANY INSTITUTE	
	(for exter	ior cabine	protection)			\$350.00			
1100 S	eries								
<u>Part #</u>	<u>Color</u>	Part	A 13 - 601 -			Price	a 1		
1700	Lt. Grey	Data Sto	rage Cabinet (Not	tor ke	y storage)	\$274.00			
									1. I.S. 1
								A B In-	
								Serving Fire Departments Since 1975	
								623-687-2300 • 800-552-5669	
								Fax 623-687-2299	

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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 des increase/decrease; and other relevant facts). (Attach	ign impact; code interpretation: budget additional sheets as needed).
4. Design and Construction Cost impact if approved:	\$, \$
	Design Construction
5. Approval/Disapproval of this request is required by	
	(Allow minimum 2 weeks.) . Days
BELOW THIS LINE IF FOR INTERNAL USE ONI	Y
A. OFM Comments.	
B. Director of Engineering Comments.	
C. Variance approved as submitted. Variance approved with comments inc Variance denied.	orporated.
	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.



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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 (Examp	ole: 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	2		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			DST
(Note: The concourse width is not permitted to be less than 12 or 14			
feet during normal flight operating hours.)			

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 [],	-		Various
FA supervised, Cleanout access signage placed []			
Other-			

Electrical System	Yes	No	Reference
Panel board clear of storage	с.		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 #			9.7.2.1
Pin#			
Initiating devices: PS [], HD [], SD [], Water flow[],			9.7.2.1
Valve Tamper[], Special Systems/MM [], Building Notification [
]			
Audio/Visual [], Other []			
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	Yes	No	Reference
The Building manager has been advised of testing, maintenance, and			
document submission requirements for the following special fire			Sector Sector
protection systems			
[] 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			N/A
system re-submittals, field revisions, conformed graphic plans, and	-		
CD copies must be provided to the OFM.			
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]

AIRPORT WIDE STANDARD FOR DIVISION OF AIRPORT TECHNOLOGY DESIGN STANDARD AND UNIFORM SPECIFICATIONS

REQUEST FOR VARIANCE

Name:	Date:
Company:	Tel. No.:
Project Name:	MAA Contract No.:
	MAA Building or Installation Permit No.
1. Purpose of Variance Request.	
2. Related Code References:	
3. Justification forVariance (include discussion of a increase/decrease; and other relevant facts). (A	design impact, code interpretation; budget ttach additional sheets as needed)
4. Design and Construction Cost impact if approve	ed: \$, \$
5. <i>Approval/Disapproval of this request is required</i>	<i>l by:</i> (Allow minimum 2 weeks.) Days
BELOW THIS LINE IF FOR INTERNAL USE ONL	Y
A. Fire Marshall Comments.	
B. Director of Airport Technology.	
 C. □ Variance approved as submitted. □ Variance approved with comments □ Variance denied. 	incorporated.
	YesNo
Manager, IT Networking (OAT) Date	
Manager, Telecommunications (OAT) Date	YesNo
MAA Director (OAT) Date	YesNo

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

AIRPORT WIDE STANDARD FOR DIVISION OF AIRPORT TECHNOLOGY DESIGN STANDARD AND UNIFORM SPECIFICATIONS

CHANGE REQUEST

Name:	Date: Tel. No.:		
Company:			
Date/Revision No. of Standard:	MAA Contract No		
1. Station/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			
Mr. Robert C. Polkiewicz		Yes	No
Manager, IT Network Engineering Airport Technology & Community Affairs	Date		
Mr. Timothy A. Watson Manager, Telecommunications Engineering	Date	Yes	No
Airport Technology & Community Affairs			
Mr. Neal Heaton Manager, Enterprise Services	Date	Yes	No
Airport Technology & Community Affairs			
Mr. William Lins Director	Date	Yes	No
Airport Technology & Community Affairs			
Mr. Edward P. Carey		Yes	No
Deputy Executive Director Airport Technology & Community Affairs	Date		
APPENDIX C

MAA STANDARD CONTRACT DRAWINGS





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
- 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





- 1. THIS PROJECT IS FOR WORK AT BALTIMORE/WASHINGTON INTERNATIONAL THURGOOD MARSHALL AIRPORT, HEREAFTER REFERRED TO AS 'THE AIRPORT' OR 'RWI'.
- 2. THIS PROJECT SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE CONTRACT PLANS AND SPECIFICATIONS AND ANY RULES. REGULATIONS, STANDARDS, OR SPECIFICATIONS REFERENCED 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 DIMENSIONS IDENTIFIED ON THE PLANS SHALL BE VERIFIED IN TH 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, FROJECT BENG
- 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
- 12. ALL THE PERMITS AND LICENSES REQUIRED FOR THE PROJECT. WORK SHALL BE OBTAINED AT THE CONTRACTOR'S EXPENSE.

RATES SHALL BE POSTED OUTSIDE THE SITE FIELD DEFICED IN A WEATHERPROOF ENCLO

- 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 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 THE CONTRACTOR SHALL ALSO ENSURE THAT PROPERTY OR PUBLIC EQUIPMENT, UNRELATED TO WORK, WHICH BELONGS TO MAA OR AIRPORT TENANTS IS NOT DAMAGED DURING CONSTRUCTION
- 3. THE CONTRACTOR SHALL NOT ALLOW EMPLOYEES, SUBCONTRACTORS, THE CUNITACIUM SHALL NOT ALLOW EMPLOTEES, SUBCONTACTOM SUPPLERS, 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
- 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 AN 11/2 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
- 1. 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
- 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).

- I. 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
- 0. 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.
- n. FORFIGN 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 ORJECT DERRIS 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
- 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 INFORMATION
- s. FAILURE TO MAINTAIN RADIO COMMUNICATION BETWEEN CONSTRUCTION AND MAINTENANCE VEHICLES AND ATCT. REFER TO VEHICLE ACCESS, RADIO COMMUNICATIONS, AND SECURITY EQUIREMENTS FOR MORE INFORMATION
- 1. 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 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 LISED AS HALL 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 UNLINES 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 ADA 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.

	DESIGNED:			MARYLAND DEPARTMENT OF TRANSPORTATION	PROJECT TITL	E:	-	CONTRACT NO .:
	DRAWN:			MARYLAND AVIATION ADMINISTRATION			-	
CLIENT LOGO HERE.	CHECKED:		BALTIMORE/WASHINGTON	OFFICE OF ENGINEERING AND CONSTRUCTION MANAGEMENT	SHEET TITLE:	GENERAL C	CONSTRUCTION AND SAFETY NOTES I – SIDA	SHEET NO .:
	APPROVED:	REVISION REVISION NO.: DATE: DESCRIPTION:	A I R P O R T	INTERNATIONAL AIRPORT	SCALE:	AS SHOWN	DATE: _	

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 FACH 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 AGA WITHIN ONE MINUTE AFTER RECEIPT OF DIRECTION FROM THE TOWER.

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
- 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
- 4. COORDINATION WITH BWI AIRPORT FIRE RESCUE SERVICE (VIA THE ENGINEER):
- a. THE CONTRACTOR SHALL COMPLY WITH MARYLAND FIRE LAWS, NEPA 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, 1334 ASHTON ROAD, SUITE G, HANOVER, MD 21076. 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):

- G. 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 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
- 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 AN 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 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 BGE	1-800-257-7777 (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 ((WATER SUPPLY FROM AIRPORT P	DPERATIONS BUREAU ERIMETER TO METER)

EMERGENCIES	(410)	222-840
GENERAL INFORMATION	(410)	222-752

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-/040
iv.	BWI DUTY AIRPORT OPERATIONS MGR	(410) 859-7018
٧.	CONSOLIDATED DISPATCH CENTER	(410) 859-7117
vi.	BWI OFFICE OF AIRPORT SECURITY	(410) 859-7162
vii.	FAA ATCT	(410) 859-7636
/111.	FAA AIRWAY FACILITIES SSC	(410) 859-7252
ix.	MDE OIL CONTROL PROGRAM	(410) 537-3442
	(COMPLIANCE AND REMEDIATION)	

- 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 OURS 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
- 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
- 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.



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	DESIGNED:			MARYLAN	D DEPARTMENT OF TRANSPORTATION	PROJECT TITLE:
	DRAWN:			MAR MAR	LAND AVIATION ADMINISTRATION	SHEET TITLE.
CLIENT LOCO HERE	CHECKED:			BALTIMORE/WASHINGTON OFFICE OF E		GEI
	APPROVED:	REVISION REVIS	ON DESCRIPTION:	I hurgood Marshall A I R P O R T	INTERNATIONAL AIRPORT	SCALE: AS SHOW

- 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
- 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 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 SURVATORS 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 EENCHMARKS ARE
- 8. ALL THE PERMITS AND LICENSES REQUIRED FOR THE PROJECT WORK SHALL BE OBTAINED AT THE CONTRACTOR'S EXPENSE.
- A WEATED

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 ARFA.

- 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'
- 5. 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, 1334 ASHTON ROAD, SUITE G, HANOVER, MD 21076. 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 BGE	1-800-257-7777 (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 (WATER SUPPLY FROM AIRPORT PERIMETER T	BUREAU O METER)
EMERGENCIES GENERAL INFORMATION	(410) 222-8400 (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.

(410) 859-7815/7511

(410) 859-7222 (410) 859-7040

(410) 859-7018

(410) 859-7117

(410) 859-7162

(410) 537-3442

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

- MAA FIRE MARSHALL
- ii. BWI FIRE/RESCUE/MEDICAL EMERGENCY BWI POLICE EMERGENCY
- BWI DUTY AIRPORT OPERATIONS MGR
- v. CONSOLIDATED DISPATCH CENTER vi. BWI OFFICE OF AIRPORT SECURITY
- VII. MDE OIL CONTROL PROGRAM
- (COMPLIANCE AND REMEDIATION)
- PROJECT TITLE: DESIGNED: MARYLAND DEPARTMENT OF TRANSPORTATION MARYLAND AVIATION ADMINISTRATION DRAWN: SHEET TITLE: OFFICE OF ENGINEERING AND CONSTRUCTION MANAGEMENT GE BALTIMORE MAASHINIGTON CHECKED INTERNATIONAL CLIENT LOGO HERE. BALTIMORE/WASHINGTON Thurgood Marshall SCALE: INTERNATIONAL AIRPORT APPROVED REVISION REVISION NO.: DATE: AS SHO DESCRIPTION:

- 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

- -	CONTRACT NO.:
NERAL CONSTRUCTION AND SAFETY NOTES – STERILE BUILDING AREA	SHEET NO.:
VN DATE: _	

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

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 NECCSSARY 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:

CLIENT LOGO HERE.

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
- 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

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
- 3. ON-SITE ROADS AND OTHER PAVEMENTS LISED AS HALL POLITES 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 TERMINED 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 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 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):
- 0. THE CONTRACTOR SHALL COMPLY WITH MARYLAND FIRE LAWS. NEPA 1 - UNIFORM FIRE CODE, ; CHAPTER 16, 'SAFETY DURING CONSTRUCTION AND DEMOLITION OPERATIONS' (CURRENT EDITIONS) AND CHAPTER 21, 'AIRPORTS'.
- 5. OPEN FLAME, WEIDING OR TORCH CUITTING OPERATIONS ARE PROHIBITED WITHOUT FIRST OBTAINING A BWI AIRPORT WELDING AND BURNING PERMIT. THE PERMIT IS AVAILABLE AT THE BWI FIRE MARSHAL'S OFFICE, 1334 ASHTON ROAD, SUITE G, HANOVER, MD 21076. 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 WEIDING, 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

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

UTILITY OWNERSHIP

BGE

- MISS UTILITY CENTER
- 1-800-257-7777
- (410) 234-5000 1-800-685-0123

DESIGNED:						MARYLAND DEPARTMENT OF TRANSPORTATION	PROJECT TITLE:	
DRAWN:						MARYLAND AVIATION ADMINISTRATION		
	-	-		2 (1 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 -	BALTIMORE/WASHINGTON	OFFICE OF ENGINEERING AND CONSTRUCTION MANAGEMENT	SHEET TITLE:	GENERAL
CHECKED:		-			INTERNATIONAL	DALTHODE (WASHINGTON		NOTE
10000//00		08/20/0	LAST UPDATED		Thurgood Marshall	INTERNATIONAL AIRPORT	SCALE:	
AFFROVED:	NO.:	DATE:	DESCRIPTION:		AIRPORT	INTERNATIONAL AIM ONT		AS SHOWN

- (410) 954-2222 1-800-275-2355 (410) 859-7252 (410) 931-4600 (410) 729-8000 (410) 987-9300
- EMERGENCIES GENERAL INFORMATION

- TELEPHONE NUMBERS WITH THEM AT ALL TIMES:

- CONTACTED IN AN EMERGENCY.



REGULATIONS (FAR's) - THE FOLLOWING PUBLICATIONS CONTAIN DEFINITIONS OR DESCRIPTIONS OF CRITICAL AIRPORT OPERATING OF THE MAA.

- (410) 685-0123

- THIS PROJECT IS FOR WORK AT MARTIN STATE AIRPORT (MTN), HEREAFTER REFERRED TO AS 'THE AIRPORT'
- THIS PROJECT SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE 2. CONTRACT PLANS AND SPECIFICATIONS AND ANY RULES, REGULATIONS, STANDARDS, OR SPECIFICATIONS REFERENCED THEREIN. THE PROJECT S SUBJECT TO INSPECTION BY REPRESENTATIVES OF THE MARYLAND AVIATION ADMINISTRATION (MAA), THE FEDERAL AVIATION ADMINISTRATION (FAA), AND OTHER GOVERNING AGENCIES.
- PROJECT PHASING THE PROJECT IS TO BE COMPLETED IN CLOSE CONFORMANCE WITH THE PHASING PLANS AND NOTES AS CONTAINED N 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.
- 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 IMFERAME BE EXCEEDED.
- AIRPORT OPERATIONS THE AIRPORT WILL BE IN OPERATION DURING 5. 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.
- CONTRACTOR COORDINATION CONSTRUCTION AND MAINTENANCE 6. 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
- 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.
- B. 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
- 9. FXISTING 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 NDARDS 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 ARE 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.)

COMPANY FAX NO.

COMPANY NAME

COMPANY NAME

COMPANY ADDRESS CITY, STATE ZIP CODE

COMPANY PHONE NO.

DESIGNED:

DRAWN:

CHECKED:

APPROVED:

GENERAL AIRFIELD SAFETY DURING CONSTRUCTION

- 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.
- THE CONTRACTOR AND HIS/HER SUBCONTRACTOR(S) SHALL PROTECT 2. 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
- 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
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING ALL NECESSARY PROTECTIVE GEAR AND EQUIPMENT REQUIRED FOR THE PROTECTION OF THE CONTRACTOR'S PERSONNEL DURING
- 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 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.
- ALL WORK TO BE PERFORMED WITHIN CERTAIN LIMITS OF AN ACTIVE RUNWAY, TAXIWAY, OR APRON LINDER 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
- 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
- SAFETY PROBLEMS AND/OR HAZARDS:
- **b. PAVEMENT DROP-OFFS OR PAVEMENT TURF-LIPS GREATER THAN** 1% INCHES WHETHER PERMANENT OR TEMPORARY
- OPEN TAXIWAY, OPEN TAXILANE, OR RELATED SAFETY AREA.
- TEMPORARY STRUCTURES, OR OTHER OBJECTS IN THE VICINITY OF ANY OPEN RUNWAY, TAXIWAY, TAXILANE, OR IN A RELATED SAFETY AREA, APPROACH, OR DEPARTURE AREA.
- OPEN RUNWAY, TAXIWAY, TAXILANE, OR IN ANY RELATED SAFETY AREA, APPROACH, OR DEPARTURE AREA.
- VEHICLES, EQUIPMENT, EXCAVATION, STOCKPILES, OR OTHER MATERIALS WHICH COULD DEGRADE OR OTHERWISE INTERFERE WITH ELECTRONIC SIGNALS FROM RADIOS OR ELECTRONIC NAVIGATIONAL AIDS (NAVAIDS).
- 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.
- 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
- MISLEADING OR MALEUNCTIONING 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 LAND TAKEOFF CLEARANCE OVER OBSTRUCTIONS, INCLUDING THE CONTRACTOR'S WORK AND STORAGE AREAS)
- I. MARKING AND LIGHTING OF RUNWAYS, TAXIWAYS OR TAXILANES THAT COULD BE CONFUSING OR MISLEADING TO PILOTS,

INCLUDING IMPROPERLY MARKED DISPLACED OR RELOCATED THRESHOLDS.

- 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 RKINGS OR PAVEMENT EDGES, OR DIMINISHES THE VISIBILITY OF RUNWAY OR TAXIWAY LIGHTING.
- 0. 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:
- 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.
- a. INADEQUATE BARRICADING OR OTHER MARKING WHICH IS PLACED TO SEPARATE CONSTRUCTION OR MAINTENANCE AREAS FROM OPEN
- FAILURE TO CONTROL UNAUTHORIZED VEHICLE AND HUMAN ACCESS THROUGH ACTIVE AIRCRAFT OPERATING AREAS.
- FAILURE TO MAINTAIN RADIO COMMUNICATION BETWEEN CONSTRUCTION AND MAINTENANCE VEHICLES AND ATCT.
- CONSTRUCTION AND MAINTENANCE ACTIVITIES OR MATERIALS WHICH COULD HAMPER THE RESPONSE OF AIRCRAFT RESCUE AND FIRE FIGHTING EQUIPMENT FROM REACHING AIRCRAFT, ALL OR AN PART OF THE RUNWAY/TAXIWAY SYSTEM, RUNWAY APPROACH AND DEPARTURE AREAS, AND AIRCRAFT PARKING LOCATIONS
- THE CONTRACTOR SHALL CONDUCT ACTIVITIES SO AS NOT TO VIOLATE 9. 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 EVENT OR REMEDY ANY UNSAFE OR 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.
- MOTORIZED VEHICLES THIS PROJECT INCLUDES WORK WITHIN THE ACTIVE AIRCRAFT OPERATIONS AREA (AOA) (I.e. THE SECURE PORTION OF THE AIRPORT). ALL PERMITTED VEHICLE'S 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 AGA 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 THE CONTRACTOR HAS PERSONNEL AND EQUIPMENT O 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 CREWS WITHIN AN ACTIVE AGA WITHIN ONE MINUTE AFTER F DIRECTION FROM THE ATCT.

- 13. FLAGMEN IN ACCORDANCE WITH THE SPECIFICATIONS, THE CONTRACTOR SHALL FURNISH, AT HIS OWN EXPENSE, FLAGM NECESSARY TO CONTROL CONSTRUCTION TRAFFIC LINEESS OF DIRECTED BY THE ENGINEER. ALL CONTRACTOR VEHICLES TH REQUIRED TO CROSS ACTIVE RUNWAYS, RUNWAY SAFETY ARE TAXIWAYS AND APRONS SHALL DO SO UNDER THE DIRECT C OF A COMPETENT FLAGMAN WHO IS IN DIRECT RADIO CONTA FAA ATCT GROUND CONTROL ALL AIRCRAFT TRAFFIC ON RUN TAXIWAYS AND APRONS SHALL HAVE PRIORITY OVER CONTRA TRAFFIC. AT NO TIME SHALL THE CONTRACTOR'S VEHICLES OF PERSONNEL BE ALLOWED TO ENTER OR CROSS ACTIVE RUNY CLEAR ZONES WITHOUT PROPER AUTHORIZATION OBTAINED TH GROUND CONTROL.
- 14. OPEN FLAME, WELDING OR TORCH CUTTING OPERATIONS ARE PROHIBITED UNLESS ADEQUATE FIRE AND SAFETY PRECAUTIO BEEN TAKEN AND THE PROCEDURE PREVIOUSLY APPROVED B ENGINEER. A FIRE WATCH IS REQUIRED. OPEN FLAME OPERA REQUIRE & BURNING/WELDING PERMIT ORTAINABLE AT AIRPORT OPERATIONS 410-682-8831.

SITE ACCESS, CONTRACTOR STAGING, HAUL ROUTES AND MATERIA

- ACCESS TO THE SITE THE CONTRACTOR'S ACCESS POINTS SITE SHALL BE AS SHOWN ON THE GENERAL PROJECT LAYO CONTRACTOR SHALL BE RESPONSIBLE FOR ALL VEHICLES AN PERSONNEL WHO ENTER THE AIRPORT THROUGH THESE ACCE POINTS. GATES SHALL BE SECURED WHEN NOT IN USE. 1 CONTRACTOR SHALL PROVIDE AIRPORT OPERATIONS WITH A OF TIMES THAT THE GATE WILL BE MANNED FOR ENTRY BY
- 2. ALL OFF-SITE HAUL ROUTES SHALL BE SELECTED TO MINIMI DISTURBANCE TO THE PUBLIC. IT SHALL BE THE CONTRACTO RESPONSIBILITY TO COORDINATE OFF-SITE HAUL ROUTES (S HIGHWAYS COUNTY ROADS OR CITY STREETS) WITH THE AP OWNER WHO HAS JURISDICTION OVER THE AFFECTED ROUTE. CONTRACTOR'S ON-AIRPORT HAUI ROUTES ARE INDICATED O GENERAL PROJECT LAYOUT. THESE SHALL BE EXISTING HAU WHERE AVAILABLE, OR ALONG TAXIWAY / TAXILANE PAVEMENTS OTHERWISE INDICATED IN THE CONTRACT DRAWINGS.
- 3. ON-SITE ROADS AND OTHER AIRFIELD PAVEMENTS USED AS ROUTES SHALL BE MAINTAINED BY THE CONTRACTOR AND SH RESTORED AT THE CONTRACTOR'S EXPENSE TO THEIR ORIGIN CONDITION UPON COMPLETION OF BEING USED AS A HAUL F UNLESS OTHERWISE DIRECTED BY THE CONTRACT DOCUMENTS THE ENGINEER. THE BEFORE AND AFTER CONDITION OF ALL HAUL ROUTES (TEMPORARY OR PERMANENT) SHALL BE JOIN INSPECTED AND DETERMINED BY THE CONTRACTOR AND THE THROUGH THE USE OF DIGITAL PHOTOGRAPHY AND/OR VIDE CONTRACTOR MAY NEED TO COORDINATE HAUL ROUTE USAG OTHER CONTRACTORS WORKING ON THE AIRPORT.
- FENCING, DRAINAGE, GRADING AND OTHER MISCELLANEOUS CONSTRUCTION REQUIRED TO CONSTRUCT OR RESTORE TEMP PERMANENT HAUL ROUTES OR ACCESS POINTS ON THE AIRE BE THE CONTRACTOR'S RESPONSIBILITY AND SHALL BE APPE THE ENGINEER PRIOR TO COMMENCING THE WORK
- 5. ALL ON-SITE ACCESS ROADS TO AIRPORT FACILITIES SHALL OPEN AND MAINTAINED AT ALL TIMES
- 6. CONTRACTOR'S STAGING AREA AN AREA WILL BE MADE A FOR CONTRACTOR'S MOBILIZATION AND STORAGE. THE CON STAGING AREA SHALL BE FREE OF DEBRIS. IF DIRECTED B ENGINEER, THE CONTRACTOR WILL BE REQUIRED TO STAKE FLAG THE STACING AREA LIMITS. NO STAGING WILL BE ALLO WITHIN RUNWAY SAFETY AREAS. UPON COMPLETION OF THE THE STAGING AREA SHALL BE RESTORED TO ITS ORIGINAL CO AT THE CONTRACTOR'S EXPENSE.
- ALL MATERIALS AND EQUIPMENT (INCLUDING STOCKPILED MA WHEN NOT IN USE SHALL BE PLACED IN APPROVED AREAS THEY WILL NOT CONSTITUTE & HAZARD TO AIRCRAFT OPERA PENETRATE CLEARANCE SURFACES SHOWN ON THE GEN PROJECT LAYOUT.
- THE OBSTACLE FREE ZONE (OFZ) GOVERNS EQUIPMENT CLEARANCE DURING CONSTRUCTION ADJACENT TO AN AC RUNWAY. UNDER NO CIRCUMSTANCES SHALL ANY MEN EQUIPMENT PENETRATE THESE SURFACES UNLESS PRIOR ARRANGEMENTS HAVE BEEN MADE WITH AIRPORT OPERA
- THE FAR PART 77 APPROACH, PRIMARY, AND TRANSITIO SURFACES GOVERN STOCKPILES AND PARKED EQUIPMEN NO CIRCUMSTANCES SHALL STOCKPILES, PARKED EQUIP OTHER CONSTRUCTION ITEMS PENETRATE THESE SURFACE ADJACENT TO AN ACTIVE RUNWAY
- EQUIPMENT SHALL BE PARKED AT THE CONTRACTOR'S STAGE WHEN NOT IN USE. TALL EQUIPMENT SUCH AS CRANES SI LOWERED TO THE GROUND WHEN NOT IN USE. STOCKPILED

NO. DATE	DESCRIPTIONS		MARYLAND DEPARTMENT OF TRANSPORTATION	PROJECT INCE:	n
		MARTIN	MARYLAND AVIATION ADMINISTRATION		P
		STATE AIRPORT	OFFICE OF ENGINEERING AND CONSTRUCTION MANAGEMENT	SHEET TITLE:	GENERAL SA
			DIVISION OF FACILITIES DESIGN	SCALE:	NONE

- THE CONTRACTOR SHALL BE AWARE OF THE FOLLOWING TYPES OF
- a. TRENCHES, HOLES, OR EXCAVATION ON OR ADJACENT TO ANY OPEN RUNWAY OR IN SAFETY AREAS.
- c. UNMARKED/UNLIGHTED HOLES OR EXCAVATION IN ANY APRON.
- d. MOUNDS OR PILES OF EARTH. CONSTRUCTION MATERIALS.
- e. VEHICLES OR EQUIPMENT, WHETHER OPERATING OR IDLE, ON ANY
- UNMARKED UTILITY, NAVAID, WEATHER SERVICE, RUNWAY LIGHTING, OR OTHER POWER OR SIGNAL CABLES THAT COULD BE DAMAGED

RECEIPT		EXCESS OF 10 KNOTS.	OR WIND CONDITIONS IN
EN AS	9,	ALL CONTRACTOR VEHICLES AND TRAF AUTHORIZED) SHALL REMAIN WITHIN T LIMITS OR HAUL ROUTES.	FIC (UNLESS OTHERWISE HE DESIGNATED CONSTRUCTION
AT ARE EAS,	SEC	CURITY	
CONTROL ACT WITH NWAYS, ACTOR'S	1.	THE AIRPORT WILL NOT PROVIDE AIRFI THE CONTRACTOR MUST PROVIDE RADI PERTINENT PERSONNEL WITH THE PRO	IELD OPERATIONS AREA ESCORTS. IOS TO THE CREW AND AQUAINT PER PROCEDURES IN
VAYS OR HROUGH	2.	THE CONTRACTOR SHALL PROVIDE THE LIST OF ALL EMPLOYEES WORKING ON BE MAINTAINED CURRENT BY THE CON	KUL. E ENGINEER WITH A CURRENT I THE AIRPORT. THE LIST SHALL ITRACTOR AND APPLIES TO BOTH
NS HAVE		THE CONTRACTOR AND SUBCONTRACTO	DRS.
TIONS	UTI	LTIES	
AL	1.	UNDERGROUND UTILITIES - LOCATIONS UTILITIES SHOWN ON THE PLANS ARE LOCATIONS SHALL BE FIELD VERIFIED COMMENCING CONSTRUCTION. THE CC COMPLETE A DIGGING AUTHORIZATION ENGINEER, PRIOR TO INITIATION OF EX	S OF KNOWN UNDERGROUND APPROXIMATE. ALL UTILITY BY THE CONTRACTOR PRIOR TO ONTRACTOR IS REQUIRED TO FORM, AS SUPPLIED BY THE CAVATION OPERATIONS.
S TO THE UT. THE D	2.	REPAIR OF UTILITIES DAMAGED DURING STARTED IMMEDIATELY AND CONTINUE	G CONSTRUCTION MUST BE UNTIL COMPLETED.
ESS HE SCHEDULE THE	3.	ALL SUCH REPAIRS SHALL BE IN ACC SPECIFICATIONS OR AS DIRECTED BY AT THE CONTRACTOR'S EXPENSE.	ORDANCE WITH THE CONTRACT THE ENGINEER AND SHALL BE
ZE R'S TATE PROPRIATE	4.	IF FAA CABLES ARE DAMAGED, REPAIR ACCORDANCE WITH FAA REQUIREMENT FAA REPRESENTATIVE. THE FAA MAY PERFORMED BY OTHERS IN WHICH CA RESPONSIBLE FOR PAYING THE INCURF	RS SHALL BE DONE IN S AND IN THE PRESENCE OF AN ELECT TO HAVE THE REPAIR SE THE CONTRACTOR SHALL BE RED COSTS OF REPAIRS.
. THE IN THE . ROADS, S UNLESS	5.	UTILITIES NOTIFICATION - AT LEAST T COMMENCING CONSTRUCTION OPERATIO INVOLVE UNDERGROUND UTILITIES, THE THE ENGINEER AND THE OWNER OF E AFFECTED.	WO WORKING DAYS PRIOR TO DNS IN AN AREA WHICH MAY E CONTRACTOR SHALL NOTIFY ACH UNDERGROUND UTILITY
HAUL HALL BE	6.	THE FOLLOWING LIST INCLUDES POSSI CONSTRUCTION LIMITS. ADDITIONAL U ALSO BE ON-SITE.	BLE UTILITIES WITHIN THE TTILITIES NOT LISTED BELOW MAY
S OR BY		UTILITY OWNERSHIP:	
LY ENCINEER		MISS UTILITY CENTER	1-800-257-7777
D. THE		BGE 410-685-0123/410-23	34-5000/1-800-685-0123
		VERIZON REPAIR BURIED CABLE	(410) 954-2222 1-800-275-2355
ORARY OR ORT WILL		FAA AIRWAY FACILITIES SSC	(410) 859-7252
OVED BI	EM	ERGENCY CONTACT INFORMATION	
REMAIN VAILABLE FRACTOR'S	1.	EXCEPT FOR EMERGENCIES, ALL CONT. SHALL BE MADE THROUGH THE ENGIN INVOLVING SAFETY (INJURIES, FIRES, 3 CONTRACTOR SHALL MAKE DIRECT COI FOLLOWED BY NOTIFICATION TO THE E	ACT WITH AIRPORT PERSONNEL EER. FOR EMERGENCIES SECURITY BREACHES, ETC.) THE NTACT WITH AIRPORT OPERATIONS NGINEER AS SOON AS POSSIBLE.
OUT AND	2.	THE PROJECT SUPERVISORS SHALL HAN NUMBERS WITH THEM AT ALL TIMES:	AVE THE FOLLOWING TELEPHONE
TERIAL)		 MAA FIRE MARSHALL MTN FIRE/POLICE EMERGENCY MTN OPERATIONS MTN ATCT MDE OIL CONTROL PROGRAM CONTROL PROGRAM 	410-859-7815/7511 911 410-682-8831 410-682-8856 410-537-3442
ERAL	3.	THE CONTRACTOR SHALL PROVIDE THE	PHONE NUMBERS OF THREE
OR		CONTACTED IN AN EMERGENCY. PERS HOURS PER DAY FOR MAINTAINING AIR BARRICADES.	SONNEL SHALL BE ON CALL 24 RPORT HAZARD LIGHTING AND
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NAL T. UNDER MENT, OR ES			
NG AREA IALL BE MATERIAL			
PROJ	ECT	' TITLE	CONTRACT NO.: MAA-CO-XX-XXX
ERAL CO	NST	FRUCTION AND	SHEET NO .:

JULY 2009

SHALL BE CONSTRAINED IN A MANNER TO PREVENT MOVEMENT

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 DOWN OF CHURCH AND A DAY A 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, GRADED, DRAINED AND COMPACIED. 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.

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COMPANY NAME	DESIGNED: DRAWN: 	REVISION REVISION DESCRIPTIONS NO. DATE DESCRIPTIONS 8/7/06 CONFORMED DRAWINGS	MARYLAND DEPARTMENT OF TRANSPORTATION MARYLAND AVIATION ADMINISTRATION	PROJECT TITLE:
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COMPANY NAME	DESIGNED:	NO. DATE	DESCRIPTIONS		MARYLAND DEPARTMENT OF TRANSPORTATION	PROJECT TITLE:
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CITY, STATE ZIP CODE COMPANY PHONE NO. COMPANY FAX NO.	APPROVED:			LOGO	OFFICE OF ENGINEERING AND CONSTRUCTION MANAGEMENT DIVISION OF FACILITIES DESIGN	SCALE:

FOR EROS

	ROCK OUTLET PROTECTION		
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	STONE OUTLET STRUCTURE		
	SILT FENCE	SF-SF-	
	SUPER SILT FENCE	SSFSSF SBD	
	STANDARD INLET PROTECTION		
	AT GRADE INLET PROTECTION	AGIP	
	CURB INLET PROTECTION	LE CIP	
	MEDIAN INLET PROTECTION		
	GABION INFLOW PROTECTION	GM	
	RIP-RAP INFLOW PROTECTION	RRP	
	SUMP PIT	SP	
	REMOVABLE PUMPING STATION		
	LIMIT OF DISTURBANCE		
	DRAINAGE BOUNDARY		
	TREE PROTECTION FENCE		
	ROOT PRUNING		
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SION AND SED	IMENT CONTROL ONLY.		
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EROSION AN	D SEDIMENT		
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SEDIMENT CONTROL LEGEND (CONSULTANT CAN MODIFY PER PROJECT SPECIFIC.)

EARTH DIKE

PERIMETER DIKE/SWALE

PIPE SLOPE DRAIN

SWALE

A-2 B-3

 $\xrightarrow{A-2} \xrightarrow{B-3}$

PSD-12

GENERAL NOTES

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, STOME CHECKS, SILT FROES, SURFACE ROUGHING, MATS & NETS, AGGREGATE, MULCH, GRASSES, SLOPE DRAINS AND OTHER APPROVED METHODS. EROSION AND SEDIMENT CONTROL MEASURES AS DESCRIBED HERIN AND APPROVED BY M.D.E. SHALL BE APPLIED TO ERODIBLE MATERIAL EXPOSED BY ANY ACTIVITY ON THIS PROJECT 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 SEDILUTY CONTROL 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 CONTROL ON THE PURPOSE OF CORRECTING CONDITIONS THAT DEVELOP DURING CONSTRUCTION NOT FORESEEN DURING THE DESIGN OF THE PROJECT AND FOR THE PURPOSE OF FROMDING 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

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 VECETATION (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.

(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.



OVERSEED PHASE 1 SLOPES, IF REQUIRED

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.

PHASING PLAN~CUT SECTION

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 OFFERMINARY SEED AND INCLUSING 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

FINAL PHASE EMBANKMENT

SIDE DITCH (FIRST ORDER OF BUSINESS/SEE EMBANKMENT NOTE)

8.

PHASE 2 EMBANKMENT

PHASE 1 EMBANKMENT

THE FIRST ORDER OF BUSINESS WILL BE THE EXCAVATION AND STABILIZATION OF SIDE DITCHES AND PLACEMENT OF PERIMETER CONTROL (SILT FEACE, ETC.). THE EMBANKHENT 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.

TEMPORARY BERM TO BE PLACED AT THE END OF -EACH WORK DAY TO BE USED UNTIL SLOPE IS COMPLETELY STABILIZED SLOPE SILT FENCE, SEE DETAIL (FIRST ORDER OF

BUSINESS/SEE EMBANKMENT NOTE)

-EXISTING GROUND

CONSTRUCTION SEQUENCE: 1.

- EXCAVATE AND <u>STABILIZE</u> SIDE DITCH AND/OR INSTALL PROPOSED CONTROLS AT THE TOE OF SLOPE. 2. PLACE PHASE 1 EMBANKMENT PROVIDE TEMPORARY SEEDING OR STRAW MULCH
- PLACE PHASE 2 EMBANKMENT, DRESS 3 PROVIDE TEMPORARY SEEDING OR STRAW MULCH PLACE FINAL PHASE EMBANKMENT,

DRESS. PREPARE & PLACE PERMANENT SEED & MULCH ON THE ENTIRE SLOPE.

PHASING PLAN-FILL SECTION

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 DPERMAND. A GRADING OPENAIION IS DEFINED AS THE CONTRACTOR'S BAILITY 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. A REAS ARE TO BE PERMANENTLY OR TEMPORARILY SEEDED AND MULCHED WHEN SITE DEVELOPMENT WORK GRADING OD OTHER LEDTER DEVELOPMENT 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 PERMETER CONTROLS, DIKES, SWALES, DITCHES, PERIMETER SLOPES, AND OTHER PERMETER SCONTROLS, 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" (JE CARDING LATERDAL DAY ACCESSION OF A DETAILS TO STABILIZED STABILIZED, ONCE THE EXCAVATION OR EMBANKMENT REACHES THE "BOTTOM OR REQUIRED. ONCE THE EXCAVATION OR EMBANKMENT REACHES THE "BOTTOM OS SUBGRADE," (I.E., CAPPING MATERIAL OR AGGREGATE SUBGRADE IN PLACE), THOSE AREAS IN WHICH PAVING WILL BE PLACED WILL BE EXCMPT FROM THE STABILIZATION REQUIREMENTS." ROADWAYS AND HAUL ROADS ACTIVELY BEING USED FOR DALY CONVEYNACE 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 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 AND ONE ORGENTIAN ONE UNIT OF GRUBBED AND GRADED ARE ALLOWED AND GRADED ARE ALLOWED FOR INTERCHANGE CONSTRUCTION. WHEN WET SOIL CONDITIONS ARE ENCOUNTERED, THE CONTRACTOR WILL BE ALLOWED TO GRUBE AND GRADE ANOTHER UNIT PROVIDING THE INITIAL UNIT HAS BEEN PROPERTY EXAMILES (CANOTION) 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

MAINTENANCE 9.

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 FINIFER BY THE ENGINEER

TRAPS WILL BE CLEANED WHEN THEY ARE 50% FILLED. SILT FENCE STONE NOT STRUCTURES AND STRW BALLS 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. THIS TICM THAS DECHN ESTABLISTED TO TINULUUE THE EADAVAITUN. BACKTRLING AND MAINTENANCE OF SEDIMENT TRAFS. IT SHALL ALSO INCLUDE THE REMOVAL OF SILT IN AND AROUND SEDIMENT BASINS, SILT FENCE, STRAW BALE DICH CHECKS, TEMPORARY STONE OUTLET STRUCTURE, EARTH BERNS, 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 SLIT FENCE TO CONTROL THE PERIMETER OF THE STORYOFIC HUTH SULTABLE VECTATION IS SETAIL WE SLITD. STOCKPILE UNTIL SUITABLE VECETATION IS ESTABLISHED. IF HE ELECTS, STOCKPILE UNTIL SUITABLE VECETATION IS ESTABLISHED. IF HE ELECTS, THE CONTRACTOR, WITH THE APPROVAL OF THE ENGINEER, MAY CONSTRUCT AN EARTH BERM IN LIEU OF SLIT FERCE. 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 EMBANIMENT OR WASTED AS DIRECTED BY THE ENGINEER. EXCAVATION FROM CUTS TO BE USED FOR EMBANKAMENTS 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

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

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ALL VALUES SPECIFIED ARE MINIMUM OR MAXIMUM ROLL VALUES.

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 S GRAB TENSILE STRENG

BURST STRENGTH:

AS FOLLOWS:

16.

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 SULT FENCE SHALL CONTAIN SUFFICIENT ANOUNTS 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

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.

GRAB	
TENSILE	BURST
STRENGTH	STRENGTH
LB. MIN.	PSI, MIN.
250	500
200	320
200	320
90	145
90	145
	GRAB TENSILE STRENGTH LB. MIN. 250 200 200 90 90

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

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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

(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.

EROSION AND SEDIMENT CONTROL NOTES I DATE:

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STANDARD EROSION AND SEDIMENT CONTROL NOTES

- THE CONTRACTOR SHALL NOTIFY THE ADMINISTRATION (WMA) AT (410) 537-3510 1 THE CONTINUE OF STRUCT NUTLEY THE ADMINISTRATION (WMA) AT (410) 537-5310 SEVEN (7) DAYS BEFORE COMMENCING ANY LAND DISTURBING ACTIVITY AND, UNLESS WAVED 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.
 - 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).

B. FOLLOWING INSTALLATION OF SEDIMENT CONTROL MEASURES.

- F. PRIOR TO REMOVAL OF ALL SEDIMENT CONTROL DEVICES.
- F. PRIOR TO FINAL ACCEPTANCE.
- 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 MEASURE WITHOUT PRIOR PERMISSION FROM WWA INSPECTOR AND AGENCY INSPECTOR. THE CONTRACTOR SHALL NOT FROM WAA INSPECTOR AND AGENCY INSPECTOR. THE CONTRACTOR SHALL NOT FROM WAA INSPECTOR AND AGENCY INSPECTOR. THE CONTRACTOR VISION FROM WWAA INSPECTOR WMA APPROVAL FOR CHANCES TO THE SEDIMENT CONTROL PLAN AND/OR SEQUENCE OF CONSTRUCTION. 3. SEQUENCE OF CONSTRUCTION
- THE CONTRACTOR SHALL PROTECT ALL POINTS OF CONSTRUCTION INGRESS AND ECRESS TO PREVENT THE DEPOSITION OF MATERIALS ONTO PUBLIC ROADS. ALL MATERIALS DEPOSITED ONTO PUBLIC ROADS SHALL BE REMOVED 4.
- 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. 5.
- 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 MUCH, OR OTHER APPROVED STABILIZATION MEASURES, AS SOON AS POSSIBLE BUT NO LATER THAN SEVEN (7) CALENDAR DAYS AFTER ESTABLISHMENT. ALL AREAS DISTUBBED OUTSIDE OF THE PERIMETER SEDIMENT CONTROL SYSTEM MUST BE MINIMIZED. MAINTENANCE MUST BE PERFORMED AS NECESSARY TO ENSURE CONTINUED STARIE IZATION (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 STREPING 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 PRIOR TO REMOVAL OF SEDIMENT CONTROL MEASURES, THE CONTRACTOR SHALL STABILIZE AND HAVE ESTABLISHED PERMANENT TABILIZATION FOR ALL CONTRIBUTORY DISTURBED AREAS USING SOD OR AN APPROVED PERMANENT SEED MIXTURE WITH REQUIRED SOL 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. SEEDING SEASUM SHALL BE PERMAMENTLY STABILIZED AS SUON AS PUSSIBLE, 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.
- 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. 9.
- 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.
- 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 MESSURES.
- 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 SEDMENT 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.

- 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.
- SEDIMENT TRAPS OR BASINS ARE NOT PERMITTED WITHIN 20 FEET OF A FOUNDATION WHICH IS EXISTING OR UNDER CONSTRUCTION. NO STRUC MAY BE CONSTRUCTED WITHIN 20 FEET OF AN ACTIVE SEDIMENT TRAP (
- 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.
- 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.
- 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
- 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
- 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
- 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
- C. TRENCHES FOR UTILITY INSTALLATION SHALL BE BACKFILLED, 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 WIELDED 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 INFLITEATION DEVICES ARE USED FOR THE CONTROL OF STORNWATER, EXTREME CARE MUST BE TAKEN TO PREVENT RUNOFF FROM UNSTRAILZED AREAS FROM ENTERING THE STRUCTURE DURING CONSTRUCTION. SEDIMENT CONTROL DEVICES PLACED IN INFLITATION AREAS MUST HAVE BOTTOM ELEVATIONS AT LEAST TWO (2) FEET HIGHER THAN THE FINISH GRADE BOTTOM ELEVATION OF THE INFLITRATION PRACTICE. WHEN CONVERTING A SEDIMENT TOWN OF THE INFLITRATION PRACTICE. WHEN CONVERTING A SEDIMENT MUST BE REMOVED AND DISPOSED OF PRIOR TO FINAL GRADING OF INFLITRATION 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 CONVENING 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:

1	A. TOTAL AREA OF FACILITY	(CONSULTANT TO FILL IN)
E	 TOTAL AREA OF PROJECT SITE 	CONSULTANT TO FILL IN
	C. AREA DISTURBED	CONSULTANT TO FILL IN
1). 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
		QUOTE TO BE DETERMIN

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.

DESIGN CERTIFICATION

Designer's Signature

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

Date

cle)	Printed	Nome

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 (FACILITIES) 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)

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.

SIGNATURE

COMPANY NAME	DESIGNED:	REVISION REVISION DESCRIPTIONS	BWI THURGOOD MARYLAND DEPARTMENT OF TRANSPORTATION MARSHALL MARYLAND AVIATION ADMINISTRATION	PROJECT TILE:	CONTRACT NO .:
COMPANY NAME COMPANY ADDRESS CITY, STATE ZIP CODE COMPANY PHONE NO, COMPANY FAX NO.	CHECKED: 		OR MARTIN STATE LOGO OFFICE OF ENGINEERING AND CONSTRUCTION MANAGEMENT DIVISION OF FACILITIES DESIGN	SHEET TITLE: EROSION AND SEDIMENT CONTROL NOTES II SCALE: DATE: DATE	SHEET NO.:

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

- 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.
- 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)
- 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.
- WITH THE APPROVAL OF THE MOE 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)
- 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.
- 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.

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

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COMPANY PHONE NO.

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APPENDIX D

STANDARD SPECIFICATIONS





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 270500 Common Work Results for Communication
- Section 270526 Grounding and Bonding For Communications Systems
- Section 270528 Pathways for Communication Systems
- Section 270543 Underground Ducts and Raceways for Communications Systems
- Section 270553 Identification for Communications Systems
- Section 271100 Communications Equipments Room Fittings
- Section 271300 Communications Backbone Cabling
- Section 271500 Telecommunications Horizontal Cabling
- Section 271900 Exterior Communications Pathways





MAA LANDSCAPE SPECIFICATIONS





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 longterm 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	Topsoilper 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

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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

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 ag	riculture seeds inert matter and other se	ede dietinguishable by

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

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

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

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

Seed	Rate of Application <u>(lbs of PLS/acre)</u>
75% Hard Fescue20% Chewings Fescue5% Kentucky Bluegrass	85 23 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 <u>(lbs of PLS/acre)</u>
60% Creeping Bent Grass30% Fowl Bluegrass10% Switchgrass	83 34 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 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 quickacting, 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

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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 903-5.1Seeding Mixture No. 1 -- per acreItem 903-5.2Seeding Mixture No. 1 -- per square yardItem 903-5.3Seeding Mixture No. 2 -- per acreItem 903-5.4Seeding 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 set 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

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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 Alchemilla mollis Astilbe x arendsii Carex gravi Carex stricta Ceratostigma plumbaginoides Chrysanthemum x superbum Convallaria majalis Coreopsis rosea Coreopsis verticillata Dryopteris erythrosora Dryopteris marginalis Echinacea purpurea 'Magnus' Epigea repens Eupatorium coelestinum Eupatorium hyssopifolium Eupatorium maculatum Eupatorium purpureum Geranium maculatum Hedera helix Hemerocallis spp. Hibiscus moscheutos Hosta spp. Hydrangea quercifolia Iris sibirica Iris versicolor Lantana camara Liatris spicata Liriope muscari Liriope variegata Lobelia siphilitica Lonicera sempervirens Lythrum salicaria Narcissus (all species and cultivars) Nepeta x faassenii Onoclea sensibilis Osmunda cinnamomea Pelargonium x domesticum Perovskia abrotanoides Phlox stolonifera Polygonum aubertii Polystichum acrostichoides Rudbeckia fulgida Salvia nemorosa Schizachyrium scoparium Sedum spectabile Solidago rugosa Thelypteris noveboracensis Tiarella cordifolia Tulipa spp.

Common name Lady's Mantle Hybrid Astilbe Morningstar Sedge **Tussock Sedae** Leadwort/Plumbago Shasta Daisy Lily-of-the-Valley **Rosy Coreopsis Threadleaf Coreopsis** Autumn Fern Leatherleaf Wood Fern Magnus Coneflower **Trailing Arbutus** Hardy Ageratum Hyssopleaf Thoroughwort Joe-Pye Weed Sweet Joe-Pye Weed Wild Geranium English Ivy Daylily Rose Mallow Plantain Lily Oakleaf Hydrangea Siberian Iris Blue Flag Iris Yellow Sage Gay-feather Blue Lily-turf Variegated Liriope Blue Cardinal Flower **Coral Honeysuckle Purple Loosestrife** Daffodil Catmint Sensitive Fern **Cinnamon Fern** Mary Washington Geranium Caspian/Russian Blue Sage **Creeping Phlox** Silver Lace Vine Christmas Fern **Blackeyed Susan** May Night Salvia Little Bluestem Stonecrop Goldenrod New York Fern Foam Flower Tulip

Perennials, Ground Covers, Annuals & Bulbs

Scientific name Verbena canadensis Veronica spp. Vinca minor Yucca filamentosa

Common name Rose Verbena Speedwell Periwinkle Adam's-needle Yucca

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Trees (large, medium, small, ornamental & evergreen)

Scientific Name	Common Name
Abies concolor	White Fir
Abies nordmanniana	Nordman Fir
Acer campestre	Hedge Maple
	Red Maple (seedless cultivars such as 'Celzam',
Acer rubrum	'Karpick', and 'Somerset' only)
	Freeman Maple (seedless cultivars such as 'Autumn
Acer x freemanii	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)
Crvtomeria iaponica	Japanese Cedar
Cupressocyparis x levlandii	Levland Cypress
	White Ash (seedless cultivars such as 'Autumn
	Applause', 'Autumn Purple', Champaign County'
Fraxinus americana	'Rosehill' and 'Skyline' only)
	Green Ash (seedless cultivars such as 'Aerial'
	'Bergeson' 'Honeyshade' 'Marshalls Seedless'
Fraxinus pennsylvanica	'Patmore' and 'Robinhood' only)
Ginkao biloba	Ginko (male cultivars only)
Chinigo Shoba	Thornless Common Honeylocust (seedless cultivars
	such as 'Imperial' 'Shademaster' 'Skyline' and
Gleditsia triacanthos var inermis	Sunburst only)
	American Holly (male cultivars such as 'Jersey Knight'
llex opaca	only)
Koelreutarea naniculata	Golden Raintree
Lagerstroemia indica	Crane Myrtle
Liriodendron tulinfera	Yellow Ponlar
Liquidambar styraciflua	Sweetoum
Magnolia y loebneri	Leebneri Magnolia
Magnolia x soulangiana	Saucer Magnolia
Magnolia stellata	Star Magnolia
Magnolia virginiana	Sweethay Magnolia
magnona virginiana	Elowering Crahannie (non-fruiting cultivers such as
•	American Beauty' 'Prince Goorgos' and 'Spring Spow'
Malus son	only)
Nalus spp. Ostrvo virginiono	American Henbernhoom
Ostrya virginiaria Ovudendrum erbereum	Sourwood
Digga abias	Nervey Serves
	White Spruce
Piceo omoriko	Vitile Optice
	Service Colorado Comuço
Ficea pungens Dinus sobinata	
	Shortleat Pine
rinus mugo	iviugo Pine

Trees (large, medium, small, ornamental & evergreen)

Scientific Name

Common Name

Pinus rigida Pinus strobus Pinus taeda Pinus thunbergii Pinus virginiana Platanus occidentalis Populus deltoides Populus grandidentata Prunus spp.

Prunus serrulata Prunus x yedoensis Salix nigra Sophora japonica Stewartia pseudocamellia Styrax japonicus Syringa reticulata Taxodium distichum Thuja occidentalis Tilia americana Tilia cordata Tilia tomentosa Tsuga canadensis Tsuga caroliniana Ulmus americana Ulmus parvifolia Ulmus pumila Zelkova serrata

Pitch Pine Eastern White Pine Loblolly Pine **Japanese Black Pine** Virginia Pine American Sycamore Eastern Cottonwood **Bigtooth Aspen** Flowering Cherry (non-fruiting cultivars only) Japanese Flowering Cherry (non-fruiting cultivars such as 'Kwanzan' only) Yoshino Cherry (non-fruiting cultivars only) Black Willow Japanese Scholartree Japanese Stewartia Japanese Snowbell Japanese Tree Lilac Bald Cypress American Arborvitae American Linden Littleleaf Linden Silver Linden **Canadian Hemlock** Carolina Hemlock American Elm Chinese Elm Siberian Elm Japanese Zelkova

Shrubs (large, medium, small, ornamental & evergreen)

Scientific name Abelia "Edward Goucher" Abelia x grandiflora Acer campestre Berberis x mentorensis Buddleia davidii Calluna vulgaris Clethra alnifolia Cotoneaster dammeri Deutzia gracilis Euonymus americanus Euonymus kiautschovicus Forsythia x intermedia Forsythia suspensa Forsythia viridissima Hamamelis vernalis Hamamelis virginiana Hydrangea arborescens Hydrangea quercifolia Hypericum patulum Hypericum frondosum llex spp. llex x attenuata "Fosteri"

llex crenata llex x "Edward J Stevens"

llex glabra

llex x meserveae llex opaca ltea virginica Jasminum nudiflorum Juniperis conferta

Juniperis chinensis

Juniperis horizontalis Juniperis procumbens Juniperis sabina

Juniperis scopulorum Kalmia latafolia Lavandula angustifolia Leucothoe axillaris Ligustrum japanicum

Lindera benzoin

Common name Edward Goucher Abelia Glossy Abelia Hedge Maple Mentor Barberry **Butterfly Bush Common Heather** Sweet Pepperbush **Bearberry Cotoneaster** Slender Deutzia Strawberry Bush Spreading Euonymus **Border Forsythia** Weeping Forsythia Greenstem Forsythia Vernal Witchhazel Common Witchhazel Smooth Hydrangea Oakleaf Hydrangea Goldencup St. Johnswort Golden St. Johnswort Holly species (male cultivars only) Foster's Holly (male cultivars only) Japanese Holly (male cultivars such as 'Glass', 'Green Dragon', 'Green Island', 'Helleri', 'Howard', 'Northern Beauty' and 'Sentinel' only) Edward Stevens Holly Inkberry (male cultivars such as 'Chamzin' and 'Shamrock' only) Meserve Hybrid Hollies (male cultivars such as 'Blue Boy', 'Blue Prince', 'Blue Stallion', and 'China Boy' only) American Holly (male cultivars such as 'Jersey Knight' only) Virginia Sweetspire Winter Jasmine Shore Juniper Chinese Juniper (male cultivars such as 'Globosa' and 'Pfitzeriana Glauca' only) Creeping Juniper (male cultivars such as 'Fountain', 'Glomerata', 'Jade River', 'Jade Spreader', 'Plumosa' and 'Plumosa Compacta Youngstown' only) Japgarden Juniper (male cultivars only) Savin Juniper (male cultivars only) Rocky Mountain Juniper (male cultivars such as 'Gray Gleam', 'Medora', and 'Silver King' only) **Mountain Laurel Common Lavender** Fetterbush Japanese Privet Spicebush (use male cultivars such as 'Green Gold' and 'Rubra' only)

Shrubs (large, medium, small, ornamental & evergreen)

Scientific name

Magnolia virginiana Microbiota decussata

Common name

Microbiota decussata Mynca pennsylvanica Nandina domestica

Osmanthus heterophyllus Photinia x fraseri

Prunus laurocerasus Pyracantha koidzumii Rhododendron arborescens Sarcococca hookeriana Spiraea spp. Spiraea nipponica 'Snowmound' Syringa vulgaris Taxus baccata

Taxus x media Viburnum x burkwoodii

Viburnum plicatum var. tomentosum Viburnum rhytidophyllum Weigela florida

Sweetbay Magnolia Russian Arborvitae Northern Bayberry (male cultivars such as 'Myriman' only) Heavenly Bamboo (non-fruiting cultivars such as 'Atropurpurea Nana' only) False-holly Fraser Photinia Common Cherrylaurel (only cultivars with non-showy fruit such as 'Schipkaensis' only) Formosa Firethorn Sweet Azalea Sweetbox Meadowsweet Snowmound Spiraea Common Lilac English Yew (male cultivars only) Anglojap Yew (male cultivars such as 'Amherst', 'Brownii', 'Hatfieldii' and 'Sebian' only) Burkwood Viburnum Doublefile Viburnum (use non-fruiting cultivars such as 'Roseum' only) Leatherleaf Viburnum Old-fashioned Wegelia

Grasses (Ornamental, Turf, Erosion Control)

Scientific name

Andropogon scoparius Calamagrostis x acutiflora Calamagrostis arundinacea 'Karl Foerster' Calamagrostis stricta Festuca arundinacea Festuca longifolia Festuca rubra var. commutata Lolium multiflorum Lolium perenne Miscanthus sinensis var. gracillimus Panicum virgatum Pennisetum alopecuroides Pennisetum alopecuroides 'Hameln' Pennisetum alopecuroides 'Little Bunny' Pennisetum villosum Poa pratensis

Common name Little Bluestem Feather Reed Grass Foerster's Feather Reed Grass Slimstem Reed Grass Certified turf-type Tall Fescue Hard Fescue **Chewings Fescue** Annual Ryegrass Perennial Ryegrass Maiden Grass Switch-grass Fountain Grass 'Hameln' Fountain Grass 'Little Bunny' Fountain Grass Feathertop Kentucky Bluegrass

APPENDIX B

APPROVED INSTALLATION METHODS

July 2006 (REVISED)












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AIRPORT WIDE STANDARD FOR SOLE SOURCE SYSTEMS AND EQUIPMENT





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.

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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

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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

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Standard Technical Specifications Natural Gas Distribution 02553-3 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 Pipingper linear foot
Item 01021-1	BGE Gas Service Cost Allowance
Item 01021-2	Contractor Gas Service Support Work Allowance

END OF SECTION 02553

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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.

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- 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

Airport Wide Standard for Sole Source Systems and Equipment Baltimore/Washington International Airport Revised October 15, 2004 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: ¹/₄-inch thick steel plate cabinet with ¹/₂-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

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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,

Standard Technical Specifications Fire Alarm System 13851-1 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. <u>Acceptable Products</u>: 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.

<u>Acceptable Products</u>: Wheel Lock PS–12/24-8 Booster Panel. Wheel Lock DSM-12/24-R Synchronizing Module.

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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.

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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.
- Photoelectric Smoke Sensors shall contain an optical sensing chamber with nominal sensitivity of 2.3% per foot obscuration. <u>Acceptable Product</u>: Honeywell TC 806 B.
- 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.
 <u>Acceptable Product</u>: Honeywell TC 807 A. Honeywell 14506873, smoke sensor duct housings.
- 9. Thermal Sensors shall provide temperature measurement when scanned by the FACP for information. <u>Acceptable Product</u>: 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.

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- 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. <u>Acceptable Product</u>: 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. <u>Acceptable Product</u>: 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

Airport Wide Standard for Sole Source Systems and Equipment Baltimore/Washington International Airport February 17, 2004 Standard Technical Specifications Fire Alarm System 13851-5 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 $3-1/2 \ge 5$ 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.

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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.

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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

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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.

Standard Technical Specifications Building Automation Systems (BAS) 13975-1 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.

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- 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.

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- 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 factoryinstalled 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.

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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.
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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.

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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.

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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.

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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, multiuser, 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.

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- 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 selfdiagnostics, 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.

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- 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

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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.

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- 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 userdefined 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

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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.

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- 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. CO₂ Multiplexer--Controls the sampling sequence and storing of the three measured CO₂ 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.
- 1. 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.

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- 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

The outdoor air flow rate can then be determined as

$$FM_{OA} = \frac{CO_{2,RA} - CO_{2,SA}}{CO_{2,RA} - CO_{2,0A}} CDOTCFM$$

using the supply air volumetric flow rate in CFM (or m^3/sec) and the CO₂ concentrations in ppm (parts per million).

$CO_{2,RA}$ - $CO_{2,SA}$

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 return is equal to that of 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.

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- g. The return air CO₂ concentration, one of the three CO₂ 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 CO₂ high limit control and for Return Air CO₂ Alarms. For these applications, when an absolute CO₂ measurement is needed, accurate CO₂ sensor calibration is required. The CDS-2000 CO₂ 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 CO₂ sensors require periodic (annually) calibration with a calibration gas that contains a specific concentration of CO₂.
- 5. CO₂ 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 networkresident 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.

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- 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.

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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.

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- 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-widthmodulation 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 snapacting 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, mercuryswitch type, with adjustable or fixed anticipation heater.

- C. Line-Voltage, On-Off Thermostats: Bimetal-actuated, open contact or bellowsactuated, 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, manualor 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, manualor 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.

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- 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.

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- 1. Fittings: Cast-bronze solder fittings complying with ASME B16.18; or wroughtcopper 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 60minute 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.

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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

- 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.

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- 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

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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.

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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.

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- 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 CO₂ sensing and for verification of proper placement of outdoor air temperature and CO₂ 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

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- 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.

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- 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

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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

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Standard Technical Specifications Power Monitors for Low Voltage Switchgear 16430-1
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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

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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).

<u>Acceptable Product</u>: 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.

<u>Acceptable Product</u>: Amesco Series SL1A, Amber Strobe Light Amesco Series SL1B, Blue Strobe Light

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Standard Technical Specifications Flexible Response System 16714-1

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.

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Standard Technical Specifications Flexible Response System 16714-2 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.

<u>Acceptable Product</u>: 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

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SECTION 16724 - CONTROLLED ACCESS SECURITY SYSTEM

PART 2 – PRODUCTS

Α.

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)

- 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

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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.

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- 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.

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- 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

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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.

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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

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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

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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.

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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

 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

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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

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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 MainFrameIED 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.

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b. Scalable network <u>Acceptable Products</u>:

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. <u>Acceptable Products</u>: 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

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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
 - 1. 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 + -.1 dB
- e. THD+N: 0.0002% typical
- f. Crosstalk: <108dB
- g. Sample Rate: 48 kHz Fixed
- h. Oversampling: 64x
- i. Output Drive: > 500hm 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

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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.

<u>Acceptable Products</u>: 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.

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- 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.

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- 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.

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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 $\frac{1}{2}$ and $\frac{3}{4}$ 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.

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7. Power handling: 60 Watts

<u>Acceptable Products:</u> 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 $\frac{1}{2}$ ' and $\frac{3}{4}$ ' 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 \pm 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

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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 Kl1620PA 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

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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 16channel 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,

Airport Wide Standard for Sole Source Systems and Equipment Baltimore/Washington International Airport Revised October 15, 2004 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:

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- 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. <u>Acceptable Product</u>: 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

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 E. The unit shall be rack-mountable. The power source shall be 120VAC, 60Hz, and shall be UL listed.
<u>Acceptable Product</u>: Philips Model LTC 22377/60, Quad Video Processor.

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CLOSED-CIRCUIT TELEVISION CAMERAS

2.6

- 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. <u>Acceptable Product</u>: Philips Model LTC 0450/21. Cameras

Philips Model LTC 0450/21, Cameras.

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- 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.

Airport Wide Standard for Sole Source Systems and Equipment Baltimore/Washington International Airport Revised October 15, 2004 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, $+/-0.50^{\circ}$ 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 <u>Acceptable Product</u>: 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.

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1

ALC: NO

- 6. Connectors: Screw terminals.
- 7. Construction/finish: Beige metal case.
- 8. Dimensions: approximately 11.25 "W x 3.5 "D x 11.25. <u>Acceptable Product</u>: 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.
<u>Acceptable Product</u>:
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

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- 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 inline 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.

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- 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): $19.0 \times 5.2 \times 7$
 - 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

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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.

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(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.

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Standard Technical Specifications Modifications and Additions to Airfield Lighting Control System L-109-2 (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.

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.

Airport Wide Standard for Sole Source Systems and Equipment Baltimore/Washington International Airport Revised October 15, 2004 (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.

Module.

(c) Receives current and voltage samples from the Voltage and Current Sensor

(d) Can interface with up to one (1) circuit.

4. Display Module

(4)

(a)

(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
- the CCR.

shutdown of the CCR.

shutdown of the CCR.

switch of the CCR.

(b) Open Circuit Shutdown: LED display indicating open circuit

Primary Power: LED display indicating the status of the input power to

Over Current Shutdown: LED display indicating over current

(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.	
Board.		(b)	Transmits current and voltage samples to the Monitoring	
		(c)	Interfaces to the output of the CCR.	
interface.		(d)	Shall be isolated from the series circuit via a quick disconnect	
Board.		(e)	Quick disconnect connections for interface to the Monitoring	
	(6)	Insulation Resistance Monitoring Module (IRMM)		
		(a)	Collects insulation resistance samples.	
		(b)	Transmits insulation resistance samples to the Processor Board.	
8.3		(c)	Interfaces to the output of the CCR.	
interface.		(d)	Shall be isolated from the series circuit via a quick disconnect	
Board.	8	(e)	Quick disconnect connection for interface to the Processor	

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.

> Feedback: Two digital-isolated input points (expandable to 6). **(b)**

Current/Voltage Monitoring: One digital interface (expandable to 3). (c)

Insulation Resistance Monitoring: Two digital interface. (d)

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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.

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j. Failsafe

191. 9.1 Salah

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 fails afe 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.

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- (3) Rated Current (Resistive): 5A.
- (4) Operational Life: Mechanical $5 \ge 10^7$, 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.

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Standard Technical Specifications Modifications and Additions to Airfield Lighting Control System L-109-10 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.

Airport Wide Standard for Sole Source Systems and Equipment Baltimore/Washington International Airport Revised October 15, 2004 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

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PASSENGER BOARDING BRIDGE SPECIFICATIONS





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)

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

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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.

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REQUIREMENTS

100-2 **REQUIREMENTS FOR ALL** GENERAL 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.

- 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)

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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.

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.

- 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.

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- 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].

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 0 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 DST \cap MAA 2001-11, "PRE-**CONDITIONED AIR AND 400 HERTZ SYSTEMS AND ASSOCIATED** LOADING BRIDGE **REQUIREMENTS**" AND DST 2002-01. **"HARMONICS** PRODUCING **SPECIFICATIONS EQUIPMENT REQUIREMENTS**".

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- 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).

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

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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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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 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 mm²) consisting of two 6 in² (3871 mm²) 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.

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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 ³/₄-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

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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.

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- (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.

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- (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.

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.

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c. Provisions for hardwire emergency lighting shall be provided.

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.

"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.

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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.

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- **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 ¹/₄ 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

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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.

- **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.
- **I.** 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.

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 autoleveling 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

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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

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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 electricallyreleased 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

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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

A luminum carnet molding shall be suggided with the DDD

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-Ft² °F/BTU (.46 m² °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:

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- (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).

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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

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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)

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- **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.

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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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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.

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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

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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,

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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.

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BASIS OF PAYMENT

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

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COMMUNICATIONS SYSTEMS AND INFRASTRUCTURE SPECIFICATIONS





SECTION 270500 - COMMON WORK RESULTS FOR COMMUNICATIONS

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 I, Maryland State Highway Administration, Anne Arundel County and Interim Standard Provision Addenda, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Communications equipment coordination and installation.
 - 2. Sleeves for pathways and cables.
 - 3. Sleeve seals.
 - 4. Grout.
 - 5. Common communications installation requirements.

1.3 DEFINITIONS

- A. EPDM: Ethylene-propylene-diene terpolymer rubber.
- B. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

A. Product Data: For sleeve seals.

1.5 COORDINATION

- A. Coordinate arrangement, mounting, and support of communications equipment:
 - 1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
 - 2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
 - 3. To allow right of way for piping and conduit installed at required slope.

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- 4. So connecting pathways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.
- B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.
- C. Coordinate location of access panels and doors for communications items that are behind finished surfaces or otherwise concealed. Access doors and panels are specified in Division 08 Section "Access Doors and Frames."
- D. Coordinate sleeve selection and application with selection and application of firestopping specified in Section 270528.

PART 2 - PRODUCTS

2.1 SLEEVES FOR PATHWAYS AND CABLES

- A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
- B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

2.2 SLEEVE SEALS

- A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and pathway or cable.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Advance Products & Systems, Inc.
 - b. Calpico, Inc.
 - c. Metraflex Co.
 - d. Pipeline Seal and Insulator, Inc.
 - e. Approved Equal
 - 2. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of pathway or cable.
 - 3. Pressure Plates: Plastic. Include two for each sealing element.

4. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.3 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR COMMUNICATIONS INSTALLATION

- A. Comply with NECA 1
- B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.
- C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.
- D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both communications equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.
- E. Right of Way: Give to piping systems installed at a required slope.

3.2 SLEEVE INSTALLATION FOR COMMUNICATIONS PENETRATIONS

- A. Communications penetrations occur when pathways, cables, wireways, or cable trays penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.
- B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.
- C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
- D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

- E. Cut sleeves to length for mounting flush with both surfaces of walls.
- F. Extend sleeves installed in floors 2 inches above finished floor level.
- G. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and pathway or cable, unless indicated otherwise.
- H. Seal space outside of sleeves with grout for penetrations of concrete and masonry
 - 1 Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.
- I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and pathway or cable, using joint sealant appropriate for size, depth, and location of joint.
- J. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pathway and cable penetrations. Install sleeves and seal pathway and cable penetration sleeves with firestop materials.
- K. Roof-Penetration Sleeves: Seal penetration of individual pathways and cables with flexible boot-type flashing units applied in coordination with roofing work.
- L. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- M. Underground, Exterior-Wall Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between pathway or cable and sleeve for installing mechanical sleeve seals.

3.3 SLEEVE-SEAL INSTALLATION

- A. Install to seal exterior wall penetrations.
- B. Use type and number of sealing elements recommended by manufacturer for pathway or cable material and size. Position pathway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pathway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.4 FIRESTOPPING

A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for communications installations to restore original fire-resistance rating of assembly.

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END OF SECTION 270500

Technical Specifications Common Work Results for Communications

SECTION 270526 - GROUNDING AND BONDING FOR COMMUNICATIONS 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 Provision Addenda, apply to this Section.
- B. Related Sections:
 - 1. 270528 Pathways for Communications Systems
 - 2. 270543 Underground Ducts and Raceways for Communications Systems
 - 3. 270553 Identification for Communications Systems
 - 4. 271100 Communications Equipment Room Fittings
 - 5. 271300 Communications Backbone Cabling

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Conduit, fittings and bodies.
 - 2. Bonding, Grounding cable and fittings.
 - 3. Junction boxes, pull boxes and gutters.
 - 4. Measured pull tape.
- B. This Section covers only communications bonding and grounding conduit and fittings. Refer to Section 271100 Communications Equipment Room Fittings for cable tray/ladder rack bonded within the telecommunications rooms. Refer to Section 271300 Communications Backbone Cable for bonding of Communications Cable to the Grounding system.

1.3 **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.
- D. References:
 - 1. American National Standards Institute (ANSI):
 - a. C80.1 Rigid Steel Conduit Zinc Coated.
 - b. C80.4 Fittings for Rigid Metal Conduit.
 - 2. Federal Specifications (FS):
 - a. W-C-58C Conduit Outlet Boxes, Bodies Aluminum and Malleable Iron.
 - b. W-C-1094 Conduit and Conduit Fittings Plastic, Rigid.
 - c. WW-C-566C Flexible Metal Conduit.
 - d. WW-C-581D Coatings on Steel Conduit.
 - 3. National Electrical Manufacturers Association (NEMA):
 - a. RN1 Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Electrical metallic Tubing.
 - b. TC2 Electrical Plastic Tubing (EPT) and Conduit (EPC-40 and EPC-80).
 - c. TC3 PVC Fittings for Use with Rigid PVC Conduit and Tubing.
 - d. NEMA VE 1 Metal Cable Tray Systems.

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Technical Specifications Grounding and Bonding for Communication Systems

- e. NEMA VE 2 Metal Cable Tray Installation Guidelines.
- 4. American Society for Testing and Materials International (ASTM):
 - a. ASTM A123 Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - b. ASTM A653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - c. ASTM B633 Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.
- 5. Underwriters Laboratories Inc. (UL):
 - a. 6 Rigid Metal Electrical Conduit.
 - b. 514 B Fittings for Conduit and Outlet Boxes.
 - c. 651 Schedule 40 and 80 Rigid PVC Conduit.
 - d. 651A Type EB and A Rigid PVC Conduit and HDPE Conduit.
 - e. 1666 Standard for Riser Application for Optical Fiber Raceway.
- 6. National Fire Protection Association, Inc. (NFPA) ANSI/NFPA 70 National Electrical Code (NEC).
- 7. National Electrical Safety Code (NESC).
- 8. Telecommunications Industry Association TIA-569-B-2004 Commercial Building Standard for Telecommunications Pathways and Spaces.
- 9. American National Standards Institute ANSI J/STD-607-A-2002 Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications.
- 10. Building Industry Consulting Service International (BICSI) Telecommunications Distribution Methods Manual (TDMM).
- 11. Building Industry Consulting Service International (BICSI) Customer Owned Outside Design Manual.
- 12. Local, county, state and federal regulations and codes in effect as of date of purchase.

13. 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.

1.4 SUBMITTALS

- A. The Contractor 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 Owner. Such work shall be in accordance with approved submittals.
- B. Qualifications: The Contractor 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 Contractor 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. Record Drawings: Furnish CAD drawings of completed work including cable ID numbers following the Owner's labeling standards. Submit in hardcopy (two full size and two half size) and electronic formats.

1.5 QUALITY ASSURANCE

- A. Contractor Qualifications:
 - 1. The Contractor shall submit references and other related evidence of installation experience for a period of three years prior to the issue date of this Specification.
 - 2. All work shall be supervised on-site by a BICSI Registered Communications Distribution Designer (RCDD). Must demonstrate knowledge and compliance with all BICSI, TIA/EIA, UL, and NEC standards and codes. Contractor shall submit proof of RCDD designation.
- B. Provided products shall meet the following requirements: Items of the same classification shall be identical. This requirement includes equipment, assemblies, parts, and components.
- C. Assure that the "as installed" system is correctly and completely documented including engineering drawings, manuals, and operational procedures in such a manner as to support maintenance and future expansion of the system.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify dimensions in areas of installation by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- B. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating units without field measurements. Coordinate supports, adjacent construction, and fixture locations to ensure actual dimensions correspond to established dimensions.

1.7 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 Owner.

1.8 COORDINATION

- A. Field coordinate installation of conduit and cable with other trades to ensure clearance requirements are met.
- B. Coordinate with all contractors providing equipment outside the scope of this contract.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Grounding Conductors, Cables, Connectors, and Rods:
 - a. Apache Grounding/Erico Inc.
 - b. Boggs, Inc.
 - c. Chance/Hubbell.
 - d. Copperweld Corp.

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- e. Dossert Corp.
- f. Erico Inc.; Electrical Products Group.
- g. Framatome Connectors/Burndy Electrical.
- h. Galvan Industries, Inc.
- i. Ideal Industries, Inc.
- j. ILSCO.
- k. Kearney/Cooper Power Systems.
- 1. O-Z/Gedney Co.; a business of the EGS Electrical Group.
- m. Raco, Inc.; Division of Hubbell.
- n. Thomas & Betts, Electrical.
- o. Approved Equal.

2.2 MATERIALS

- A. All conduits, fittings, junction and pull boxes shall be UL rated.
- B. All conduits, fittings, junction and pull boxes shall comply with the NEC.
- C. PVC-Coated Rigid Steel Conduit and Fittings: Follow NEMA RN1 (Type A).
- D. Non-metallic Conduit and Fittings: Pass NEMA TC2, UL 651 and 651A and FS W-C-1094A. EMT fittings shall be formed steel compression ring type. Die cast fittings are not allowed.
- E. Rigid Steel Galvanized Conduit and Fittings Before Coating
 - 1. Follow FS WW-C-581d, ANSI C80.1, and UL 6.
 - 2. Pass bending, ductility, and thickness of zinc coating in ANSI C80.1
- F. Electrical Metallic Tubing (EMT)
 - 1. EMT fittings shall be formed steel compression ring type. Die cast fittings are not allowed.
 - 2. EMT shall be UL listed and conform to NEC Article 300.22.
 - 3. Shall be used inside buildings only.
 - 4. Only manufacturer's fittings, transition adapters, terminators and fixed bends shall be used.
 - 5. All transition junction and pull boxes, fittings terminators and adapters shall be a metallic material.

- 6. Minimum average tensile strength shall be 1250 lbs. for 1¹/₂-inch and smaller conduits and innerduct.
- 7. Minimum average tensile strength shall be 1800 lbs. for conduits larger than $1\frac{1}{2}$ inch.
- G. Conduit Bodies: Follow UL 514B and FS W-C-58C. Furnish sufficient coating for touch up after installation.
- H. Conduit Fittings
 - 1. All fittings shall be compression or threaded.
 - 2. Fittings shall provide a secure connection for pulling communications cables.
 - 3. Setscrew fittings are not permitted.
- I. Conduit "condulets" are not permitted.
- J. Flexible conduit is not permitted.
- K. Non-metallic conduits are not permitted in above ground installations. Conversion fittings are required for non-metallic (below ground) to metallic (above ground) transitions.
- L. Telecommunications Bonding Backbone (TBB):
 - 1. All Telecommunications Bonding Backbone (TBB) Cables shall be insulated and installed in conduit between manholes, telecommunications closets, building steel frame and building electrical grounding system.
 - 2. TBB cables shall interconnect all Telecommunications Grounding Busbars (TGB) with the Telecommunications Main Grounding Busbar (TMGB). The TBB shall originate at the TMGB and extend throughout the building and connects to all the TGB's in telecommunications closets and equipment rooms.
 - 3. The TBB shall be installed without splices, where practicable. If splices are necessary they shall be minimum in number accessible and located in telecommunications spaces. Joined segments shall be connected using irreversible compression-type connectors, exothermic welding or equivalent.
 - 4. The TBB shall be No. 3/0 AWG between TMGB and TGB's. The TBB from one TGB to another TGB shall be No. 6 AWG. The TBB from TGB to the panel board in the same telecommunications space shall be No. 6 AWG. All TBB connections to the TGB shall utilize listed 2-hole compression connectors.

- 5. Exothermic welds shall be used to connect TBB from TMGB or TGB and building steel frame. All other connections will use 2-hole compression connectors.
- 6. UL Listed with Flame Propagation compliant with UL 2024.
- M. Maintenance Hole Bonding and Grounding.
 - 1. The Maintenance Hole shall be bonded and grounded if a splice case is required for any cable pulled through the space. No bonding or grounding is required if all cables are pulled without a splices.
 - 2. Splice cases, cable rack and ground rod shall be bonded together using a minimum No. 6 AWG copper cable.
- N. Pull Boxes, Junction Boxes and Gutters
 - 1. All junction boxes, gutters and pull boxes shall comply with NEC Article 314.
 - 2. All junction boxes, gutters and pull boxes shall meet the following minimum material requirements:
 - a. 16-gauge steel or heavier.
 - b. Seams shall be continuously welded and grounded smooth.
 - c. External screws and clamps.
 - d. External mounting feet (where possible).
 - e. Oil-resistant gasket and adhesive.
 - f. ANSI 61 gray polyester powder coating inside and out over phosphatized surface.
 - g. UL 50 type 12.
 - 3. All junction boxes, gutters and pull boxes shall be provided with bushings for conduits and/or cabling.
 - 4. All junction boxes, gutters and pull boxes shall be securely installed.
 - 5. All junction boxes, gutters and pull box sizes for single and multiple conduit runs shall comply with BICSI TDMM.
 - 6. All bonding conductors and connectors shall be listed for the purpose intended and approved by a Nationally Recognized Testing Laboratory (NRTL).
 - 7. All bonding conductors shall be insulated and copper. The minimum bonding conductor size shall be a No. 6 AWG.

PART 3 - EXECUTION

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3.1 PREPARATION

- A. Contractor's on-site RCDD supervisor shall review, approve and stamp all shop drawings, coordination drawings and record drawings.
- B. Verify conduit system is properly sized for cables (minimum one inch, unless otherwise noted in Drawings).
- C. Verify general conduit route following Drawings.
- D. Verify substrates to which work is connected and determine detail requirements for proper support.
- E. Verify proper location and type of rough-in for conduit, cable terminations and ground buss bar.

3.2 INSTALLATION

- A. Coordinate locations with other trades prior to installation.
- B. Install work following drawings, manufacturer's instructions and approved submittal data.
- C. Installation plans and requests for information (RFIs) shall be reviewed by contractor's on-site RCDD.
- D. All work shall be supervised and reviewed by contractor's on-site RCDD.
- E. Locations and Types:
 - 1. Install PVC coated conduits in outdoor above-ground locations, inside valve vaults and wet wells, and in corrosive and wet environments.
 - 2. Install PVC conduits in buried duct banks or encased in concrete. Use PVC coated rigid steel elbows for stub-outs.
 - 3. Install exposed conduit parallel or perpendicular to lines of existing construction and grouped together where possible, without interfering with use of premises or working areas. Prevent safety hazards and interference with operating and maintenance procedures.
 - 4. Conduit may pass through areas with temperature differential of 20 degrees F or more. Seal with proper fitting at barrier between areas of differing temperature.
 - 5. Do not install conduit in interference with equipment placement or operation; piping; structural members; maintenance access, indicated future equipment.

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- 6. Contractor's RCDD supervisor shall coordinate with drawings of other disciplines to determine availability of space for installation.
- F. Design Considerations
 - 1. Conduit fill shall comply with ANSI/TIA/EIA-569-B.
 - 2. The minimum bend radius is six times the conduit inside diameter (ID) for a twoinch conduit or less.
 - 3. The minimum bend radius is ten times the conduit ID for a conduit greater than two inches.
 - 4. Below grade conduit shall extend three inches above finished floor (AFF) with a bushing.
 - 5. Ceiling conduit or sleeves shall extend six inches below finished ceiling with a bushing.
 - 6. All stubbed conduit ends shall be provided with a ground bushing.
 - 7. All conduit penetrations shall comply with all applicable fire codes. All conduit penetrations in fire-rated walls or floors shall be sealed and fire proofed to at least the rating of the penetration area.
 - 8. Conduits shall be routed in the most direct route, with the fewest number of bends possible.
 - 9. There shall be no continuous conduit sections longer than 100 feet. For runs that total more than 100 feet, insert junction or pull boxes (or gutters if appropriate) so that no continuous run between pull boxes is greater than 100 feet.
 - 10. There shall be no more than two 90-degree bends (180 degrees total) between conduit pull boxes.
 - 11. Changes in direction shall be accomplished with sweeping bends observing minimum bend radius requirements above. Do not use pull boxes for direction changes unless specifically designated otherwise in the Drawings.
 - 12. Unless otherwise noted in the Drawings, conduits entering pull boxes shall be aligned with exiting conduits.
- G. Telecommunication Bonding Backbone (TBB) Installation
 - 1. Comply with ANSI/TIA/EIA-607.

- 2. TBB placed in ferrous metallic conduit that exceeds 1m(3 ft) in length, shall be bonded to each end of the conduit with a conductor sized as a NO. 6AWG, minimum.
- 3. The TBB conductor for telecommunications shall bond the TMGB to the service equipment (power) ground.
- H. Identification: Refer to Section 270553 Identification for Communications Systems for labeling requirements.

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.

3.4 ACCEPTANCE

- A. Once all work has been completed, test documentation has been submitted and approved, and the Owner is satisfied that all work has been completed in accordance with contract documents, the Owner will notify Contractor in writing of formal acceptance of the system.
- B. Acceptance shall be subject to completion of all work and submittal and approval of complete as-built documentation as described above, and MAA final inspection of the work for compliance with the approved as-built documentation.

END OF SECTION 270526

SECTION 270528 – PATHWAYS FOR COMMUNICATIONS 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 Provision Addenda, apply to this Section.
- B. Related Sections:
 - 1. 270526 Grounding and Bonding for Communications Systems
 - 2. 270543 Underground Ducts and Raceways for Communications Systems
 - 3 270553 Identification for Communications Systems
 - 4. 271100 Communications Equipment Room Fittings
 - 5. 271300 Communications Backbone Cabling
 - 6. 271900 Exterior Communications Pathways

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Conduit, fittings and bodies, including multi-cell conduit
 - 2. Riser flexible raceway (innerduct) and fittings
 - 3 Junction boxes, pull boxes and gutters
 - 4. Measured pull tape
- B. This Section covers only communications conduit and fittings. Refer to Section 271100 Communications Equipment Room Fittings for cable tray/ladder rack within the telecommunications rooms.

1.3 REFERENCES

A. The publications listed below form a part of this specification. The publications are referred to in the text by basic designation only.

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- 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.
- D. References.
 - 1. American National Standards Institute (ANSI):
 - a.) C80.1 Rigid Steel Conduit Zinc Coated.
 - b.) C80.4 Fittings for Rigid Metal Conduit.
 - 2. Federal Specifications (FS):
 - a.) W-C-58C Conduit Outlet Boxes, Bodies Aluminum and Malleable Iron.
 - b.) W-C-1094 Conduit and Conduit Fittings Plastic, Rigid.
 - c.) WW-C-566C Flexible Metal Conduit.
 - d.) WW-C-581D Coatings on Steel Conduit.
 - 3. National Electrical Manufacturers Association (NEMA):
 - a.) RN1 Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Electrical metallic Tubing.
 - b.) TC2 Electrical Plastic Tubing (EPT) and Conduit (EPC-40 and EPC-80).
 - c.) TC3 PVC Fittings for Use with Rigid PVC Conduit and Tubing.
 - d.) NEMA VE 1 Metal Cable Tray Systems.
 - e.) NEMA VE 2 Metal Cable Tray Installation Guidelines.
- 4. American Society for Testing and Materials International (ASTM)
 - a.) ASTM A123 Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - b.) ASTM A653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - c.) ASTM B633 Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.
- 5. Underwriters Laboratories Inc. (UL):
 - a.) 514 B Fittings for Conduit and Outlet Boxes.
 - b.) 651 Schedule 40 and 80 Rigid PVC Conduit.
 - c.) 651A Type EB and A Rigid PVC Conduit and HDPE Conduit.
 - d.) 1666 Standard for Riser Application for Optical Fiber Raceway.
- 6. National Fire Protection Association (NFPA) ANSI/NFPA 70 National Electrical Code (NEC).
- 7. Telecommunications Industry Association TIA-569-B-2004 Commercial Building Standards for Telecommunications Pathways and Spaces.
- 8. Building Industry Consulting Service International (BICSI) Telecommunications Distribution Methods Manual (TDMM).
- 9. Local, county, state and federal regulations and codes in effect as of date of purchase.
- 10. 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.

1.4 SUBMITTALS

A. The Contractor 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 Owner. Such work shall be in accordance with approved submittals.

- B. Qualifications: The Contractor 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 Contractor 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. Coordination Drawings: The Contractor shall submit coordination drawings showing coordination between communications pathways and other trades.
- E. Record Drawings: Furnish CAD drawings of completed work including cable ID numbers following the Owner's labeling standards. Submit in hardcopy (two full size and two half size) and electronic formats.

1.5 QUALITY ASSURANCE

- A. Contractor Qualifications:
 - 1. The Contractor shall submit references and other related evidence of installation experience for a period of three years prior to the issue date of this Specification.
 - 2. All work shall be supervised on-site by a BICSI Registered Communications Distribution Designer (RCDD). Must demonstrate knowledge and compliance with all BICSI, TIA/EIA, UL, and NEC standards and codes. Contractor shall submit proof of RCDD designation.
- B. Provided products shall meet the following requirements: Items of the same classification shall be identical. This requirement includes equipment, assemblies, parts, and components.
- C. Assure that the "as installed" system is correctly and completely documented including engineering drawings, manuals, and operational procedures in such a manner as to support maintenance and future expansion of the system.

1.6 WARRANTY

A. General Warranty: Refer to MAA's General and Special Provisions Document for warranty requirements.

1.7 **PROJECT CONDITIONS**

A. Field Measurements: Verify dimensions in areas of installation by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

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B. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating units without field measurements. Coordinate supports, adjacent construction, and fixture locations to ensure actual dimensions correspond to established dimensions.

1.8 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 Owner.

1.9 COORDINATION

- A. Field coordinate installation of conduit and cable tray with other trades to ensure clearance requirements are met.
- B. Coordinate with all contractors providing equipment outside the scope of this contract.

PART 2 - PRODUCTS

2.1 PATHWAYS

- A. Definition.
 - 1. For the purpose of this document, the term "Telecommunication Pathways" defines a portion of BWI's communication infrastructure. Telecommunication Pathways include products provided for the routing, segregation and support of telecommunication cabling both inside and outside of facilities.
- B. Primary Industry Standard Requirements for Telecommunication Pathways:
 - 1 Comply with TIA-569-B.

2.2 CABLE TRAYS

- A. Cable tray installations shall be the primary pathway method used for extension of backbone cable plant to Telecommunication Room's (TR's):
 - 1. Comply with TIA-569-B.

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- 2. Cable tray shall be sized to accommodate known cable load and provide for 100% expansion. Where applicable, trays shall be provisioned with barriers (minimum of 3) segregating the tray into 4 channels.
- 3. Tray rungs shall be removable, and capable of sustaining minimum 75 lbs per linear foot when supported at 10-foot interval with a maximum deflection of 0.6 inches at the center of cable tray width for each XX-inch tray. Grounding connections shall be in accordance with the latest edition of NEC.
- 4. Provide supports, couplings, elbows, tees, dropouts and other fittings as required. Support assemblies shall support at least 200 percent of tray system allowable load.
- 5. Internal Bend Radius: 12 inches.
- 6. Comply with the requirements of NEMA VE-1, 2 and ASTM A123.

2.3 CONDUIT SYSTEMS

- A. Conduit pathways shall be provided as complete Conduit systems including:
 - 1. Conduit with pull strings
 - 2. Pull box / Junction box assemblies
 - 3. Mounting / attachment hardware
 - 4. Labeling
 - 5. Grounding
- B. Conduit Fill Calculations.
 - 1. Calculate and provide conduit systems with sizing and quantities to assure conduit wire/cable fill does not exceed pulling tensions, rush limits and performance properties of cables installed.
- C. Conduit Trade Sizes:
 - 1. Typical conduit trade sizes used in Inside Plant Telecommunication Pathways are:
 - a.) Trade Size ³/₄ Inch EMT
 - b.) Trade Size 1 Inch EMT (Minimum Conduit size without written exception by OAT Engineer)

c.) Trade Size 1 ½ Inch EMT 270528 - 6

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- d.) Trade Size 2 Inch EMT
- e.) Trade Size 3 Inch EMT
- f.) Trade Size 4 Inch EMT
- g.) Various trade size "Flex" conduit (typically limited to 6 feet in length)

2.4 INNERDUCTS

- A. Inside plant innerduct shall be plenum rated in building conduits 3-inches and larger.
 - 1. Inside Plant Innerduct shall be listed and marked for installation in plenum airspaces. Plenum rated innerduct shall be minimal 1.00-inch inside diameter.
 - a.) Plenum innerducts shall be constructed of low smoke emission, flame retardant PVC.
 - b.) Innerducts shall be furnished with factory installed nylon pull ropes.
 - c.) Innerducts shall have a UL 94 V-O rating for flame spreading limitation.
 - d.) Innerduct reel lengths shall be provided as necessary to insure that ducts are continuous; one piece runs from communication room to communication room. No innerduct connectors will be allowed between rooms.
 - e.) Pulling accessories used for innerduct shall be compatible with materials being pulled. Accessories shall be furnished as required to complete the installation, including but not limited to, inner duct lubricants, spreaders, applicators, grips, swivels, harnesses, and line missiles.
 - f.) Each segment of innerduct shall extend at least twelve inches beyond the end of the service conduit and or cable tray. Innerduct ends shall be neatly restrained with wall mount clamps.

2.5 FIRESTOPPING

- A. Firestopping shall be provided for Telecommunication Pathways at penetration areas for fire rated walls and floors. Firestopping shall meet or exceed the hour rating of wall or floor penetrated by the Telecommunication Pathway.
 - 1. Firestopping shall comply with latest release of NEC NFPA 70
 - 2. Firestopping products and applications shall provide containment of smoke, fumes and flame with performance in accordance with ASTM E814-00 and UL 1479

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- 3 Local Authority Having Jurisdiction –Building Code Requirements
- B. Types of Firestopping hardware and materials include:
 - 1. Mechanical Firestopping Products Conduit Sleeves
 - a.) Conduit Sleeves
 - b.) Cable Tray Penetrations
 - c.) Penetration Frame Products
 - 2. Non-Mechanical Firestopping Products
 - a.) Putties
 - b.) Caulks
 - c.) Cementitious / Foams / Intumescent Materials
 - d.) Prefabricated Pillows, Blocks and Blankets
 - 3. Firestopping products shall be installed per manufacturer's practices.
 - 4. Manufactures include:
 - a.) Specified Technologies Inc. (STI) SpecSeal
 - b.) 3M Products
 - c.) CSD Sealing Systems
 - d.) Approved Equal.

2.6 GROUNDING

- A. Comply with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems." for grounding conductors and connectors.
- B. Telecommunications Main Bus Bar:
 - 1. Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.
 - 2. Ground Bus Bar: Each communication room depicted in the drawings shall be provisioned with a Telecommunications Grounding Busbar (TGB) meeting or exceeding the following requirements:

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- a.) Each bar shall be installed with isolated standoff mounts.
- b.) Minimal bar size is $\frac{1}{4}$ " thick x 2" wide x 10" long.
- c.) The TGB's shall be electroplated and pre-drilled for connector attachment to 6 AWG ground cables.
- d.) Holes spaced 1-1/8 inches apart.
- C. A #6 AWG stranded copper wire cable shall be extended between Telecommunication Room (TR) Busbars (TGB) and the Telecommunications Main Grounding Busbar (TMGB) (located in MDF) via conduit and cable tray systems as shown on the drawings.
- D. Ground conductor shall be provided, installed and utilized for equipment, termination, cable tray, equipment rack and computer equipment grounding, including telephone systems.
- E. All grounding material and work shall comply with the National Electric Code (NEC Chapter 8), Local and State regulations as well as ANSI-J/STD-607-A.
- F. Coordinate with the electrical power trades for grounding wiring interface to an approved connection to the building electrical power service panel ground source. Provide #6 AWG stranded copper bonding conductor extending from the electrical ground source to the Telecommunication Main Grounding Busbar (TMGB) located in the MDF.
- G. Provide ground cable #6 AWG stranded copper bonding conductor installed from the TMGB to each of the TR's as depicted in the project drawings ground wiring riser diagram.
- H. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Cooper B-Line P/N: SB-477 or equal.

2.7 IDENTIFICATION PRODUCTS

- A. Comply with TIA/EIA-606-A and UL 969 for labeling materials, including label stocks, laminating adhesives, and inks used by label printers.
- B. Comply with requirements in Division 26 Section "Identification for Electrical Systems."

2.8 MANUFACTURERS

- A. Subject to compliance with requirements, manufacturers that may be incorporated in the work, include, but are not limited to the following:
 - 1. PVC Rigid Conduit:
 - a.) Carlon.
 - b.) Robroy Industries, Inc.
 - c.) Cantex.
 - 2. Conduit Fittings and Bodies:
 - a.) Crouse-Hinds, Appleton Electric.
 - b.) Killark Electric Manufacturing Company
 - c.) O-Z/Gedney.
 - 3. Innerduct: Carlon Riser Gard Flexible Raceway (corrugated)
 - 4. Measured pull tape pull tape printed with sequential footage markings for accurate measurements:
 - a.) Fibertek.
 - b.) Condux International.

2.9 MATERIALS

- A. All conduits, fittings, junction and pull boxes shall be UL rated.
- B. All conduits, fittings, junction and pull boxes shall comply with the NEC.
- C. Non-metallic Conduit and Fittings: Pass NEMA TC2, UL 651 and 651A and FS W-C-1094A. EMT fittings shall be formed steel compression ring type. Die cast fittings are not allowed.
- D. Conduit Bodies: Follow UL 514B and FS W-C-58C. Furnish sufficient coating for touch up after installation.
- E. Conduit Fittings
 - 1. All fittings shall be compression or threaded.

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- 2. Fittings shall provide a secure connection for pulling communications cables.
- 3. Setscrew fittings are not permitted.
- F. Flexible conduit is not permitted except as noted in section 2.3-C.1.G or with prior written approval by the engineer
- G. Non-metallic conduits are not permitted in above ground installations. Conversion fittings are required for non-metallic (below ground) to metallic (above ground) transitions. Exceptions will be granted to accommodate the transition from outside plant to inside plant to comply with code requirements
- H. Innerduct:
 - 1. All fiber shall be installed in innerduct.
 - 2. One part segmented
 - 3. UL Listed with Flame Propagation compliant with UL 2024
 - 4. Only manufacturer's fittings, transition adapters, terminators and fixed bends shall be used.
 - 5. $1\frac{1}{4}$ -inch corrugated, non-metallic
- I. Measured Pull Tape
 - 1. Pre-lubricated, woven polyester, low friction, and high abrasion resistant yarn
 - 2. Minimum average tensile strength shall be 1250 lbs. for 1¹/₂-inch and smaller conduits and innerduct.
 - 3. Minimum average tensile strength shall be 1800 lbs. for conduits larger than $1\frac{1}{2}$ inch.
- J. Pull Boxes, Junction Boxes and Gutters
 - 1. All junction boxes, gutters and pull boxes shall comply with NEC Article 314.
 - 2. All junction boxes, gutters and pull boxes shall meet the following minimum material requirements:
 - a.) 16-gauge steel or heavier.
 - b.) Seams shall be continuously welded and grounded smooth.
 - c.) External screws and clamps.

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- d.) External mounting feet (where possible).
- e.) Oil-resistant gasket and adhesive.
- f.) ANSI 61 gray polyester powder coating inside and out over phosphatized surface.
- g.) UL 50 type 12.
- 3. All junction boxes, gutters and pull boxes shall be provided with bushings for conduits and/or cabling.
- 4. All junction boxes, gutters and pull boxes shall be securely installed.
- 5. All junction boxes, gutters and pull box sizes for single and multiple conduit runs shall comply with BICSI TDMM.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Contractor's on-site RCDD supervisor shall review, approve and stamp all shop drawings, coordination drawings and record drawings.
- B. Verify conduit system is properly sized for cables (minimum one inch, unless otherwise noted in Drawings).
- C. Verify general conduit route following Drawings.
- D. Verify substrates to which work is connected and determine detail requirements for proper support.
- E. Verify proper location and type of rough-in for conduit terminations.

3.2 INSTALLATION

- A. Coordinate locations with other trades prior to installation.
- B. Install work following drawings, manufacturer's instructions and approved submittal data.
- C. Installation plans and requests for information (RFIs) shall be reviewed by contractor's on-site RCDD.
- D. All work shall be supervised and reviewed by contractor's on-site RCDD.

E. Locations and Types: 8/11/2009

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- 1. Install PVC coated conduits in outdoor above-ground locations, inside valve vaults and wet wells, and in corrosive and wet environments.
- 2. Install PVC conduits in buried duct banks or encased in concrete. Use PVC coated rigid steel elbows for stub-outs.
- 3. Install exposed conduit parallel or perpendicular to lines of existing construction and grouped together where possible, without interfering with use of premises or working areas. Prevent safety hazards and interference with operating and maintenance procedures.
- 4. Conduit may pass through areas with temperature differential of 20 degrees F or more. Seal with proper fitting at barrier between areas of differing temperature.
- 5. Do not install conduit in interference with equipment placement or operation; piping; structural members; maintenance access; indicated future equipment.
- 6. Contractor's RCDD supervisor shall coordinate with drawings of other disciplines to determine availability of space for installation.
- F. Design Considerations:
 - 1. Conduit fill shall comply with ANSI/TIA/EIA-569-B.
 - 2. The minimum bend radius is six times the conduit inside diameter (ID) for a twoinch conduit or less.
 - 3. The minimum bend radius is 10 times the conduit ID for a conduit greater than two inches.
 - 4. Below grade conduit shall extend three inches above finished floor (AFF) with a bushing.
 - 5. Ceiling conduit or sleeves shall extend six inches below finished ceiling with a bushing.
 - 6. All stubbed conduit ends shall be provided with a ground bushing.
 - 7. All conduit penetrations shall comply with all applicable fire codes. All conduit penetrations in fire-rated walls or floors shall be sealed and fire proofed to at least the rating of the penetration area.
 - 8. Conduits shall be routed in the most direct route, with the fewest number of bends possible.

- 9. There shall be no continuous conduit sections longer than 100 feet. For runs that total more than 100 feet, insert junction or pull boxes (or gutters if appropriate) so that no continuous run between pull boxes is greater than 100 feet.
- 10. There shall be no more than two 90-degree bends (180 degrees total) between conduit pull boxes.
- 11. Changes in direction shall be accomplished with sweeping bends observing minimum bend radius requirements above. Do not use pull boxes for direction changes unless specifically designated otherwise in the Drawings.
- 12. Unless otherwise noted in the Drawings, conduits entering pull boxes shall be aligned with exiting conduits.
- G. Identification: Refer to Section 270553 Identification for Communications Systems for labeling requirements.

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.

3.4 ACCEPTANCE

- A. Once all work has been completed, test documentation has been submitted and approved, and the Owner is satisfied that all work has been completed in accordance with contract documents, the Owner will notify Contractor in writing of formal acceptance of the system.
- B. Acceptance shall be subject to completion of all work and submittal and approval of full documentation as described above.

END OF SECTION 270528

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SECTION 270543 – UNDERGROUND DUCTS AND RACEWAYS FOR COMMUNICATIONS 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 Provision Addenda, apply to this Section.
- B. Related Sections:
 - 1. 270526 Grounding and Bonding for Communications Systems
 - 2. 270528 Pathways for Communications Systems
 - 3. 270553 Identification for Communications Systems
 - 4. 271100 Communications Equipment Room Fittings
 - 5. 271300 Communications Backbone Cabling
 - 6. 271900 Exterior Communications Pathways

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Underground ducts and duct banks
 - 2. Handholes
 - 3. Maintenance holes
- 1.3 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.

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D. References:

- 1. National Electrical Manufacturers Association (NEMA):
 - a.) RN1 Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Electrical metallic Tubing
 - b.) TC2 Electrical Plastic Tubing (EPT) and Conduit (EPC-40 and EPC-80)
 - c.) TC3 PVC Fittings for Use with Rigid PVC Conduit and Tubing
- 2. Underwriters Laboratories Inc. (UL):
 - a.) 651 Schedule 40 and 80 Rigid PVC Conduit
 - b.) 651A Type EB and A Rigid PVC Conduit and HDPE Conduit
- 3. National Electrical Safety Code (NESC)
- 4. National Fire Protection Association (NFPA) ANSI/NFPA 70 National Electrical Code (NEC)
- 5. Telecommunications Industry Association/Electronic Industries Alliance TIA-569-B-2004 Commercial Building Standard for Telecommunications Pathways and Spaces
- 6. ANSI/TIA/EIA-758 Customer-Owned Outside Plant Telecommunications Cabling Standard
- 7 Building Industry Consulting Services International (BICSI) Telecommunications Distribution Methods Manual (TDMM)
- 8. BICSI Customer Owned Outside Plant (CO-OSP) Design Manual
- 9. Occupational Safety and Health Administration (OSHA) Regulations
- 10. Local, county, state and federal regulations and codes in effect as of date of purchase
- 11. 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.

1.4 SUBMITTALS

- A. The Contractor 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 Owner. Such work shall be in accordance with approved submittals.
- B. Qualifications: The Contractor 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.

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- C. Proposed product data sheets: The Contractor 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. Coordination Drawings: Contractor shall submit plan and section drawings showing total requirement for duct banks.
- E. Contractor shall submit calculations associated with sizing and arrangements of ducts and cables.
- F. Record Drawings: Furnish CAD drawings of completed work including cable ID numbers following the Owner's labeling standards. Submit in hardcopy (two full size and two half size) and electronic formats.
- 1.5 QUALITY ASSURANCE
 - A. Contractor Qualifications:
 - 1. The Contractor shall submit references and other related evidence of installation experience for a period of three years prior to the issue date of this Specification.
 - 2. All work shall be supervised on-site by a BICSI Registered Communications Distribution Designer (RCDD). Must demonstrate knowledge and compliance with all BICSI, TIA/EIA, UL, and NEC standards and codes. Contractor shall submit proof of RCDD designation.
 - B. Provided products shall meet the following requirements: Items of the same classification shall be identical. This requirement includes equipment, assemblies, parts, and components.
 - C. Verify duct banks do not interfere with existing or new underground facilities.
 - D. Follow Annex B of National Electrical Code (NEC).
 - E. Assure that the "as installed" system is correctly and completely documented including engineering drawings, manuals, and operational procedures in such a manner as to support maintenance and future expansion of the system,

1.6 WARRANTY

- A. General Warranty: Refer to MAA's General and Special Provisions Document for warranty requirements.
- 1 7 PROJECT CONDITIONS
 - A. Field Measurements: Verify dimensions in areas of installation by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - B. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating units without field measurements. Coordinate supports, adjacent construction, and fixture locations to ensure actual dimensions correspond to established dimensions.

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1.8 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 Owner.
- D. Containers shall be clearly marked "For Communications Duct Banks Only".

1.9 COORDINATION

- A. Field coordinate installation of ducts with other trades to ensure clearance requirements are met.
- B. Coordinate with all contractors providing equipment outside the scope of this contract.

PART 2 - PRODUCTS

2.1 PATHWAYS

- A. Definition:
 - 1. For the purpose of this document, the term "Telecommunication Underground Ducts and Raceways" defines a portion of BWI's communication infrastructure. Telecommunication Underground Ducts and Raceways include products provided for the routing, segregation and support of telecommunication cabling both inside and outside of facilities.

2.2 UNDERGROUND DUCT BANKS

- A. Duct material: Schedule 40 rigid PVC with non-magnetic universal interlocking type spacers for both horizontal and vertical duct arrangements. Where all-dielectric cables are used below ground, an additional insulated conductor shall be placed along with the cable to provide means of tone locating. The trace conductor shall be 10 AWG or larger.
- B. Underground Duct Banks, Maintenance holes/Handholes- Design Load Rating:
 - 1. AASHTO Extra Heavy Duty Rating for Aircraft apron / Taxiway / Runway Areas.
 - 2. AASHTO H-20 Rating for Typical Roadway / Commercial Traffic Areas.
- C. Telecommunication Handholes and Maintenance holes (A.K.A. Manholes)
 - 1. Telecommunication Handholes:
 - a) The use of handholes should be limited to low density cable runs. All proposed handhole applications must be reviewed with MAA OAT in the early stages of design.
 - 2. Telecommunication Maintenance holes:

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- a) Shall not be used by lighting and power cable plant
- b) Used for Telecommunication cable pulling and splicing
- c) Maintenance hole covers and frames shall be load rated for expected traffic load.
- d) Standard Maintenance hole Configurations:
 - 1) Type A
 - 2) Type J
 - 3) Type V
 - 4) Application specific design as field and cable density/routing conditions require.
 - 5) Typical Maintenance hole Corrosion Resistant Accessories:
 - a) Sump
 - b) Ladder
 - c) Cable Rack/Ladder
 - d) Pulling Eyes
 - e) Grounding hardware
- D. Building Entrances
 - 1. Pulling Eyes
 - 2. Splice Frame
 - 3. Grounding /Protection Hardware
 - 4. Sealing and capping of conduit and innerducts to prevent migration of, pests, water and vapors into the facility. Concrete and Reinforcing Steel for Encasement: Furnish products following Division 3, except strengths as follows:
 - 1. Compressive Strength: 2500 psi at 28 days, class A.
 - 2. Flexural Strength: 500 psi at 28 days.

2.3 CONDUIT SYSTEMS

A. Conduit pathways shall be provided as complete Conduit systems including:

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- 1. Conduit with pull strings
- 2. Pull box / Junction box assemblies
- 3. Mounting / attachment hardware
- 4. Labeling
- 5. Grounding
- B. Conduit Fill Calculations.
 - 1. Calculate and provide conduit systems with sizing and quantities to assure conduit wire/cable fill does not exceed pulling tensions, rush limits and performance properties of cables installed.
- C. Conduit Trade Sizes:
 - 1. Typical conduit trade sizes used in Outside Plant Telecommunication Pathways are:
 - a.) Trade Size 4 Inch PVC Sch40

2.4 INNERDUCTS

- A. Outside plant innerduct shall be installed in UG conduits and duct banks.
 - 1. Outside Plant Inner Ducts shall be 1.25-inch and/or 1.5-inch selected to optimize current and future cable routing through underground conduits. Outside plant innerduct shall include the following features:
 - a.) Innerducts shall be constructed of high-density polyethylene with internal and external longitudinally ribs.
 - b.) Innerducts shall be furnished with factory installed nylon pull ropes.
 - c.) Innerducts shall have a UL 94 V-O rating for flame spread from final maintenance holes to interconnection cabinets within buildings.
 - d.) Innerduct reel lengths shall be provided as necessary to insure that ducts are continuous; one piece runs from maintenance hole/handhole to maintenance hole/handhole. No innerduct connectors will be allowed between maintenance holes/handholes.
 - e.) Pulling accessories used for innerduct shall be compatible with materials being pulled. Accessories shall be furnished as required to complete the

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installation, including but not limited to, inner duct lubricants, spreaders, applicators, grips, swivels, harnesses, and line missiles.

- f.) Each segment of innerduct shall extend at least twelve inches beyond the end of the service conduit.
- 2. At Building entrances locations, innerduct shall be extended into racking infrastructure and securely fasten to prevent pull back into the conduit systems.
- 3. In maintenance holes planned for cable pull through, (non-pull point for cable) innerduct shall be properly racked and secure to minimize congestion in the maintenance holes. In maintenance holes where cable pulling is required, innerducts shall be secured to racking to prevent pull back, and sealed to minimize migration or water, vapors and pests.
- 4. At each maintenance hole and cable entrance to the facility, the inner ducts shall be labeled to indicate cable (s) supported inside the innerduct.
- 5. Design Selection: Carlon, Integral or equal.

2.5 IDENTIFICATION PRODUCTS

- A. Comply with TIA/EIA-606-A and UL 969 for labeling materials, including label stocks, laminating adhesives, and inks used by label printers.
- B. Comply with requirements in Division 26 Section "Identification for Electrical Systems."

2.6 MANUFACTURERS

- A. Subject to compliance with requirements, manufacturers that may be incorporated in the work, include, but are not limited to the following:
 - 1. PVC Rigid Conduit:
 - a.) Carlon.
 - b.) Robroy Industries, Inc.
 - c.) Cantex.
 - 2. Conduit Fittings and Bodies:
 - a.) Crouse-Hinds, Appleton Electric.
 - b.) Killark Electric Manufacturing Company.
 - c.) O-Z/Gedney.

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- 3. Innerduct: Carlon Riser Gard Flexible Raceway (corrugated)
- 4. Measured pull tape pull tape printed with sequential footage markings for accurate measurements:
 - a.) Fibertek.
 - b.) Condux International.

2.7 MATERIALS

- A. All conduits, fittings, junction and pull boxes shall be UL rated.
- B. All conduits, fittings, junction and pull boxes shall comply with the NEC.
- C. Non-metallic Conduit and Fittings: Pass NEMA TC2, UL 651 and 651A and FS W-C-1094A. EMT fittings shall be formed steel compression ring type. Die cast fittings are not allowed.
- D. Conduit Bodies: Follow UL 514B and FS W-C-58C. Furnish sufficient coating for touch up after installation.
- E. Conduit Fittings
 - 1. All fittings shall be compression or threaded.
 - 2. Fittings shall provide a secure connection for pulling communications cables.
 - 3. Setscrew fittings are not permitted.
- F. Conduit "condulets" are not permitted.
- G. Flexible conduit is not permitted.
- H. Non-metallic conduits are not permitted in above ground installations. Conversion fittings are required for non-metallic (below ground) to metallic (above ground) transitions.
- I. Innerduct:
 - 1. All fiber shall be installed in innerduct.
 - 2. One part segmented
 - 3. UL Listed with Flame Propagation compliant with UL 2024

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- 4. Only manufacturer's fittings, transition adapters, terminators and fixed bends shall be used.
- 5. $1\frac{1}{4}$ -inch corrugated, non-metallic
- J. Measured Pull Tape
 - 1. Pre-lubricated, woven polyester, low friction, and high abrasion resistant yarn
 - 2. Minimum average tensile strength shall be 1250 lbs. for 1¹/₂-inch and smaller conduits and innerduct.
 - 3. Minimum average tensile strength shall be 1800 lbs. for conduits larger than $1\frac{1}{2}$ inch.
- K. Pull Boxes, Junction Boxes and Gutters
 - 1. All junction boxes, gutters and pull boxes shall comply with NEC Article 314.
 - 2. All junction boxes, gutters and pull boxes shall meet the following minimum material requirements:
 - a.) 16-gauge steel or heavier.
 - b.) Seams shall be continuously welded and grounded smooth.
 - c.) External screws and clamps.
 - d.) External mounting feet (where possible).
 - e.) Oil-resistant gasket and adhesive.
 - f.) ANSI 61 gray polyester powder coating inside and out over phosphatized surface.
 - g.) UL 50 type 12.
 - 3. All junction boxes, gutters and pull boxes shall be provided with bushings for conduits and/or cabling.
 - 4. All junction boxes, gutters and pull boxes shall be securely installed.
 - 5. All junction boxes, gutters and pull box sizes for single and multiple conduit runs shall comply with BICSI TDMM.

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PART 3 - EXECUTION

3.1 PREPARATION

- A. Contractor's on-site RCDD supervisor shall review, approve and stamp all shop drawings, coordination drawings and record drawings.
- B. Verify materials are on site in proper condition and of sufficient quantity.
- C. Verify proper excavation depth (minimum 48 inches below finished grade), width, route and support of work. Verify proper location of handholes and maintenance holes (minimum every 350 feet). Communications facilities must be placed in separate handholes and maintenance holes from Electrical facilities.
- D. Trenches greater than or equal to 5 feet deep:
 - 1. Shall be shored to prevent cave-in.
 - 2. Shall have 2 feet clearance from the dirt pile.
- E. Directional boring is a suitable substitute when trenching is impractical or impossible. Locating existing underground utilities is crucial when directional boring is planned because of the potential for the drilling unit to encounter high voltages. Although directional boring machines are manufactured with electrical strike sensing capabilities, which can warn the operator of any contact with a high voltage source, accidents may still occur.
 - 1. Operators of directional boring machines require special protection due to the potential for exposure to high voltage. Therefore, operators must always have a ground mat grid underfoot as insulation protection. In addition, operators must wear insulating boots and gloves, along with hard hats and safety glasses.
- F. Minimum electrical/communications underground cable separation:
 - 1. Concrete: 3 inches
 - 2. Masonry: 4 inches
 - 3. Well-tamped earth: 12 inches
- G Before encasement, verify ducts are free of debris and properly installed in support and spacer system, are properly fitted together and hold-down hardware is properly installed.

3.2 INSTALLATION

- A. Install work following drawings, manufacturer's instructions and approved submittal data.
- B. Install conduit in excavations following Drawings. If directional boring is utilized, cable or flexible conduits can be attached to the unit and pulled back to the origination point (after the drilling unit reaches its destination).
- C. Handholes shall be sized in accordance with BICSI CO OSP Manual but no larger than four feet by four feet and shall be constructed of 2-inch thick cement covered with 3/8

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inch steel plate. The handhole or maintenance hole shall rest on a 4-inch blanket of sand, and four inches around the side walls shall be filled with sand.

- D. Each handhole or maintenance hole which contains a pedestal shall have four bollards installed 18 inches diagonally from each corner, with a cross member welded at 30 inches connecting the four corners. These barriers shall be constructed of four-inch rigid conduit filled with concrete, driven four feet in the ground and extending 36 inches above the protective cover.
- E. Install watertight penetrations through foundation, handhole and maintenance hole walls. Wherever a handhole is used to simply pass through, the conduit entrances and exits shall be situated at opposite ends of the handhole instead of 90 degree angles.
- F. Assemble duct banks with non-magnetic saddles, spacers and separators. Position separators for 2-inch minimum concrete separation between outer surfaces of adjacent ducts.
 - 1. Make uniform required bends with a minimum of a 24-inch radius for conduits less than 3 inch diameter, and a 48 inch radius for conduits 3 inches and larger.
 - 2. Maintain vertical or horizontal separations of 12 inches of well-packed topsoil from any electrical service conduit run parallel to communications conduits.
- G. Install reinforcing. Install concrete encasement fully surrounding reinforcing steel and ducts.
 - 1. Unless otherwise noted on the drawings, reinforce with No. 5 longitudinal steel bars placed at each corner and along each face at maximum parallel spacing of 12 inches o.c., and No. 5 tie-bars transversely placed at 12 inches o.c. maximum longitudinal. Maintain maximum clearance of 2 inches from bars to edge of forms and ducts.
 - 2. Place concrete with minimum 3-inch cover surrounding ducts and reinforcement.
 - 3. Maintain ducts in proper place during concrete placement.
- H. Transition from Schedule 40 rigid PVC non-metallic to metallic conduit where duct banks enter structures or turn upward for continuation above grade.
- I. Where ducts enter structures such as handholes, maintenance holes, pullboxes, or buildings, terminate ducts in proper end bells, insulated L-bushings, Meyers hubs or couplings on steel conduits.
- J. Extend below grade conduits to 4 inches above the finished floor inside a building.
- K. Tag conduits entering pull boxes with stamped stainless steel tags following cable and conduit schedule.
- L. Backfill after concrete cures 24 hours.
- M. Install one bare stranded copper duct bank ground cable following Section 270526 in each duct bank envelope. Make ground electrically continuous throughout duct bank system. Connect to each handhole and maintenance hole ground rod.

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- N. Pull a 12-inch long mandrel (1/4 inch smaller than duct diameter) through ducts. Pull a rag swab or sponge through to remove debris, until it shows clean.
- O. Where fiber optic cables will be installed, place innerducts inside each Trade Size 4 inch conduit as designated on the drawings for this purpose. See Section 270528 for innerduct specifications.
- P. Provide a measured pull tape in all underground conduits.
- 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.
- 3.4 ACCEPTANCE
 - A. Once all work has been completed, test documentation has been submitted and approved, and the Owner is satisfied that all work has been completed in accordance with contract documents, the Owner will notify Contractor in writing of formal acceptance of the system.
 - B. Acceptance shall be subject to completion of all work and submittal and approval of full documentation as described above.

END OF SECTION 270543

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SECTION 270553 – IDENTIFICATION FOR COMMUNICATIONS 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 Provision Addenda, apply to this Section.
- B. Related Sections:
 - 1. 270526 Grounding and Bonding for Communications Systems
 - 2. 270528 Pathways for Communications Systems
 - 3. 270543 Underground Ducts and Raceways for Communications Systems
 - 4. 271100 Communications Equipment Room Fittings
 - 5. 271300 Communications Backbone Cabling
 - 6. 271900 Exterior Communications Pathways

1.2 SUMMARY

- A. This Section includes labeling and identification standards for:
 - 1. Horizontal and backbone cabling and termination hardware
 - 2. Conduits and pathways
 - 3. Equipment cabinets, racks, frames and enclosures
- B. As-builts shall contain matching label information.

1.3 REFERENCES

A. The publications listed below form a part of this specification. The publications are referred to in the text by basic designation only.

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- 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.
- D. References:
 - 1. ANSI/TIA/EIA-606-A Administration Standard for the Telecommunications Infrastructure of Commercial Buildings
 - 2. International Standards Organization/International Electromechanical Commission (ISO/IEC) DIS11801, January 6, 1994
 - 3. Building Industry Consulting Services International (BICSI) Telecommunications Distribution Methods Manual (TDMM)
 - 4. Local, county, state and federal regulations and codes in effect as of date of purchase.
 - 5. 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.

1.4 SUBMITTALS

- A. Product Data: The Contractor 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.
- B. Qualification Data: For firms and persons specified in "Quality Assurance" Article.

1.5 QUALITY ASSURANCE

A. Provided products shall meet the following requirements: Items of the same classification shall be identical. This requirement includes equipment, assemblies, parts, and components.

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- B. Assure that the "as installed" system is correctly and completely documented including engineering drawings, manuals, and operational procedures in such a manner as to support maintenance and future expansion of the system.
- C. Materials and equipment: Equipment shall be rated for continuous operation under the ambient environmental temperature, humidity, and vibration conditions encountered at the installed location. The equipment shall meet the following requirements:
 - 1. Interior controlled environment: 60 to 100 degrees F dry bulb and 20 to 90 percent relative humidity, non-condensing.
 - 2. Interior uncontrolled environment: 0 to 130 degrees F dry bulb and 10 to 95 percent relative humidity, non-condensing.
 - 3. Exterior environments: Minus 30 degrees to 130 degrees F dry bulb, and 10 to 100 percent relative humidity, condensing.
 - 4. Hazardous environment: All system components located in areas where fire or explosion hazards may exist because of flammable gas or vapors, flammable liquids, combustible dust, or ignitable fibers or flyings, shall be rated and installed according to Chapter 5 of the NEC and as shown.
 - 5. Listing and Labeling: Provide products specified in this Section that are listed and labeled, as defined in the NEC Article 100.
- D. Standard products:
 - 1. Equipment and materials shall be standard products of a manufacturer regularly engaged in the manufacture of specified 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.

1.6 COORDINATION

A. Coordinate identification of all cable, termination hardware, conduit and pathways, and equipment cabinets with MAA Information Technology Department.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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- A. Subject to compliance with requirements, manufacturers that may be incorporated in the work, include, but are not limited to the following:
- B. Labels and Labeling System
 - 1 Basis of Design: Brady
 - 2. Acceptable substitutes: Dymo or submitted and Approved equal

2.2 GENERAL REQUIREMENTS

- A. All telecommunication components, areas, and cables shall be labeled, including but not limited to:
 - 1. Fiber cables
 - 2. Metallic cable
 - 3. Ground points
 - 4. Cross-connect fields
 - 5. Exterior enclosures
 - 6. Conduit ends (pathways)
 - 7. Pull boxes and junction boxes
 - 8. Equipment racks and cabinets
 - 9. Fiber patch panels
 - 10. Maintenance holes
 - 11. Cables in maintenance holes and pull boxes
 - 12. Patch cables/jumpers
- B. Pathways are defined but not limited to; any conduit, innerduct, underground duct bank, wiring troughs, pull boxes, and any wiring systems used to enclose cabling of any type
- C. Labeling guidelines are ANSI/TIA/EIA-606-A-2002 Administration Standard for Commercial Telecommunications Infrastructure with Owner specific asset nomenclature.
- D. All label material shall be suitable for intended usage and environment, meeting the legibility, defacement and general exposure requirements listed in UL 969 for indoor

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and outdoor use. Where insert labels are used the insert label shall be covered with clear cover and securely held in place.

- E. Interior labeling: printer shall be of the thermal transfer type capable of printing self laminating labels of various size up to and including 1.5" by 1.5" printable area with a 4.5" self laminating tail. No non-self-laminating labels shall be approved.
- F. All labels shall be permanent, i.e. will not fade, peel, or deteriorate due to environment or time.
- G. Handwritten labels are not acceptable.

2.3 CONDUITS AND PATHWAYS

- A. Conduits: General-purpose label designed for powdered coated surfaces with an ultraaggressive adhesive, trade name, "Mondo Bondo" (Brady). Label size shall be appropriate for the conduit size. Font size shall be easily visible from the finished floor.
- B. Innerduct: Polyethylene general-purpose tagging material, Brady part number PTL-12-109 (.75 X 3.00) used with an R4310 ribbon. This tag shall be attached using tie wraps.
- C. Junction boxes (larger than four-inch x four-inch): General-purpose label designed for powdered coated surfaces with an ultra-aggressive adhesive, trade name, "Mondo Bondo", Brady part number PTL-43-483 (1.90 X continuous) used with an R6010 ribbon. Font size shall be easily visible from the finished floor.
- D. Junction boxes (four-inch x four-inch): General-purpose label designed for powdered coated surfaces with an ultra-aggressive adhesive, trade name, "Mondo Bondo", Brady part number PTL-42-483 (1.00 X continuous) used with an R6010 ribbon.

2.4 BACKBONE AND HORIZONTAL CABLE AND TERMINATIONS

- A. Fiber termination hardware (cover): General purpose label designed for powdered coated surfaces, trade name, "Mondo Bondo", Brady part number PTL-42-483 (1.00 X continuous) used with an R6010 ribbon.
- B. Fiber termination hardware (designation strip): Thermal transfer printable label with a permanent acrylic adhesive, Brady part number PTL-10-423 (.75 X .25) used with an R6010 ribbon.
- C. Patch panels. Gloss white film with a permanent acrylic based adhesive, Brady part number PTL-39-422 (.375 X .60) used with an R6010 ribbon.

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Inside and outside plant fiber cables: Permanent acrylic adhesive, self-laminating vinyl wire and cable identification, Brady part number PTL-33-427 (1.50 X 4.00 X 1.00) used with an R4310 ribbon.

2.5 EQUIPMENT RACKS AND CABINETS

- A. General purpose label designed for powdered coated surfaces.
- B. Basis of Design. Trade name, "Mondo Bondo", Brady part number PTL-42-483 (1.00 X continuous) used with an R6010 ribbon.

PART 3 - EXECUTION

3.1 GENERAL

A. Labeling format shall be as shown in Attachment A.

3.2 CONDUITS AND JUNCTION/PULL BOXES

- A. All conduits, innerduct, junction boxes, gutters and pull boxes shall be labeled.
- B. Conduits shall be labeled with the word "communications" and the conduit's origination room number and destination room number. Permanent room identifiers shall be used.
- C. Label conduit every 50 feet, at each wall and floor penetration and at each conduit termination, such as outlet boxes, pull boxes, and junction boxes, or as otherwise specified in other Sections.
- D. Junction boxes, gutters and pull boxes shall be labeled with identification name or number as determined by Contractor and submitted for approval.
- E. Labels on conduits, junction boxes, gutters and pull boxes shall be machine-generated and easily visible from the finished floor.

3.3 FIBER TERMINATIONS

- A. Label cable terminations on designation strips.
- B. Label all cable at each terminating point.
- C. Labels shall be self-adhesive and machine generated. Handwritten labels are not acceptable.

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- D. Cable identification numbers shall not be duplicated.
- E. Three copies of a cable record document containing the cable information required on the cable label shall be delivered to the GOAA Telecommunications Department.

3.4 EQUIPMENT RACKS AND CABINETS

- A. All racks and cabinets shall be properly labeled with permanent typewritten labels, easily visible from finished floor.
- B. Label as indicated in Drawings.

3.5 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.
- 3.6 ACCEPTANCE
 - A. Once all work has been completed and the Owner is satisfied that all work has been completed in accordance with contract documents, the Owner will notify Contractor in writing of formal acceptance of the system.
 - B. Acceptance shall be subject to completion of all work and submittal and approval of full documentation as described above.

END OF SECTION 270553

SECTION 271100 -- COMMUNICATIONS EQUIPMENT ROOM FITTINGS

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 Provision Addenda, apply to this Section.
- B. Related Sections:
 - 1. 270526 Grounding and Bonding for Communications Systems
 - 2. 270528 Pathways for Communications Systems
 - 3. 270543 Underground Ducts and Raceways for Communications Systems
 - 4. 270553 Identification for Communications Systems
 - 5. 271300 Communications Backbone Cabling
 - 6. 271900 Exterior Communications Pathways

1.2 SUMMARY

- A. This Section includes:
 - 1. Equipment cabinets, racks, frames and enclosures
 - 2. Cable management and ladder racks
 - 3. Rack mounted power protection and power strips
 - 4. Plywood backboards

1.3 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.

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- 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.
- D. References:
 - 1 Telecommunications Industry Association TIA-569-B-2004 Commercial Building Standard for Telecommunications Pathways and Spaces
 - 2. American National Standards Institute/Telecommunications Industry Association/Electronic Industries Alliance ANSI/TIA/EIA-606-A-2002 Administration Standard for Commercial Telecommunications Infrastructure
 - 3. International Standards Organization/International Electrotechnical Commission (ISO/IEC) DIS11801, January 6, 1994
 - 4. National Electrical Manufacturers Association (NEMA)
 - 5. American Society for Testing Materials International (ASTM)
 - 6. National Electrical Code (NFPA-70)
 - 7 Building Industry Consulting Service International (BICSI) Telecommunications Distribution Methods Manual (TDMM)
 - 8. Local, county, state and federal regulations and codes in effect as of date of purchase
 - 9. 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.

1.4 SUBMITTALS

- A. The Contractor 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 Owner. Such work shall be in accordance with approved submittals.
- B. Qualifications: The Contractor 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.

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- C. Proposed product data sheets: The Contractor 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. MDF and Telecommunications Room Equipment Layout: Contractor shall submit shop drawings (floor plan and elevations) of each equipment and telecommunications room prior to installing connecting hardware, termination equipment, racks, cabinets, cable tray or other systems in the rooms.
- E. Record Drawings: Furnish CAD drawings of completed work including cable ID numbers following the Owner's labeling standards. Submit in hardcopy (two full size and two half size) and electronic formats.

1.5 QUALITY ASSURANCE

- A. Contractor Qualifications:
 - 1. The Contractor shall submit references and other related evidence of installation experience for a period of three years prior to the issue date of this Specification.
 - 2. All work shall be supervised on-site by a BICSI Registered Communications Distribution Designer (RCDD). Must demonstrate knowledge and compliance with all BICSI, TIA/EIA, UL, and NEC standards and codes. Contractor shall submit proof of RCDD designation.
- B. Provided products shall meet the following requirements: Items of the same classification shall be identical. This requirement includes equipment, assemblies, parts, and components.
- C. Assure that the "as installed" system is correctly and completely documented including engineering drawings, manuals, and operational procedures in such a manner as to support maintenance and future expansion of the system.
- D. Materials and equipment: Equipment shall be rated for continuous operation under the ambient environmental temperature, humidity, and vibration conditions encountered at the installed location. The equipment shall meet the following requirements:
 - 1. Interior controlled environment: 60 to 100 degrees F dry bulb and 20 to 90 percent relative humidity, non-condensing.
 - 2. Interior uncontrolled environment: 0 to 130 degrees F dry bulb and 10 to 95 percent relative humidity, non-condensing.
 - 3. Exterior environments: Minus 30 degrees to 130 degrees F dry bulb, and 10 to 100 percent relative humidity, condensing.

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- 4. Hazardous environment: All system components located in areas where fire or explosion hazards may exist because of flammable gas or vapors, flammable liquids, combustible dust, or ignitable fibers or flyings, shall be rated and installed according to Chapter 5 of the NEC and as shown.
- 5. Listing and Labeling: Provide products specified in this Section that are listed and labeled, as defined in the NEC Article 100.
- E. Standard products:
 - 1. Equipment and materials shall be standard products of a manufacturer regularly engaged in the manufacture of specified 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.

1.6 WARRANTY

A. General Warranty: Refer to MAA's General and Special Provisions Document for warranty requirements.

1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify dimensions in areas of installation by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- B. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating units without field measurements. Coordinate supports, adjacent construction, and fixture locations to ensure actual dimensions correspond to established dimensions.

1.8 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 Owner

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1.9 COORDINATION

- A. Coordinate installation of all equipment cabinets and systems with special systems subcontractors, MAA Information Technology Department, and other trades, including mechanical, electrical and plumbing.
- B. Coordinate with all contractors providing equipment outside the scope of this contract.

PART 2 - PRODUCTS

2.1 TELECOMMUNICATION ROOM (TR) FITTINGS

A. Definition:

- 1. For the purpose of this document, the term "Telecommunication Room Fittings" defines a portion of BWI's communication infrastructure. Telecommunication Room Fittings include products and configurations typically provided for the fitout or finishing of a room in the facility that is dedicated to support of telecommunications equipment and associated signal distribution to work areas, service providers and/or other Telecommunication Rooms.
- B. Primary Industry Standard Requirements for Telecommunication Room Fittings:
 - 1. Comply with ICEA S-90-661 for mechanical properties.
 - 2. Comply with TIA-569-B
 - 3. Comply with TIA/EIA-568-B.1 & B.2.
 - 4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444 and NFPA 70:
- C. Coordination with Other Trades:
 - 1. Power
 - 2. Lighting.
 - 3. HVAC.
 - 4. Fire Suppression

2.2 EQUIPMENT RACKS AND CABINETS

A. Telecommunications Room (TR) shall be equipped with 19" EIA relay racks and cabinets to house MAA termination systems and network equipment.

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- B. Each rack and cabinet shall be mounted on an isolation pad and utilize non conductive washers to secure the rack to the floor.
- C. Each rack and cabinet shall be secured from the top rail to the cable tray, to prevent movement.
- D. Racks and cabinets shall be grounded to the isolated ground bar within the TR using a standard ground lug and #6 green jacketed cable ground wire.
- E. Provide equipment racks and cabinets in quantities and locations as indicated on the drawings.
- F. Design Selection:
 - 1 Racks: Self supporting EIA racks (19-inch) shall be 7 feet in height with 6 inch wide, side mount vertical cable management hardware, horizontal cable management, shelves and other accessories as required. Design selection. Ortronics MM or approved equal.
 - 2. Cabinets: Freestanding 19" EIA Cabinets, equipped w/ shelves vertical and horizontal cable management as required to support cable. Design selection Hoffman Proline or approved equals.
- 2.3 UNINTERRUPTIBLE POWER SUPPLY (UPS)
 - A. Provide a rack mount UPS for each rack/cabinet illustrated with a UPS unit in the project drawings.
 - B. Design Selection: APC Smart-UPS 1.4 kV P/N: SU1400RMNET or approved equal.
- 2.4 POWER STRIPS
 - A. Power Strips: Comply with UL 1363.
 - 1. Rack mounting.
 - 2. 12, 20-A, 120-V ac, NEMA WD 6, Configuration 5-20R receptacles.
 - 3. As manufactured by Tripp Lite, Catalog Number PS3612-20HW, or Approved Equal.
- 2.5 GROUNDING
 - A. Comply with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems." for grounding conductors and connectors.
 - B. Telecommunications Main Bus Bar:

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- 1. Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.
- 2. Ground Bus Bar: Each communication room depicted in the drawings shall be provisioned with a Telecommunications Grounding Busbar (TGB) meeting or exceeding the following requirements:
 - a. Each bar shall be installed with isolated standoff mounts.
 - b. Minimal bar size is $\frac{1}{4}$ " thick x 2" wide x 10" long.
 - c. The TGB's shall be electroplated and pre-drilled for connector attachment to 6 AWG ground cables.
 - d. Holes spaced 1-1/8 inches (28 mm) apart.
- 3. Stand-Off Insulators: Comply with UL 891 for use in switchboards, 600 V. Lexan or PVC, impulse tested at 5000 V.
- C. A #6 AWG stranded copper wire cable shall be extended between TR's Telecommunications Ground Busbars (TGB) and the Telecommunications Main Grounding Busbar (TMGB) (located in MDF) via conduit and cable tray systems as shown on the drawings.
- D. Ground conductor shall be provided, installed and utilized for equipment, termination, cable tray, equipment rack and computer equipment grounding, including telephone systems.
- E. All grounding material and work shall comply with the National Electric Code (NEC Chapter 8), Local and State regulations as well as ANSI-J-STD-607-A.
- F. Coordinate with the electrical power trades for grounding wiring interface to an approved connection to the building electrical power service panel ground source. Provide #6 AWG stranded copper bonding conductor extending from the electrical ground source to the Telecommunication Main Grounding Busbar (TMGB) located in the MDF.
- G. Provide ground cable #6 AWG stranded copper bonding conductor installed from the TMGB to each of the IDF's as depicted in the project drawings ground wiring riser diagram.
- H. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Cooper B-Line P/N: SB-477 or Approved equal.

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2.6 LABELING

- A. Comply with TIA/EIA-606-A and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.
- B. Comply with MAA 2008 Design Standards, Volume II, Appendix E.

2.7 SURGE SUPPRESSION

- A. Surge suppression devices shall be furnished and installed on all copper wire analog and digital data circuits when the circuit enters a building or controls equipment located outdoors. Circuits that are routed wholly within a building do not require surge protection.
- B. Surge suppression devices shall be listed by Underwriter's Laboratories, Inc., according to Standard UL 1449.
- C. Surge suppression devices shall be tested against ANSI/IEEE 587 defined waveforms to simulate field conditions.
- D. Device performance shall be documented per ANSI/IEEE C62.41.
- E. Unit Performance ratings. The units published performance ratings shall be the UL 1449 listed suppression ratings tested and assigned by Underwriters Laboratories utilizing the test procedure described in this document titled UL 1449 Suppression Voltage Performance Testing.
- F. System Performance Ratings. Multiple suppression filter system units configuration shall have a published performance rating as a system. The systems published performance rating shall be the UL 1449 listed suppression ratings tested and assigned by Underwriters Laboratories utilizing the test procedure described in this document titled UL 1449 Suppression Voltage Performance Testing.
- G. Fuses shall not be used for surge suppression.
- H. Design selection:
 - 1. Low density cable (Pair count of 100 or less): ADC66XX building entrance terminals loaded with C3B 5-pin modules.
 - 2. High Density cable (pair counts in excess of 100): Commscope AT-9040 connectors, frames and stub cables. Load connectors with C3B 5-pin modules.

2.8 UNSPECIFIED EQUIPMENT AND MATERIAL

A. Any item of equipment or material not specifically addressed on the contract drawings or in this document and required to provide a complete and functional Public Wide

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Distribution System (PWDS) installation, shall be provided in a level of quality consistent with other specified items.

2.9 MANUFACTURERS

- A. Subject to compliance with requirements, manufacturers that may be incorporated in the work, include, but are not limited to the following:
- B. Equipment Racks and Cabinets
 - 1 Basis of Design: Chatsworth
 - 2. Acceptable substitutes:
 - a. DAMAC
 - b. Cooper B-Line
 - c. Great Lakes
- C. Distribution Frame
 - 1. Basis of Design: Homaco
 - 2. Submitted and owner-approved equivalent
- D. Ladder Rack
 - 1. Basis of Design: Chatsworth 12100-712 series
 - 2. Submitted and owner-approved equivalent
- E. Fiber Optic Cable Open Trough System
 - 1 Basis of Design:
 - a. Panduit Fiber Runner
 - b. ADC FGS Series
 - 2. Submitted and owner-approved equivalent

2.10 EQUIPMENT RACKS

- A. Universal EIA self-supporting all aluminum rack 84" H. x 19" W. x 6" D,
- B. Mounting holes

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- 1. Both sides (front and rear) of upright channels
- 2. 12-24 or 10-32 rolled threads in 5/8" 5/8" x 1/2" hole pattern
- 3. Heavy-duty assembly hardware,
- C. There shall be two top cross-angles 1-1/2" x 1-1/2" x $\frac{1}{4}$ ".
- D. Black in color with all mounting screws black.
- E. Racks to come standard with minimum 3" vertical wire management full height both sides, one jumper tray installed in the uppermost position, and one heavy duty vented full size shelf (front/rear) installed in the bottom.
- F. Basis of Design for Jumper Tray: Chatsworth 12183 series or approved substitution.
- 2.11 FREESTANDING EQUIPMENT CABINETS
 - A. Cabinets shall be sized according to Project design, with cabinets having internal vertical, horizontal, and inter-cabinet cable management.
 - B. Footprint 24" wide by 32" deep standard, black, with internal vertical wire management.
 - C. All cabinets to have louvered locking front and rear doors, no perforated covers, locks independently keyed to MAA PDS cabinet key.
 - D. Cabinets and racks shall have overhead ladder rack and fiber trough installed to create connectivity paths to other racks and wall mounted communication equipment.
 - E. All cabinets shall be provided with capacity for four fans in top. Provide four fans in all cabinets housing active equipment.
- 2.12 LARGE FRAME
 - A. 110D Double-sided frame
 - B. 6061-T6 structural grade aluminum uprights
 - C. Drilled and tapped on both sides
 - D. 5/8" floor anchoring holes on base feet
 - E. Eight locations for attaching a ground
 - F. Greystone finish
 - G. Listed to UL 1863 Standard for Communication Circuit Accessory

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- H. 7200 pair and 24 block capacity
- I. Dimensions: 84"H x 37.5"W x 21.25"D
- J Fully loaded with 300-pair 110D blocks
- K. Built-in horizontal rings and 6" vertical channels
- L. 12" cable runway support
- 2.13 CABLE MANAGEMENT
 - A. Horizontal Cable Management: Provide 19-inch rack mountable horizontal wire management below each copper termination panel, data switching equipment and as specified in Drawings.
 - B. Vertical Cable Management:
 - 1. Provide minimum three-inch vertical cable managers on each side of 19-inch rack
 - 2. Provide two-inch vertical cable managers on each side of 19-inch frame within cabinets.

2.14 POWER STRIPS

- A. Provide and install two power strips in each vertical cabinet.
 - 1. 66 inches, 16 outlet vertical power strips
 - 2. 20 amp
 - 3. 10-foot cord length
 - 4. Surge protection
 - 5. 20 amp twist lock plug
 - 6. No on/off switch
 - 7. For wall-mounted cabinets, provide 28-inch, 8 outlet vertical power strip.

2.15 FIBER OPTIC CABLE OPEN TROUGH SYSTEM

A. An overhead fiber optic trough system with an open channel design to protect and route fiber optic patch cords shall be installed where fiber jumpers will be deployed, yellow finish.

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B. Fiber trough shall have downspout jumper exit and other accessories required to support fiber jumpers at each rack rail and cabinet entry. Flex tubes are NOT required, shall include all end caps and protective bushings. All downspouts and fiber trough ends shall have trumpet flares.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify backboards are properly installed.
- B. Verify telecommunications grounding system is properly installed and tested following Section 270526.
- C. 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. 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.
- C. Rack and Cabinet Installation

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- 1. Shall be properly positioned, leveled, ganged, anchored, grounded and powered.
- 2. Shall be populated as noted in drawings with termination hardware, equipment, proper patch cord lengths, and power outlets.
- 3. Install and anchor all racks and cabinets to floor following the drawings and manufacturer's instructions.
- 4. All cabinet doors shall be configured as shown in the drawings.

- 5. All cabinet cable entrances shall be provided with bushings.
- D. Grounding: Ground communications room components per Section 270526 Grounding and Bonding for Communications Systems
- E. Identification: Per MAA standards.
- 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.

3.4 ACCEPTANCE

- A. Once all work has been completed, test documentation has been submitted and approved, and the Owner is satisfied that all work has been completed in accordance with contract documents, the Owner will notify Contractor in writing of formal acceptance of the system.
- B. Acceptance shall be subject to completion of all work and submittal and approval of full documentation as described above.

END OF SECTION 271100

SECTION 271300 - COMMUNICATIONS BACKBONE CABLING

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 Provision Addenda, apply to this Section.
- B. Related Sections:
 - 1. 270526 Grounding and Bonding for Communications Systems
 - 2. 270528 Pathway for Communications Systems
 - 3. 270543 Underground Ducts and Raceways for Communications Systems
 - 4. 270553 Identification for Communications Systems
 - 5. 271100 Communications Equipment Room Fittings
 - 6. 271900 Exterior Communications Pathways

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Fiber and Copper Cables
 - 2. Splice Cases
 - 3. Terminal Blocks and Cross-Connect Systems
 - 4. Fiber Termination Equipment
 - 5. Building Entrance Terminals
 - 6. Maintenance Hole Racking and Duct Plug Equipment
 - 7. Cabling identification products
- B. This Section covers only communications backbone cables and terminations. Refer to Section 271100 Communications Equipment Room Fittings for cable tray/ladder rack within the telecommunications rooms. Refer to Section 270526

Grounding and Bonding for Communications Systems for grounding and bonding of cables and termination equipment.

1.3 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.
- D. References:
 - 1. ANSI/TIA/EIA-526-7 Measurement of Optical power Loss of Installed Single-mode Fiber Cable Plant (Method A).
 - 2. ANSI/TIA/EIA-526-14-A Measurement of Optical power Loss of Installed Multi-mode Fiber Cable Plant.
 - 3. ANSI/TIA/EIA-568-B Commercial Building Telecommunications Cabling Standard.
 - 4. ANSI/TIA/EIA-568-B.3 .1 Additional Transmission Performance Specifications for 50/125µm Optical fiber Cables.
 - 5. TIA-569-B-2004 Commercial Building standard for Telecommunications Pathways and Spaces.
 - 6. ANSI/TIA/EIA-606-A-2002 Administration Standard for the Telecommunications Infrastructure of Commercial Buildings.
 - 7. ANSI J/STD-607-A-202 Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications.
 - 8. ANSI/TIA/EIA-758 Customer Owned Outside Plant Telecommunications Cabling Standard.

- 9. ANSI/TIA/EIA 758-1 Customer Owned Outside Plant Telecommunications Cabling Standard.
- 10. International Standards Organization/International Electrotechnical Commission (ISO/IEC) DIS11801, January 6, 1994.
- 11. National Electrical Manufacturers Association (NEMA).
- 12. American Society for Testing Materials International (ASTM).
- 13. National Electrical Code (NFPA-70).
- 14. National Electrical Safety Code (NESC).
- 15. Underwriters Laboratories Inc. (UL 497).
- 16. Building Industry Consulting Service International (BICSI) Telecommunications Distribution Methods Manual (TDMM).
- 17. Building Industry Consulting Service International (BICSI) Customer Owned Outside Design Manual.
- 18. Local, county, state and federal regulations and codes in effect as of date of purchase.
- 19. 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.

1.4 PERFORMANCE REQUIREMENTS

A. General Performance: Backbone cabling system shall comply with transmission standards in TIA/EIA-568-B.1, when tested according to test procedures of this standard.

1.5 SUBMITTALS

- A. The Contractor 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 Owner. Such work shall be in accordance with approved submittals.
- B. Qualifications: The Contractor 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 Contractor 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. Record Drawings: Furnish CAD drawings of completed work including cable ID numbers following the Owner's labeling standards. Submit in hardcopy (two full size and two half size) and electronic formats.
 - 1. System Labeling Schedules: Electronic copy of labeling schedules that are part of the cabling and asset identification system of the software.
 - 2. Cabling administration drawings and printouts.
 - 3. Wiring diagrams to show typical wiring schematics including the following:
 - a.) Cross-connects.
 - b.) Patch panels.
 - c.) Patch cords.
 - 4. Cross-connects and patch panels. Detail mounting assemblies, and show elevations and physical relationship between the installed components.
- E. Qualification Data: For Installer, qualified layout technician, installation supervisor, and field inspector.
- F. Source quality-control reports.
- G. Field quality-control reports.
- H. Maintenance Data: For splices and connectors to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Contractor Qualifications:
 - 1. The Contractor shall submit references and other related evidence of installation experience for a period of three years prior to the issue date of this Specification.
 - 2. All work shall be supervised on-site by a BICSI Registered Communications Distribution Designer (RCDD). Must demonstrate knowledge and compliance with all BICSI, TIA/EIA, UL, and NEC standards and codes. Contractor shall submit proof of RCDD designation.

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- B. Provided products shall meet the following requirements. Items of the same classification shall be identical. This requirement includes equipment, assemblies, parts, and components.
- C. Assure that the "as installed" system is correctly and completely documented including engineering drawings, manuals, and operational procedures in such a manner as to support maintenance and future expansion of the system.
 - 1. Layout Responsibility: Preparation of Shop Drawings and Cabling Administration Drawings, Cabling Administration, and field testing program development by an RCDD.
 - 2. Installation Supervision: Installation shall be under the direct supervision of BICSI Registered Technician Level 2 Installer, who shall be present at all times when Work of this Section is performed at Project site.
 - 3. Testing Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.
- D. Testing Agency Qualifications: An NRTL.
 - 1. Testing Agency's Field Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.
- E. Telecommunications Pathways and Spaces: Comply with TIA/EIA-569-A.
- F. Grounding: Comply with ANSI J/STD-607-A.

1 7 DELIVERY, STORAGE, AND HANDLING

- A. Test cables upon receipt at Project site.
 - 1. Test optical fiber cable to determine the continuity of the strand end to end. Use optical loss test set to determine.
 - 2. Test optical fiber cable while on reels. Use an optical time domain reflectometer to verify the cable length and locate cable defects, splices, and connector, including the loss value of each. Retain test data and include the record in maintenance data.
 - 3. Test each pair of UTP cable for open and short circuits.

1.8 WARRANTY

A. General Warranty: Refer to MAA's General and Special Provisions Document for warranty requirements.

1.9 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install cables and connecting materials until wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
- B. Field Measurements: Verify dimensions in areas of installation by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. Established Dimensions. Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating units without field measurements. Coordinate supports, adjacent construction, and fixture locations to ensure actual dimensions correspond to established dimensions.

1.10 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 Owner.

1.11 COORDINATION

- A. Field coordinate installation of conduit and cable tray with other trades to ensure clearance requirements are met.
- B. Coordinate with all contractors providing equipment outside the scope of this contract.

PART 2 - PRODUCTS

2.1 BACKBONE COMMUNICATION CABLING SYSTEM

- A. Definition:
 - 1. For the purpose of this document, the term "Backbone Cabling" defines a portion of BWI's structured communication infrastructure. Backbone cabling includes the passive cable distribution system which extends voice,

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271300-6 Technical Specifications Telecommunication Backbone Cable video and data signaling, between BWI's main Telecommunication Room(s) punchdown blocks and patch panels to the various smaller telecommunication room punchdown blocks and patch panels, used for signal distribution to the Horizontal cabling systems.

- 2. Backbone cabling is generally considered to include copper cable in pair counts above 8 pair and fiber optic cable with strand counts higher than 6 strands.
- B. Primary Industry Standard Requirements for Backbone Cabling Systems
 - 1 Comply with ANSI/ICEA S-83-569 for Fiber Optic Premise Distribution
 - 2. Comply with ANSI/ICEA S-87-640 for Fiber Optic Outside Plant Distribution
 - 3. Comply with ICEA S-90-661 for mechanical properties.
 - 4. Comply with TIA/EIA-568-B.1 for performance specifications.
 - 5. Comply with TIA/EIA-568-B.2,
 - 6. Fiber Optic Cabling Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444 and NFPA 70 for the following types. Note: Design shall determine one of the following cable jacket types:
 - a.) General Purpose, Nonconductive: Type OFN or OFNG.
 - b.) Plenum Rated, Nonconductive: Type OFNP, complying with NFPA 262.
 - c.) Riser Rated, Nonconductive: Type OFNR, complying with UL 1666.
 - d.) General Purpose, Conductive: Type OFC or OFCG.
 - e.) Plenum Rated, Conductive: Type OFCP, complying with NFPA 262.
 - f.) Riser Rated, Conductive: Type OFCR, complying with UL 1666.

2.2 BACKBONE OPTICAL FIBER CABLE

- A. General:
 - 1. Backbone Optic Fiber Cabling currently accepted for installation at BWI includes several product types, fiber types and strand counts suitable for various applications.

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- 2. Typical Fiber Optic Backbone Cable is available with various fiber types (Multimode and/or Singlemode) and is acceptable for use at BWI in the following cable configurations":
 - a.) Inside Plant Plenum Rated: Plenum rated fiber optic backbone cable shall comply with requirements of the National Electric Code article 770.50 for nonconductive plenum cable, and shall be marked with OFNP designation
 - b.) Outside Plant: Outside Plant fiber optic backbone cable shall be suitable for installations in underground ducts and/or direct buried.
- B. Singlemode Backbone Fiber Types:
 - 1. 8.4 to 9.3/125 micrometer Singlemode
 - a.) Maximum Attenuation: 0.5 dB/km at 1310 nm; 0.5 dB/km at 1550 nm.
 - b.) Minimum Modal Bandwidth: 1000 MHz-km at 1310 nm; 1000 MHzkm at 1550 nm.
 - 2. Singlemode Backbone Fiber Cable Configuration
 - a.) Strand Count (192 strands in 12 fiber units).
 - b.) Inside Plant Backbone fiber shall be configured as either" Tight Buffer "(900 micron or 3mm jacketed)
 - c.) Outside Plant Backbone fiber shall be configured as "Loose tube Buffer" filled with water blocking gel.
 - d.) Jacket Color: Yellow or Black
- C. Singlemode Backbone Fiber Design Selection Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. Inside Plant: UL-OFNP Plenum rated, tight buffer Design Selection: Superior Essex Multi-Unit Premises Distribution Fiber Optic cable, 440 Series or approved equal.
 - 2. Outside Plant: Dielectric, dry water block filled, loose tube buffer. Design Selection Superior Essex loose tube, single jacket, All Dielectric series 11 Fiber Optic cable or approved equal.

2.3 BACKBONE CABLE OPTICAL FIBER TERMINATIONS

A. EIA/TIA 19-inch Rack or Wall Mounted Fiber Optic Patch Panels:

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- 1. General
 - a.) Singlemode fiber shall be terminated in separate, dedicated rack mounted patch panels.
 - b.) Rack Mounted Fiber terminations shall include vertical and horizontal cable restraint, organization and support brackets as required for each panel.
 - c.) Rack Mounted Fiber Optic Patch panels shall support a minimum of 24 ports, and include permanent port numbering identification.
 - d.) Singlemode fiber termination loss shall not exceed .50 dBm
- 2. Singlemode Fiber Optic Patch Panels:
 - a.) Singlemode fiber optic patch panels shall support termination of horizontal fiber optic cable using:
 - 1) Termination utilizing factory built, connectorized pigtails and fusion splicing.
 - b.) Singlemode fiber shall be terminated using factory built, ceramic ferrule, SC type connectors, attached and finished using heat or time cured epoxy adhesives and polish method. Crimp-on or quick cleave type connectors are not acceptable.
 - c.) Singlemode fiber optic patch panels shall be fully loaded with SC adapters (ports).
- 3. Design Selection for Fiber Optic Patch Panel products:
 - a.) Ortronics ORMMAC 625 Series (minimum of 36 ports)
 - b.) Load panels with couplers for :
 - Singlemode fiber SC type couplers plates (Ortronics P/N: 615 SC)

B. Patch Cords:

- 1 Fiber Optic Patch Cords shall be provided and installed to complete all fiber optic circuits and as required to connect equipment to the PWDS. Fiber optic patch cards shall be factory manufactured and tested assembled with color-coded restraint boots, factory epoxy and out-gas processing. All patch cords lengths shall be determined by the Contractor as required to make neat secure and orderly routing between connection points.
- 2. Label each end of patch cable with use or system ID. Coordinate with MAA OAT for labeling conventions.
- 3. Connectors used for patch cords shall be ST type for Multimode fiber and SC Type for Singlemode fiber. All Fiber connectors shall have ceramic ferrules.
- 4. Single-mode patch cord jackets shall be 3mm diameter and yellow in color. Single-mode fiber shall be optically compatible with backbone cable specifications. Single-mode connectors shall be blue in color.
 - a.) Design selection: Krone P/N: PAT-CSMZ-xxxM
- 5. Multimode patch cord jackets shall be 3mm diameter and orange in color. Multimode fiber shall be 62.5/125, or 50.125 micrometers compatible with backbone cable specifications. Multimode connectors shall be beige in color.
 - a.) Design selection: Krone P/N: PAT-CM6Z-xxxM

2.4 FIBER OPTIC SPLICING

- A. General Backbone fiber cable splicing:
 - 1. Splice enclosures used for fiber splicing shall support "Butt" type configurations and be designed for use in maintenance hole environments, supporting multiple singlemode fiber cables. Splice enclosures shall meet or exceed the following:
 - a.) Tested for compliance with Telcordia GR-771
 - b.) RUS Listed
 - c.) Properly sized to support strand counts planned for splice
 - d.) Sealable and re-enterable sealed must withstand minimum of 20 feet water head, and/or 10 Lbs air pressure for a minimum of 48 hrs.

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- e.) Chemically resistant to aviation fuel and Glycol
- f.) Include accessories for fusion splicing: trays, heat shrink splice protection sleeves, encapsulate and other items as recommended by the manufacture.
- 2. Design Selection for Fiber Optic OSP Splice Enclosures:
 - a.) Corning: SCF-6Cxx-xx-xxx
 - b.) AFL: LG-250
 - c.) Approved equivalents

2.5 IDENTIFICATION METHODS AND LABELING PRODUCTS

- A. Comply with BWI'S Telecommunication labeling methods and ANSI/TIA/EIA-606-A and UL 969 for labeling materials, including label stocks, laminating adhesives, and inks used by label printers.
- B. All backbone cable and termination fields shall be labeled with permanent, easy to read identifications which are compliant with MAA OAT cable labeling scheme.
- C. Coordinate with MAA OAT for cable labeling means and methods.

2.6 SOURCE QUALITY CONTROL

- A. Test Plan: Prior to testing installation of cables the Contractor shall submit a cable test plan for MAA OAT approval.
 - 1. The test plan should be specific to the project and consistent with current industry standards and specifications. Procedures and methods including a list of test equipment and certification dates will be required. Pass/fail thresholds should be included.
 - 2. All testing must be coordinated with MAA OAT. Test results are to be delivered in both electronic and hard copy; a minimum of 4 copies are required.
 - 3. Minimal requirements for cable test plan include: Fiber Test requirements:
 - a.) Pre-installation fiber test –OTDR
 - b.) Post-installation fiber test OTDR and power meter / light source
 - c.) Singlemode fibers tested at both 1310nm and 1550 nm wavelengths

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- d.) Test results documented and submitted in both hard copy and software files.
- B. Testing Agency: Engage a qualified testing agency to evaluate cables.
- C. Factory test cables on reels according to TIA/EIA-568-B.3.
- D. Cable will be considered defective if it does not pass tests and inspections.
- E. Prepare and submit for approval, test results and inspection reports.

2.7 MANUFACTURERS

- A. Subject to compliance with requirements, manufacturers that may be incorporated in the work, include, but are not limited to the following
- B. Traditional Backbone Optical Fiber Cable, Patch Cables and Connecting Hardware
 - 1. Basis of Design: Superior Essex.
 - 2. Approved Substitutions.
 - a.) Optical Cable Corporation.
 - b.) Hitachi.
 - c.) Corning.

C. Splice Cases

- 1. Basis of Design: Preformed Line Products.
- 2. Approved Substitutions.
 - a.) 3M.
 - b.) Norland Products.
 - c.) Corning.
- D. Building Entrance Terminals
 - 1. Basis of Design TVSS cans. Circa.
 - 2. Basis of Design TVSS modules: Oneac.
- E. Maintenance Hole Racking and Duct Plug Equipment.

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- 1. Basis of Design: Cob Industries.
- 2. Approved Substitutions.
 - a.) TVC/Vikimatic.
 - b.) Condux International.
 - c.) Peterson.
 - d.) Harman Corp.

2.8 OPTICAL FIBER CABLE.

- A. General: Singlemode 192 strand nonconductive, tight buffer, optical fiber cable. Interconnecting tubes and tube distribution hardware shall be used to distribute air blown fiber cables.
 - 1. Cable:
 - a.) Comply with ICEA S-83-596 for mechanical properties for indoor cable and ICEA S-87-640 standard for outside plant.
 - b.) Comply with TIA/EIA-568-B.3 for performance specifications.
 - c.) Comply with TIA/EIA-492AAAA-B for detailed specifications.
 - d.) Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444, UL 1651, and NFPA 70 for the following types:
 - 1) Plenum Rated, Nonconductive: Type OFNP, complying with NFPA 262.
 - 2) Riser Rated, Nonconductive: Type OFNR or OFNP, complying with UL 1666.
 - e.) All OSP fiber shall be dielectric.
 - f.) Maximum Attenuation: MM 3.50 dB/km at 850 nm; 1.5 dB/km at 1300 nm, SM 0.40dB/km at 1310 nm, 0.30dB/km at 1550 nm.
 - g.) Minimum Modal Bandwidth: MM 500 MHz-km at 850 nm; 500 MHzkm at 1300 nm. SM Dispersion unshifted, matched-clad, zero water peak.
 - 2. Jacket:
 - a.) Jacket Color:

- 1) Singlemode shall be yellow.
- b.) Cable cordage jacket, fiber, unit, and group color shall be according to TIA/EIA-598-B.
- c.) Imprinted with fiber count, fiber type, and aggregate length at regular intervals not to exceed 40 inches (1000 mm).
- 3. Breakout kits and splice trays for terminations shall be provided by the same manufacturer as cable.
- B. Underground and exterior cables
 - 1. Single-mode 8.7 μm to 9 μm diameter, underground and exterior cables shall be loose tube construction, gel-filled design or use dry water blocking technology, and meet or exceed the transmission performance specifications listed in ANSI/TIA/EIA-568-B.3 and ANSI/TIA/EIA-758(A), glass shall be Corning glass.

2.9 OPTICAL FIBER CABLE HARDWARE

- A. Modular Fiber Optic Patch Panels Light Interface Units (LIUs)
 - 1. LIUs shall be rack-mounted and have black all metal solid surfaces, padlock hasps on front and rear doors, legends to be installed inside.
 - 2. LIUs shall support modular six or eight SC connector bulkhead panels.
 - 3. Singlemode bulkhead connectors and end connectors shall be designed strictly for singlemode fiber. Singlemode connector/coupler covers to be yellow.
 - 4. Side cable entry, side jumper entry.
 - 5. All coupler panels to have ceramic sleeves/ferrules.
 - 6. Basis of design: Superior Modular Products or approved substitution.
- B. Fiber Optic Splice Trays
 - 1. Fiber cable splice trays shall be used for all fiber cable terminations requiring spliced pigtails, splice cases installed without splice trays designed are prohibited.
 - 2. Splice trays to be tray type with factory recommended mounting brackets and enclosure, splice trays to be provided by same manufacture as LIU(s) installed.

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- C. Fiber Optic Patch Cords
 - 1. Patch cords shall be factory-made.
 - 2. Singlemode: Duplex style Single mode 9 micron core diameter/125 micron cladding diameter for single mode patch cables. Singlemode patch cords shall be yellow.
 - 3. The fiber optic cladding shall be covered by aramid yarn and an OFNR jacket. Specialty use patch cords shall have a jacket suitable for intended use.
 - 4. Provided factory assembled patch cords with SC style connectors with ceramic ferrules.
 - 5. Provide one (1) duplex patch cord for each Fiber Optic Patch Panel termination pair.
 - 6. Provide patch cables sized to routing requirements.
- D. Cable Connecting Hardware:
 - 1 Comply with Optical Fiber Connector Intermateability Standards (FOCIS) specifications of TIA/EIA-604-2, TIA/EIA-604-3-A, and TIA/EIA-604-12. Comply with TIA/EIA-568-B.3
 - 2. Fiber optic cable connector shall be ST type with ceramic ferrules, ST exceptions as designated by Project.
 - 3. Connector shall be properly sized for fiber type.
 - 4. All termination methods shall be as specified as acceptable to the fiber cable manufacture to maintain full cable manufacturers warranty and industry standard expected life cycle. Construction shall be applicable for the intended installation environment.
- E. Indoor Tube Cable:
 - 1. All indoor tube cables shall be composed of dielectric materials and properly rated (i.e. plenum/riser/general purpose) per application.
 - 2. All Tube Distribution Units (NEMA rated per application, provide Engineer with list of NEMA ratings of proposed units for approval), tube-splice enclosures/Tube Splice Cases/cold-shrink closures per manufacturer's recommendations.
- F. Outdoor Tube Cables:

- 1. Tube cables may be composed of dielectric and metallic materials and shall be suitable for underground applications.
- 2. All Tube Distribution Units (NEMA rated per application, provide Engineer with list of NEMA ratings of proposed units for approval), Tube-splice enclosures/Tube Splice Cases/cold-shrink closures per manufacturer's recommendations.
- G. Tube Distribution Units (TDUs):
 - 1. A NEMA-rated enclosure (provide Engineer with list of NEMA ratings of proposed units for approval), suitable for the site environmental conditions (i.e. NEMA 1 for indoor use) shall be provided for tube distribution, routing, and termination.
 - 2. The contractor is responsible for selecting the TDU hardware to meet site conditions.
 - 3. Choose TDU size based on the number of tubes to enter the unit.
 - 4. TDUs shall be rack mounted to provide better protection and geometry for distribution.
 - 5. Tube Cable System shall be provided with tube cables and tube distribution units at each Telecom room and maintenance hole as indicated on the drawings.

2.10 SPLICE CASES

- A. Description: Fiber Splice Casing for use in underground and building entrance applications with two cable entrance ports on each end to facilitate butt or inline splices.
- B. Case shall be water proof with encapsulation for underground use. Entrance splice cases shall reenter able with splicing modules capable of 50 percent growth.
- C. Outdoor NEMA-rated enclosure, or splice case suitable for the site environmental conditions shall be provided for outside plant tube distribution and routing

2.11 MAINTENANCE HOLE RACKING AND DUCT PLUG EQUIPMENT

A. Description: Maintenance Hole and Duct Plugs: All cables in maintenance holes shall be racked to relieve strain on the cable and allow adequate slack for future moves/adds or changes. All conduits in maintenance holes and entering from outside the building shall be sealed using duct plugs during cable installation. Where cables are installed duct plugs shall be fitted to match the diameter of the cables to ensure a watertight seal.

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2.12 IDENTIFICATION PRODUCTS

A. Comply with Section 270553 Identification for Communications Systems.

2.13 MATERIALS

- A. All cables, splice cases, terminations and protection shall be UL rated.
- B. All cables, splice cases, terminations and protection shall comply with the NEC.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Contractor's on-site RCDD supervisor shall review, approve and stamp all shop drawings, coordination drawings and record drawings.
- B. Verify cable schedule matches conduit system, length and routing is in accordance with drawings and schedules.
- C. Verify all cable and materials have been tested prior to and after installation.
- D. Verify all cable splices have been identified and adequate equipment is on hand to perform splicing.
- E. Verify all equipment is certified and tested before being used to test cables.

3.2 INSTALLATION

- A. Coordinate locations with other trades prior to installation.
- B. Install work following drawings, manufacturer's instructions and approved submittal data.
- C. Installation plans and requests for information (RFIs) shall be reviewed by contractor's on-site RCDD.
- D. All work shall be supervised and reviewed by contractor's on-site RCDD.
- E. Locations and Types:
 - 1. Install cables in PVC conduits buried in duct banks or encased in concrete. Use PVDF coated cables in hazardous area where fuel is transferred near the conduits.
 - 2. Cables may pass through areas with temperature differential of 20 degrees F or more. Seal with proper fitting at barrier between areas of differing temperature.

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Technical Specifications Telecommunication Backbone Cable 3. Contractor's RCDD supervisor shall coordinate with drawings of other disciplines to determine availability of space for installation.

3.3 INSTALLATION OF CABLES

- A. Comply with NECA 1.
- B. General Requirements for Cabling:
 - 1. Comply with TIA/EIA-568-B.1.
 - 2. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices."
 - 3. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
 - 4. Cables may not be spliced except to attach pigtail connectors. Secure and support cables at intervals not exceeding 30 inches (760 mm) and not more than 6 inches (150 mm) from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
 - 5. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
 - 6. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Use lacing bars and distribution spools.
 - 7 Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
 - 8. In the communications equipment room, install a 10-foot- (3-m-) long service loop on each end of cable.
 - 9. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.
 - a.) Optical Fiber Cable Installation:1) Comply with TIA/EIA-568-B.3.
 - 10. Cable may be terminated on connecting hardware that is rack or cabinet mounted.

- a.) Group connecting hardware for cables into separate logical fields.
- b.) Separation from EMI Sources:
- c.) Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:
 - 1) Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches (127 mm).
 - 2) Electrical Equipment Rating between 2 and 5 kVA. A minimum of 12 inches (300 mm).
 - 3) Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches (610 mm).
- 11. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:
 - a.) Electrical Equipment Rating Less Than 2 kVA. A minimum of 2-1/2 inches (64 mm).
 - b.) Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches (150 mm).
 - c.) Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches (300 mm).
- 12. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:
 - a.) Electrical Equipment Rating Less Than 2 kVA: No requirement.
 - b.) Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches (76 mm).
 - c.) Electrical Equipment Rating More Than 5 kVA. A minimum of 6 inches (150 mm).
- 13. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches (1200 mm).
- 14. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches (127 mm).

3.4 FIRESTOPPING

- A. Comply with requirements in Division 07 Section "Penetration Firestopping." Comply with TIA/EIA-569-A, Annex A, "Firestopping."
- B. Comply with BICSI TDMM, "Firestopping Systems" Article.
- C. Comply with NECA 1.

3.5 IDENTIFICATION

- A. Identify system components, wiring, and cabling complying with ANSI/TIA/EIA-606-A.
- B. Cable Schedule: Install in a prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.
- C. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, backbone pathways and cables, entrance pathways and cables, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors.
- D. Cable and Wire Identification. Comply with Section 270553 Identification for Communications Systems.

3.6 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.

3.7 FIELD QUALITY CONTROL

- A. Post-Installation Testing
 - 1. Contractor shall test each fiber strand of every optical fiber cable prior to acceptance.
 - 2. Contractor shall supply all of the required test equipment used to conduct acceptance tests.

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- 3. Contractor shall submit acceptance documentation as defined below. No cabling installation is considered complete until test results have been completed, submitted and approved.
- B. Test Procedure
 - 1 Owner reserves the right to be present or to assign a representative to be present during any or all testing.
 - 2. All cabling not tested strictly in accordance with these procedures shall be re-tested at no additional cost to the Owner.
 - 3. Testing of all fiber wiring shall be performed prior to system(s) cutover.
 - 4. 100 percent of the installed cabling shall be tested. All tests shall pass test criteria defined below.
 - 5. Test equipment shall be fully charged prior to each day's testing.
 - 6. Any pairs not meeting the requirements of the standard shall be brought into compliance by the contractor at no charge to the Owner. Complete end-to-end test results shall be submitted to the Owner.
- C. Standards Compliance and Test Criteria
 - 1. Fiber optic cable shall meet or exceed ANSI/TIA/EIA-568-B.3 Optical Fiber Cabling Components Standard requirements and meet the manufacturer's specifications for the installed product.
- D. Cable Test Documentation
 - 1. Cable test documentation shall be submitted in hard copy in three-ring binders and electronic (CD-ROM) formats. If proprietary software is used, CD shall contain any necessary software application required to view test results. If the results are delivered in a standard format like Excel, Access, CSV files, etc., software to read these files is not required. Electronic reports shall be accompanied by a Certificate signed by an authorized representative of the Contractor warranting the truth and accuracy of the electronic report. Certificate shall reference traceable circuit numbers that match the electronic record.
 - 2. The following reports shall be submitted. Any individual test that fails the relevant performance specification shall be marked as FAILED.
 - a.) Certification test report for Fiber Optic cable.
 - b.) OTDR and power meter test report for Fiber Optic cable.

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- 3. Test reports shall include the following information for each cabling element tested:
 - a.) Wiremap results that indicate that 100% of the cabling has been tested for shorts, opens, miswires, splits, polarity reversals, transpositions, presence of AC voltage and end-to-end connectivity.
 - b.) Length (in meters), propagation delay, and delay skew relative to the relevant limit. Any individual test that fails the relevant performance specification shall be marked as a FAIL.
 - c.) Cable manufacturer, cable model number/type and nomical velocity of propagation (NVP)
 - d.) Tester manufacturer, model, serial number, hardware version, and software version
 - e.) Circuit ID number and project name
 - f.) Origination and destination locations.
 - g.) Autotest specification used
 - h.) Overall pass/fail indication
 - i.) Date of test
 - j.) Test reports shall be submitted within seven (7) business days of completion of testing.
- E. Fiber Cable Testing
 - 1. Perform bi-directional end to end Optical Time Domain Reflectometer (OTDR) testing on each fiber optic conductor per TIA/EIA 455-61. The system loss measurements shall be provided at 1310 and 1550 for singlemode fibers. Measured results shall be plus/minus 1 dB of submitted loss budget calculations.
 - 2. Fiber links shall have a maximum loss of: (allowable cable loss per km)(km of fiber in link) + (.4dB)(number of connectors) = maximum allowable loss
 - 3. Loss numbers for the installed link shall be calculated by taking the sum of the bi-directional measurements and dividing that sum by two.
 - 4. Any link not meeting the requirements of the standard shall be brought into compliance by the contractor, at no charge to the Owner.

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- 5. Submit OTDR and/or Power Loss test results and include the following:
 - a.) Fiber Type
 - b.) Wavelength
 - c.) Fiber and cable number
 - d.) End point locations
 - e.) Test direction
 - f.) Reference power measurement (when not using a power meter with a Relative Power Measurement Mode)
 - g.) Measured attenuation of the link segment
 - h.) Acceptable link attenuation
 - i.) Test equipment model and serial numbers
 - J.) Date
 - k.) Reference setup
 - 1.) Operator (crew members)
- 6. Acceptable Attenuation Values
 - a.) The general attenuation equation for any link segment is as follows; Acceptable Link Attn. = Cable Attn. + Connection Attn. + Splice Attn. + Coupled Power Ration (CPR) Adjustment.
 - b.) Note: A connection is defined as the joint made by mating two fibers terminated with re-mateable connectors (e.g. SC, LC).
- F. Cable 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.
- G. No cable shall be put into service until it is fully tested and accepted by the Designer and Owner.

3.8 AS-BUILTS

- A. All backbone cable label information cross-referenced by location room number, rack/cabinet ID, and patch panel ports.
- B. All conduit and pull-box locations to detail specified in division 1600.
- C. Any Fiber Channels created.
- D. One copy, or as directed by Project Documents, of Fiber Channel Record forms shall be submitted separately in one three ring binder to Owner's Telecommunications Department through the OAR.

3.9 ACCEPTANCE

- A. Once all work has been completed, test documentation has been submitted and approved, and the Owner is satisfied that all work has been completed in accordance with contract documents, the Owner will notify Contractor in writing of formal acceptance of the system.
- B. Acceptance shall be subject to completion of all work and submittal and approval of full documentation as described above.

END OF SECTION 271300

SECTION 271500 – TELECOMMUNICATIONS HORIZONTAL CABLING

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:
 - 1. 270526 Grounding and Bonding for Communications Systems
 - 2. 270528 Pathways for Communications Systems
 - 3. 270553 Identification for Communications Systems
 - 4. 271100 Communications Equipment Room Fittings
 - 5. 271300 Communications Backbone Cabling
 - 6. 271900 Exterior Telecommunication Pathways

1.2 SUMMARY

- A. This Section includes fiber optic and copper horizontal cabling, termination hardware and patch cables for the Airside Terminal in the South Terminal Complex.
- B. Provide all horizontal cabling, terminating hardware, adapters, and cross-connecting hardware necessary to connect work area outlets to the structured cabling system (SCS).
- C. The structured cabling system provides a consolidated communications infrastructure comprised of copper and fiber optic cables routed throughout the facility. This system shall provide transmission media for voice and data signals. The Contractor shall provide structured cabling transmission media, components, and testing to conform to the Owner's standards as specified herein or shown on the plans and in conformance with manufacturers' requirements and recommendations.
- D. This Section includes horizontal cable, patch panels, connectors, patch cables, outlets, terminal blocks, etc. as required to provide a complete system. This section specifies the following types of control and signal transmission media:

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- 1. UTP Copper: The SCS may contain Enhanced Category 5, augmented Category 6, or both rated horizontal cabling with related components. Any reference to "Category 6 Plus", "augmented Category 6", or "Category 6 Enhanced" or "Category 6A" refers to cable and cable plant components that will perform to proposed TIA/EIA-568-B.2-10 (augmented Category 6) characteristics.
- 2. RS-422 Serial Data Cable
- 3. Fiber Optic: 50 µm Multimode (Horizontal distribution)
- 4. Coaxial Cable (Horizontal distribution)
- E. This Section covers only horizontal cable used in this project. Refer to Section 271300 Communications Backbone Cabling for copper and fiber backbone cabling requirements.

1.3 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.
- D. References:
 - 1. ANSI/TIA/EIA-568-B, Commercial Building Telecommunications Wiring Standards
 - 2. ANSI/TIA/EIA-569-B Commercial Building Standard for Telecommunications Pathways and Spaces
 - 3. ANSI/TIA/EIA-606-A-2002 Administration Standard for Commercial Telecommunications Infrastructure
 - 4. ANSI/TIA/EIA-526-14A Measurement of Optical Power Loss of Installed Multimode Fiber Cable Plant
- 5. International Standards Organization/International Electromechanical Commission (ISO/IEC) DIS11801, January 6, 1994
- FCC: Federal Communication Commission Part 68 as modified by Wiring Docket 88-57
- 7. Underwriters Laboratories Inc. (UL) Cable Certification and Follow Up Program
- 8. Americans with Disabilities Act (ADA): Where applicable, the structured cabling system shall comply with ADA, Public Law 101-336. The system shall comply with ADA Accessibility Guidelines (ADAAG).
- 9. National Electrical Manufacturers Association (NEMA)
- 10. American Society for Testing Materials International (ASTM)
- 11. National Electrical Code (NFPA-70)
- 12. National Electrical Safety Code (NESC)
- 13. Institute of Electrical and Electronic Engineers (IEEE)
- 14. UL Testing Bulletin
- 15. Building Industry Consulting Service International (BICSI) Telecommunications Distribution Methods Manual (TDMM)
- 16. Local, county, state and federal regulations and codes in effect as of date of purchase
- 17. 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.

1.4 SUBMITTALS

- A. The Contractor 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 Owner. Such work shall be in accordance with approved submittals.
- B. Qualifications: The Contractor 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 Contractor 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 Contractor shall provide one sample of each type of the following cables for approval:
 - 1. Multimode fiber optic breakout cable with connectors attached to each end.
 - 2. Category 6 cable with connectors attached to each end.
 - 3. RG-6 coaxial cable with BNC connectors attached to each end.
- E. Cable Testing Plan: The Contractor shall provide a test plan for media testing as described in the article "Field Quality Control" prior to beginning cable 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 Cable Testing Reports: The Contractor shall submit cable test reports as follows:
 - 1. Submit certification test reports of Contractor-performed tests in accordance with the "Field Quality Control" article of this document.
 - 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.

- G. Cable inventory data shall be submitted for all fiber, copper, and coaxial cabling and termination equipment. Submit data electronically on CD-ROM in Microsoft Excel format, listing products furnished, including:
 - 1. Manufacturer's name
 - 2. Manufacturer's part numbers
 - 3. Cable numbers utilizing the Owner's cable numbering standard
 - 4. Location and riser assignments
- H. Record Drawings: Furnish CAD drawings of completed work including cable ID numbers following the Owner's labeling standards. Submit in hardcopy (two full size and two half size) and electronic formats.
- 1.5 QUALITY ASSURANCE
 - A. Contractor Qualifications:
 - 1. The Installing Contractor shall be currently licensed by the Electrical Contractors' Licensing Board as a Statewide Low Voltage System Specialty Contractor (ES-069).
 - 2. The Contractor shall be certified by the manufacturer of the products, adhere to the manufacturer's engineering, installation and testing procedures and utilize the authorized manufacturer components and distribution channels in provisioning this Project.
 - 3 All work shall be supervised on-site by a BICSI Registered Communications Distribution Designer (RCDD). Supervising RCDD shall demonstrate knowledge and compliance with all BICSI, TIA/EIA, UL, and NEC methods, standards and codes.
 - 4. All members of the installation team shall be certified by the manufacturer as having completed the necessary training to complete their part of the installation, including installation. Resumes of the entire team shall be provided along with documentation of completed training courses.
 - 5. The Contractor shall provide five references for projects of equivalent scope, type and complexity of work completed within the last five years.
 - 6. The Contractor shall provide a letter certifying the Contractor maintains an office within fifty (50) miles of the project location.

- B. Materials and equipment: Equipment shall be rated for continuous operation under the ambient environmental temperature, humidity, and vibration conditions encountered at the installed location. The equipment shall meet the following requirements.
 - 1. Interior controlled environment: 60 to 100 degrees F dry bulb and 20 to 90 percent relative humidity, non-condensing.
 - 2. Interior uncontrolled environment: 0 to 130 degrees F dry bulb and 10 to 95 percent relative humidity, non-condensing.
 - 3. Exterior environments: Minus 30 degrees to 130 degrees F dry bulb, and 10 to 100 percent relative humidity, condensing.
 - 4. Hazardous environment: All system components located in areas where fire or explosion hazards may exist because of flammable gas or vapors, flammable liquids, combustible dust, or ignitable fibers or flyings, shall be rated and installed according to Chapter 5 of the NEC and as shown.
 - 5. Listing and Labeling: Provide products specified in this Section that are listed and labeled, as defined in the NEC Article 100.
- C. 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. Single Point of Contact Responsibility: All cable and components of each kind shall be covered by a single warranty program with a single point of contact. For fiber optic and Category 5e and Category 6 or Augmented Category 6 UTP cable, cable and connecting hardware shall be manufactured by the same company or be part of the same cabling system, i.e. warranted by the manufacturer(s) as one cabling system.

1.6 WARRANTY

A. The Contractor 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, and software to be free from defects in materials and workmanship for a period of no less than 20 years for horizontal copper and 25 years for fiber, starting with the date of Final System Acceptance.

- B. Contractor shall warrant that all approved cabling components meet or exceed the specifications provided in the product data submittal and exceed ANSI/TIA/EIA-568-B and ISO/IEC 11801 for the warranty period. The warranty shall apply to all passive SCS components.
- C. Copper horizontal distribution media components, including cabling, jacks and connecting hardware, shall carry warranty to meet applicable enhanced Category 5 or augmented Category 6 performance standards as defined in ANSI/TIA/EIA-568-B series of standards and addenda and in manufacturer specifications.
- D. Fiber optic multimode horizontal distribution media components, including cabling, connectors, splices, and jacks, shall carry warranty to meet applicable transmission performance requirements of the ANSI/TIA/EIA-568-B series of standards and addenda and in manufacturer specifications.
- E. The Contractor 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.
- F. 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 structured cabling system to support the application which it was designed to support, as well as additional application(s) introduced in the future by recognized standards or user forums that use the ANSI/TIA/EIA-568-B or ISO/IEC 11801 component and link/channel specifications for cabling, for the warranty period.
- B. System Certification: Upon successful completion of the installation and subsequent inspection, the DOA shall be provided with a numbered certificate, from the manufacturing company, registering the installation.
- C. Support Availability: The Contractor 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 1", all exterior conduit/cabling, and all Work Area communications outlet information.
- D. Maintain temperature of between 64 degrees F and 75 degrees F and between 30 and 55 percent humidity in areas of voice and data system work.
- 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 Owner.
- 1.10 COORDINATION
 - A. Determine required separation between cable and other work.
 - B. Coordinate cable routing to avoid interference with other work disciplines.
 - C. Coordinate installation with other trades and furniture installers.
 - D. Coordinate with all contractors providing equipment outside the scope of this contract.

PART 2 - PRODUCTS

2.1 HORIZONTAL TELECOMMUNICATION CABLING SYSTEM

- A. Definition:
 - 1. For the purpose of this document, the term "Horizontal Cabling" defines a portion of BWI's communication infrastructure. Horizontal cabling includes the passive cable distribution system which extends communication voice, video and data signaling, between a local Telecommunication Room (TR) patch panel/punchdown and a work

area outlet. Note TR is the current industry trade name for Intermediate Distribution Frames (IDF's)and Main Distribution Frames (MDF's).

- 2. MAA OAT standard configurations for voice data outlets consists of 4 CAT6 UTP cables. Two of these cables shall have blue jackets and are terminated for data signaling, the other 2 CAT 6 cables shall have a white jacket and is terminated for voice signaling.
- B. Primary Industry Standard Requirements for Horizontal Cable Systems:
 - 1. Comply with ICEA S-90-661 for mechanical properties.
 - 2. Comply with TIA/EIA-568-B.1 & B.2, Category 6 UTP
 - 3. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444 and NFPA 70 for the following types:
 - 4. Communications, Plenum Rated: Type CMP, complying with NFPA 262.
 - 5. Multipurpose, Plenum Rated: Type MPP, complying with NFPA 262.
- 2.2 UNSHIELDED TWISTED PAIR (UTP) CABLE
 - A. Design Selection Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. Superior Essex DataGain CMP.
 - B. Description: UTP horizontal cabling is 100-ohm, 4-pair cable, protected with a plenum jacket.
 - 1. Category 6 UTP (CAT 6) the current primary cable product for new horizontal cable installations at BWI, and used in two jacket colors:
 - White jacket for voice circuits
 - Blue jackets for data circuits
 - 2. All non-MAA systems shall be coordinated to exclude the use these jacket colors.
- 2.3 UNSHIELDED TWISTED PAIR (UTP) CABLE TERMINATION HARDWARE
 - A. Horizontal UTP Cable terminations at BWI shall include the following:
 - 1 Voice circuit UTP cables

- a. Near End (Telecommunications Rooms).
- b. Far End (Work Area Outlets)
- 2. Data circuit UTP cables
 - a. Near End (Telecommunications Rooms).
 - b. Far End (Work Area Outlets)
- B. General Note:
 - 1. Coordinate with electrical power trade for provision of quad 120 VAC, 20A outlet adjacent to typical voice/data outlets.
- C. Voice circuit UTP Terminations:
 - 1. Voice Circuit Near End (Telecommunications Rooms).
 - a. Design Selection for Near End IDF/MDF: Fully equipped ADC Krone Series 2 termination system to include back frame, terminal blocks, hinged labeling system and cable/jumper management hardware. Back frames should be equipped with suitable mounting hardware to accommodate mounting conditions including wall, freestanding rack and cabinets.
 - 2. Voice Circuit Far End (Work Area Outlets)
 - a. Design Selection for Far End (Workstation): 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. Special applications such as systems furniture and in floor access should be addressed on a case-by-case basis utilizing above product guide lines were possible.
 - b. Horizontal UTP cables for wall telephones should be terminated on stainless steel 630 series faceplates.
- D. Split Terminations –Voice Circuits (SHALL NOT BE USED) unless specified and approved by OAT Engineer.
 - 1. MAA OAT termination scheme for voice cables planned as "Split CAT 6", where a single CAT 6 UTP cable is used to support two voice jackets in an outlet.
 - a. Primary Jack Position (Gray) V-1

Pin 3 White/Orange Pin 4 Blue/White Pin 5 White/Blue Pin 6 Orange/White

- b. Secondary Jack Position (Black) V-2
 Pin 3 White/Brown
 Pin 4 Green/White
 Pin 5 White/Green
 Pin 6 Brown/White
- E. Data circuit UTP cables
 - 1. General UTP Data cable terminations:
 - a. Terminate in accordance with TIA/EIA T568B Standard
 - 2. Data Circuit near end (Telecommunications Rooms)
 - a. Design Selection for Near End data terminations include: Fully equipped Ortronics MM series termination system to include Cat-6 patch panels, cable management hardware, vertical and horizontal patch cord management hardware and labels
 - b. Minimum patch panel size 24 ports, maximum patch panel size 48 ports. Use multiple 48 port panels in high density applications.
 - c. Provide a minimum of 25% spare port capacity over equipped port capacity.
 - 3. Data Circuit Far End (Work Area Outlets)
 - a. Design Selection Far End Work Station: Face plates, jacks, labels and icons should be Ortronics Clarity series Cat 6 or approved equal. Primary data jack should be Red (-42) secondary jack should be Yellow (-44) faceplate should be Fog White. Special applications such as systems furniture and in floor access should be addressed on a case-by-case basis utilizing above product guide lines were possible.

2.4 HORIZONTAL OPTICAL FIBER CABLE

A. Horizontal use of fiber optic cable currently not recognized by MAA OAT, coordinate with MAA OAT for applications requiring fiber optic cable to be used in horizontal cable applications.

2.5 SPECIAL CABLE APPLICATIONS

A. If as part of the project special cable applications are required to support stand alone systems or equipment the cable requirements should be reviewed with MAA OAT in the early stages of the design to determine the impact of the systems and cabling requirements on the voice and data systems and infrastructure. Examples of these systems would be voice paging, Lift-Net, 800 MHz radio system etc.

2.6 IDENTIFICATION METHODS AND LABLING PRODUCTS

- A. Comply with BWI'S Telecommunication labeling methods and TIA/EIA-606-A and UL 969 for labeling materials, including label stocks, laminating adhesives, and inks used by label printers.
- B. All Horizontal cable and termination fields shall be labeled with permanent, easy to read identifications which are compliant with MAA OAT cable labeling scheme.
- C. Coordinate with MAA OAT for cable labeling means and methods.
- 2.7 SOURCE QUALITY CONTROL
 - A. Testing Agency: Engage a qualified testing agency to evaluate cables.
 - B. Factory test UTP and optical fiber cables on reels according to TIA/EIA-568-B.1.
 - C. Factory test UTP cables according to TIA/EIA-568-B.2.
 - D. Factory test multimode optical fiber cables according to TIA/EIA-526-14-A and TIA/EIA-568-B.3.
 - E. Cable will be considered defective if it does not pass tests and inspections.
 - F. Prepare test and inspection reports.
- 2.8 MANUFACTURERS
 - A. Subject to compliance with requirements, manufacturers that may be incorporated in the work, include, but are not limited to the following:
 - B. Horizontal Fiber Optic Cable, Patch Cables and Connecting Hardware
 - 1. Basis of Design: Corning
 - 2. Approved Substitutions

- a. Berk-Tek
- b. Optical Cable Corporation
- c. Superior Essex
- C. Horizontal Copper Cable, Patch Cables and Connecting Hardware
 - 1. Basis of Design: Superior Essex NextLAN
 - 2. Approved Substitutions
 - a. Mohawk
 - b. Berk-Tek
 - c. Hitachi
- D. Serial Data Cable
 - 1 Basis of Design: Black Box.
 - 2. Submitted and owner-approved equivalent.
- 2.9 HORIZONTAL FIBER OPTIC CABLE GENERAL REQUIREMENTS
 - A. Fiber optic cable shall be of tight buffered, non gel-filled design, provided in counts as indicated on the Drawings.
 - B. Fiber optic cable shall be certified to meet all parts of TIA/EIA-455 and comply with TIA/EIA-492, ISO/IEC 11801, ANSI/ICEA S-83-596 and ANSI/ICEA S-83-640 and the NEC.
 - C. Fibers shall have D-LUX coating or approved equivalent to ensure color retention, minimize microbending losses and improve handling. The coating shall be mechanically strippable.
 - D. Cable installed in plenums or air-handling spaces shall meet UL 910 and shall be marked OFNP (optical fiber non-conductive plenum) in accordance with the NEC.
 - E. Plenum-rated cable consisting of multiple fibers shall have a Plenum PVC outer jacket. Each group of fibers shall have a color-coded Low Smoke PVC buffer. The buffered fibers are organized in subunits of fibers, reinforced with aramid yarn for extra strength and surrounded with a color-coded low smoke tube.

- F. No cabling shall be placed in plenum without written permission from the Owner.
- G. Fiber optics conductors shall follow standard color code schemes. Fiber numbers and binders shall correspond to the color codes as follows:
 - 1. Fiber/Binder No. 1 blue.
 - 2. Fiber/Binder No. 2 orange.
 - 3. Fiber/Binder No. 3 green.
 - 4. Fiber/Binder No. 4 brown.
 - 5. Fiber/Binder No. 5 slate.
 - 6. Fiber/Binder No. 6 white.
 - 7. Fiber/Binder No. 7 Red.
 - 8. Fiber/Binder No. 8 Black.
 - 9. Fiber/Binder No. 9 Yellow
 - 10. Fiber/Binder No. 10 Violet.
 - 11. Fiber/Binder No. 11 Rose.
 - 12. Fiber/Binder No. 12 Aqua.
- H. The fiber optic cable shall be shipped on reels in lengths as specified with a minimum overage of 10 percent.
- I. The cable shall be wound on the reel so that unwinding can be done without kinking the cable.
- J. Two meters of cable at both ends of the cable shall be accessible for testing.
- K. Marking: Each reel shall have a permanent label attached showing length, cable identification number, cable size, cable type, attenuation, bandwidth, and date of manufacture. Labels shall be water resistant and the writing on the labels shall be indelible.
- L. Cable Minimum Bending Radius
 - 1. During Installation: 20 times cable diameter
 - 2. After Installation: 10 times cable diameter

- M. Operating Range: -76°F to 185°F (-60°C to 85°C)
- N. Storage Temperature Range: -40°F to 149°F (-40°C to 65°C)
- O. All fiber optic cable not encased in conduit must be armor-jacketed with proper outer covering.
- 2.10 MULTIMODE FIBER REQUIREMENTS
 - Multimode fiber shall meet the requirements of EIA/TIA-492AAAC, "Detail Specification for 850-nm Laser-Optimized, 50 micron Core Diameter/125 micron Cladding Diameter Class Ia Graded-Index Multimode Optical Fibers."
 - B. Fibers shall have dual wavelength capability; transmitting at 850 and 1300 nm ranges.
 - C. Laser optimized 50 micron \pm 2.5 micron core.
 - D. Core non-circularity: $\leq 5\%$.
 - E. 125 micron ± 2 micron cladding diameter.
 - F Cladding non-circularity: $\leq 1\%$.
 - G. Colored fiber diameter: $254 \text{ micron} \pm 5 \text{ micron}$.
 - H. Minimum tensile strength: 100,000 psi.
 - I. Maximum Attenuation: 3.5 dB/km at 850 nm and 1.0 dB/km at 1300 nm.
 - J. Minimum Bandwidth: 2000 MHz at 850 nm and 500 MHz at 1300 nm.

2.11 SINGLEMODE FIBER REQUIREMENTS

- A. Singlemode fiber shall meet EIA/TIA-492CAAB, "Detail Specification for Class IVa Dispersion-Unshifted Single-Mode Optical Fibers with Low Water Peak,", ITU recommendation G.652, "Characteristics of a single-mode optical fiber cable," and IEC 60793-2-50 Type B1.3.
- B. Fibers shall have dual wavelength capability; transmitting at 1310 and 1550 nm ranges.
- C. 8.3 micron core
- D. 125 micron \pm 7 micron cladding diameter
- E. Cladding non-circularity: $\leq 7\%$

- F. Core/cladding concentricity error: $\leq .5$ micron
- G. Colored fiber diameter: $254 \text{ micron} \pm 5 \text{ micron}$
- H. Maximum Attenuation: .40 dB/km at 1310 nm and .30 dB/km at 1550 nm
- I. Minimum Bandwidth: 20 GHz
- 2.12 HORIZONTAL COPPER UTP REQUIREMENTS
 - A. Horizontal copper cable may be either Category 5E or augmented Category 6 four pair UTP as specified in the Drawings.
 - B. Category 5E cable basis of design Superior Essex Cat 5E Plus (Cobra 427) with continuous yellow jacket.
 - C. Category 6 Plus cable basis of design ESSEX NextLAN Cat 6 Plus with continuous green jacket.
 - D. Cable jacket shall comply with NEC Article 800 for use as a plenum cable and shall be UL and c (UL) Listed Type CMP (communications multipurpose plenum).
 - E. Cable shall terminate on an eight-pin modular jack at each outlet. All horizontal cabling shall meet or exceed the ANSI/EIA/TIA-568-B.2 Commercial Building Telecommunications Cabling Standard, Part 2. Balanced Twisted Pair Cabling Components.
 - F. Cables shall be marked as UL verified with a minimum of Category 6 rating.
 - G. The cable shall support Voice, Analog Baseband Video/Audio, Fax, Modem, Switched-56, T-1, ISDN, RS-232, RS-422, RS-485, 10BASE-T Ethernet, Token Ring, 100Mbps TP-PMD, 100BASE-T Ethernet, 155 Mbps ATM, AES/EBU Digital Audio, 270 Mbps Digital Video, 622 Mbps 64-CAP ATM and emerging high-bandwidth applications, including 1 Gbps Ethernet, gigabit ATM, as well as all 77 channels (550 MHz) of analog broadband video.
 - H. The maximum horizontal cable length for horizontal copper UTP cable from the termination of the cable in the communications room to the outlet is 295 feet.
 - I. Cable shall meet or exceed the following electrical characteristics:
 - 1. Mutual capacitance: 47.8 nF/m
 - 2. Characteristic impedance: (± 3%) of 100 Ohms 1-550 MHz.
 - 3. DC resistance maximum. 9.83 Ohms/100m.

4. Positive ACR: Out to 395 MHz-km.

2.13 COAXIAL CABLE

- A. Shielded, plenum RG-6 cable.
- B. Shall consist of a 20-AWG solid-copper conductor. The cable shall be UL and (UL) Listed for Fire Safety and ISO 9001 Certified.
- C. Characteristic Impedance: 75 Ohms at 50 MHz.

2.14 SERIAL DATA CABLE

- A. Use only where specified in Drawings.
- B. Twisted pair with PVC jacket.
- C. Capable of sending RS-422 signal up to 4,000 feet.
- D. Capacitance: 12 pF/ft + -2 pF/ft.
- E. Conductor Gauge: 24 AWG (7x32 AWG stranded).
- F. Maximum Resistance: 16 ohms/1000 ft.
- G. Shield: Foil around each pair, each with drain wire.
- H. Four conductor.
- 2.15 FIBER TERMINATION HARDWARE
 - A. Modular Fiber Optic Patch Panels
 - 1. Fiber patch panels shall have black all metal solid surfaces, padlock hasps on front and rear doors, legends to be installed inside.
 - 2. Fiber patch panels shall support modular six or eight ST connector bulkhead panels.
 - 3. MM connector/coupler covers shall be orange in color.
 - 4. Side cable entry, side jumper entry.
 - 5. All coupler panels shall have ceramic sleeves/ferrules.
 - 6. 19-inch rack-mountable

- 7. Accept 12, 24, 48, 72 or 144-strand terminations, as shown on Drawings.
- B. Fiber Optic Cable Connectors
 - 1. Fiber optic cable connector shall be ST type with ceramic ferrules, ST exceptions as designated by Project.
 - 2. Connector shall be properly sized for fiber type.
 - 3. All connectors' terminations to ST type connectors shall be epoxy ST II Plus or 3M hot melt.
 - 4. All termination methods shall be as specified as acceptable to the fiber cable manufacture to maintain full cable manufacturers warranty and industry standard expected life cycle. Construction shall be applicable for the intended installation environment.

2.16 COPPER TERMINATION HARDWARE

- A. Copper Patch Panels
 - 1. Component certified to meet or exceed Category 5E or augmented Category 6 standards.
 - Configuration: Modular RJ-45 non-keyed 8-position jack port to 110 printed circuit board, factory pre-wired, Category 5E or augmented Category 6 standards, EIA/TIA T568B, active pins: 1 through 8, connection hardware: IDC PCB (printed circuit board) mounted connector for 22-26 AWG.
 - 3. Individual patch panel size not to exceed 48 ports, black finish.
 - 4. Basis of design; Superior Modular Products
 - 5. The termination block on the patch panel shall support the appropriate augmented Category 6 applications (or Category 5e, as applicable), including 100 Base-T, 52/155 Mbps ATM, and 1000 BASE-T Gigabit Ethernet, and facilitate cross connection and inter connection using modular patch cords.
 - 6. All modular cross connect panels shall be UL listed.
- B. Fiber Optic Outlets
 - 1. Four or eight port double gang ruggedized outlet box
 - 2. 1.3-inch or 2.5-inch deep depending on application

- 3. All metal welded construction
- 4. Cable bend radius protection and strain-relief provisions
- 5. Screw-on cover plate
- 6. Basis of design: Corning Ruggedized Information Outlet
- 2.17 FIBER OPTIC PATCH CABLES MULTIMODE
 - A. Buffered, graded-index fiber with a 50 micron core and a 125 micron cladding
 - B. Orange in color
 - C. The fiber optic cladding shall be covered by aramid yarn and an OFNR jacket. Specialty use patch cords shall have a jacket suitable for intended use.
 - D. ISO 9001 Certified Manufacturer.
 - E. Operating temperature: -4° to 158° F (-20 to 70° C).
 - F. Cable Retention: 50 lb. (220 N) minimum.
 - G. Mated Connector Loss: $\mu = 0.3 \text{ dB}, \sigma = 0.2 \text{ dB}.$
 - H. Connection Repeatability: 0.20 dB maximum change per 100 reconnects.
 - I. Provide factory assembled patch cords with ST style connectors with ceramic ferrules.
 - J. Provide one duplex patch cord for each Fiber Optic Patch Panel termination pair.
 - K. Provide patch cables sized to routing requirements.
 - L. Refer to Section 271300 Communications Backbone Cabling for singlemode patch cable specifications.

2.18 COPPER PATCH CABLES

- A. Provide an augmented Category 6 (or Category 5e, as applicable) Modular Patch Cord for each installed port.
- B. Category 5e patch cables shall have a continuous yellow jacket and augmented Category 6 patch cables shall have a continuous green jacket.

- C. Patch cables shall be performance and impedance matched with horizontal cables and provided by the same manufacturer of the horizontal cable.
- D. All augmented Category 6 patch cables shall conform to the requirements of proposed TIA/EIA-568-B.2-10 for augmented Category 6. Category 5e patch cables shall conform to ANSI/TIA/EIA-568-B.1 Commercial Building Telecommunications Cabling Standard, Horizontal Cabling Section.
- E. Cords shall be equipped with an eight-pin modular connector on each end and shall be of appropriate length for application.
- F. Where applicable (only when connecting voice outlets to copper riser), provide hybrid patch cords. Cords shall be one-pair stranded D8PS (RJ45) connector on one end and 110GS on the other end and shall be of appropriate length for application.
- G. All Category 6 cordage shall be round, and consist of 24 AWG minimum copper, stranded conductors, tightly twisted into individual pairs.
- H. Maximum equipment cable length from the work area outlet to the device should be limited to 10 feet. Maximum cable length for jumpers and patch cords in the communications room should be limited to 20 feet.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify conduits, cable trays and pull boxes are properly installed following Section 270528.
- B. Verify backboards are properly installed.
- C. Verify telecommunications grounding system is properly installed and tested following Section 270526.
- D. 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.
- E. Verify that no horizontal copper cable run is greater than 295 feet from the outlet, through the provided pathway, to the communications room termination panel, including slack and service loops.
- 3.2 INSTALLATION
 - A. Install work following drawings, manufacturer's instructions and approved submittal data.

- B. All installation shall be done in conformance with ANSI/TIA/EIA-568-B standards, BICSI methods, industry standards and manufacturers' installation guidelines. The Contractor 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 Contractor 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 Contractor during the implementation.
- C. The Contractor shall provide a 10-foot service loop at the communications room and shall provide a three-foot service loop above the access ceiling or cable trays unless specified otherwise. This allows for future changes or expansion without installing new cables.
- D. All cabling shall be in conduit.
- E. Route all horizontal and similar cables in rear of rack or internal to cabinet clear of spaces reserved for electronics.
- F. Identification: Label all cable and terminations following Section 270553 Identification for Communications Systems.
- G. Documentation
 - 1. All cable inventory data documentation shall be submitted in format coordinated with and approved by MAA IT Department so that data can be incorporated into existing databases.
 - 2. Documentation shall include cable identification number, source and destination, type of cable, length of cable and number of pairs or fibers.
 - 3. Complete cross connect documentation is required. It shall include detailed documentation of each pair of all horizontal cable.

3.3 FIELD QUALITY CONTROL

- A. Post-Installation Testing
 - 1. Contractor shall test each Category 6 and Category 5e cable and each fiber strand of every optical fiber cable prior to acceptance.
 - 2. Contractor shall supply all of the required test equipment used to conduct acceptance tests.

- 3. Contractor shall submit acceptance documentation as defined below. No cabling installation is considered complete until test results have been completed, submitted and approved.
- B. Test Procedure
 - 1. Owner reserves the right to be present or to assign a representative to be present during any or all testing.
 - 2. Testing of the horizontal cabling shall be of the Basic Link. However, Contractor shall warrant performance based on Channel performance and provide patch cords that meet channel performance.
 - 3. All cabling not tested strictly in accordance with these procedures shall be re-tested at no additional cost to the Owner.
 - 4. Testing of all copper and fiber wiring shall be performed prior to system(s) cutover.
 - 5. 100% of the installed cabling shall be tested. All tests shall pass test criteria defined below.
 - 6. Test equipment shall be fully charged prior to each day's testing.
 - 7. Any pairs not meeting the requirements of the standard shall be brought into compliance by the contractor at no charge to the Owner. Complete end-to-end test results shall be submitted to the Owner.
- C. Standards Compliance and Test Criteria
 - 1. Category 5e Copper Backbone Cabling shall meet or exceed ANSI/TIA/EIA-568-B.1 Category 5e Horizontal Cabling requirements and meet the manufacturer's specifications for the installed product.
 - 2. Augmented Category 6 Copper Backbone Cabling shall meet or exceed performance standards of the proposed TIA/EIA-568-B.2-10 (augmented category 6) and meet the manufacturer's specifications for the installed product.
 - 3. Fiber optic cable shall meet or exceed ANSI/TIA/EIA-568-B.3 Optical Fiber Cabling Components Standard requirements and meet the manufacturer's specifications for the installed product.
- D. Cable Test Documentation

- 1. Cable test documentation shall be submitted in hard copy in three-ring binders and electronic (CD-ROM) formats. If proprietary software is used, CD shall contain any necessary software application required to view test results. If the results are delivered in a standard format like Excel, Access, CSV files, etc., software to read these files is not required. Electronic reports shall be accompanied by a Certificate signed by an authorized representative of the Contractor warranting the truth and accuracy of the electronic report. Certificate shall reference traceable circuit numbers that match the electronic record.
- 2. The following reports shall be submitted. Any individual test that fails the relevant performance specification shall be marked as FAILED.
 - a. Certification test report for augmented Category 6 cable.
 - b. Certification test report for Category 5e cable.
 - c. Certification test report for Fiber Optic cable.
 - d. OTDR and power meter test report for Fiber Optic cable.
- 3. Test reports shall include the following information for each cabling element tested.
 - a. Wiremap results that indicate that 100% of the cabling has been tested for shorts, opens, miswires, splits, polarity reversals, transpositions, presence of AC voltage and end-to-end connectivity.
 - b. Length (in meters), propagation delay, and delay skew relative to the relevant limit. Any individual test that fails the relevant performance specification shall be marked as a FAIL.
 - c. Cable manufacturer, cable model number/type and nomical velocity of propagation (NVP).
 - d. Tester manufacturer, model, serial number, hardware version, and software version.
 - e. Circuit ID number and project name.
 - f. Origination and destination locations.
 - g. Autotest specification used.
 - h. Overall pass/fail indication.

- i. Date of test.
- j Test reports shall be submitted within seven (7) business days of completion of testing.
- E. Fiber Cable Testing
 - 1. For cable lengths over 1000 feet; perform bi-directional end to end Optical Time Domain Reflectometer (OTDR) testing on each fiber optic conductor per TIA/EIA 455-61. The system loss measurements shall be provided at 850 and 1300 nanometers for multimode fibers and 1310 and 1550 for singlemode fibers. Measured results shall be plus/minus 1 dB of submitted loss budget calculations.
 - 2. For cable length less than 1000 feet, initially test optical cable with a light source and power meter utilizing procedures as stated in ANSI/TIA/EIA-526-14A. OFSTP-14A Optical Power Loss Measurements of Installed Multimode Fiber Cable.
 - a. Measured results shall be plus/minus 1 dB of submitted loss budget calculations.
 - b. If loss figures are outside this range, test cable with optical time domain reflectometer to determine cause of variation. Correct improper splices and replace damaged cables at no charge to the owner.
 - 3. Fiber links shall have a maximum loss of: (allowable cable loss per km)(km of fiber in link) + (.4dB)(number of connectors) = maximum allowable loss
 - 4. Loss numbers for the installed link shall be calculated by taking the sum of the bidirectional measurements and dividing that sum by two.
 - 5. Any link not meeting the requirements of the standard shall be brought into compliance by the contractor, at no charge to the Owner.
 - 6. Submit OTDR and/or Power Loss test results and include the following:
 - a. Fiber Type.
 - b. Wavelength.
 - c. Fiber and cable number.
 - d. End point locations.
 - e. Test direction.

- f. Reference power measurement (when not using a power meter with a Relative Power Measurement Mode).
- g. Measured attenuation of the link segment.
- h. Acceptable link attenuation. (Note: Horizontal Link Segments are limited to 90 meters; therefore, the acceptable link attenuation can be based on the longest installed link without introducing a significant error.).
- i. Test equipment model and serial numbers.
- j. Date.
- k. Reference setup.
- 1. Operator (crew members).
- 7 Acceptable Attenuation Values
 - a. The general attenuation equation for any link segment is as follows; Acceptable Link Attn. = Cable Attn. + Connection Attn. + Splice Attn. + Coupled Power Ration (CPR) Adjustment.
 - b. Note: A connection is defined as the joint made by mating two fibers terminated with re-mateable connectors (e.g. SC, LC).
- F Cable 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. Test equipment for Category 6 UTP shall be UL verified to meet Level III accuracy as specified in ANSI/TIA/EIA-568-B.2-1 and proposed TIA/EIA-568-B.2-10 (augmented Category 6). The cable installers shall have a copy of this reference in their possession and be familiar with the contents.
 - 3. Test equipment for Category 5e UTP shall be UL verified to meet Level IIe or Level III accuracy as specified in ANSI/TIA/EIA-568-B.1. The cable installers shall have a copy of this reference in their possession and be familiar with the contents.
 - 4. Test equipment for multimode fiber cabling shall meet the requirements of ANSI/TIA/EIA-526-14-A. The light source shall meet the launch requirements of

ANSI/TIA/EIA-455-50B, Method A. The cable installers shall have a copy of these references in their possession and be familiar with the contents.

- 5. The test instrument shall be within the calibration period recommended by the manufacturer
- 6. Test instruments shall have the latest software and firmware installed.
- 7. All test tools of a given type shall be from the same manufacturer, and have compatible electronic results output.
- 8. Test adapter cables shall be approved by the manufacturer of the test equipment. Adapters from other sources are not acceptable.
- G. No cable shall be put into service until it is fully tested and accepted by the Designer and Owner.

3.4 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.

3.5 ACCEPTANCE

- A. Once all work has been completed, test documentation has been submitted and approved, and the Owner is satisfied that all work has been completed in accordance with contract documents, the Owner will notify Contractor 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. Owner reserves the right to conduct, using Contractor 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 Owner, using standard labor rates. Any failing cabling shall be re-tested and restored to a passing condition at no cost to the Owner. 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 conditional cost to the Owner.
- D. Owner 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 271500

8/11/2009

SECTION 271900 - EXTERIOR COMMUNICATIONS PATHWAYS

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 Provision Addenda, apply to this Section.
- B. Related Sections:
 - 1. 270526 Grounding and Bonding for Communications Systems
 - 2. 270543 Underground Ducts and Raceways for Communications Systems
 - 3. 270553 Identification for Communications Systems
 - 4. 271100 Communications Equipment Room Fittings
 - 5. 271300 Communications Backbone Cabling

1.2 SCOPE OF WORK

- A. Provide all services, labor, materials, tools, and equipment required for the complete and proper installation of exterior telecommunications pathways as called for in these specifications and related drawings.
- B. This section includes minimum requirements and installation methods for the following:
 - 1. Cutting and Patching Asphalt and Concrete
 - 2. Trenching and Excavation
 - 3. Underground Conduit Systems
 - 4. Horizontal Directional Drilling (Directional Boring)

1.3 QUALITY ASSURANCE

- A. All installation work for the new exterior telecommunications pathways shall be performed in a neat and workmanlike manner.
- B. Equipment and materials shall be of the quality and manufacturer indicated. The equipment specified is based on the acceptable manufacturers listed. Where "approved equal" is stated, equipment shall be equivalent in every way to that of

the equipment specified and subject to approval based on submittals provided.

- C. Materials and work specified herein shall comply with the applicable requirements of:
 - 1. ANSI/NFPA 70 National Electrical Code
 - 2. IEEE/NESC National Electrical Safety Code
 - 3. NEMA Standards including, but not limited to:
 - a. NEMA, RN1, PVC Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit
 - b. NEMA, TC3, PVC Fittings for use with Rigid PVC Conduit and Tubing
 - c. NEMA, TC6, PVC and ABS Plastic Utilities Duct for Underground Installation
 - d. NEMA, TC8, Extra Strength PVC Plastic Utilities Duct for Underground Installation
 - e. NEMA, TC9, Fitting for ABS and OVC Plastic Utilities Duct and Fittings for Underground Installation
 - f. NEMA, TC10, PVC and ABS Plastic Communications Duct and Fittings for Underground Installation
 - 4. UL Standards including, but not limited to:
 - a. UL 6, Rigid Metal Electrical Conduit
 - b. UL 651 Schedule 40 and 80 PVC Conduit
 - 5. ANSI-C80.2, Specification for Rigid Steel Conduit, Enameled
- D. For horizontal directional drilling, the Contractor shall follow all procedural precautions necessary to ensure that the essential aspects of proper directional bore installation are adequately controlled.
- E. Personnel for horizontal directional drilling shall be fully trained in their respective duties as part of the directional drilling crew and in safety.
- 1.4 SUBMITTALS
 - A. Product Data: For each type of product indicated.
 - B. As-built drawings: per Division 1 requirements.

PART 2 – PRODUCTS

- 2.1 TRENCH/BACKFILL MATERIALS
 - A. Trenching and Excavation Backfill: Select fill materials as specified in P-152.
 - B. Asphalt Pavement: Select asphaltic paving materials as specified in P-405.
 - C. Concrete Pavement: Select concrete paving materials as specified in P-505.
- 2.2 CONDUIT SYSTEM

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- A. Non-Metallic Conduit shall be Sch 40 PVC per Section 270528.
- B. Metallic Conduit shall be EMT per Section 270528.
- C. Conduit Joint Couplings:
 - 1. PVC non-metallic fittings must be installed with solvent applied couplings.
 - 2. An approved transition coupling shall be used to connect metal to plastic (PVC) conduits.
 - 3. Couplings may be threaded and/or glued to provide watertight seal at conduit junctions.
- D. Test mandrel shall be 1/4" smaller than inside conduit diameter and not less than 12 inches long.
- E. Core Drill Seals for Outside Building Walls: Link-Seal waterproof assembly or Approved Equal.
- F. Spacers for 4" Conduit: Carlon (Intermediate Spacer and Base Spacer), or Approved Equal.
- G. Handholes and Manholes: per Section 270543

2.3 HORIZONTAL DIRECTIONAL DRILLING EQUIPMENT

- A. The horizontal directional drilling equipment shall consist of a directional drilling rig of sufficient capacity to perform the bore, a guidance system to accurately guide boring operations, and trained and competent personnel to operate the system.
- B. All equipment shall be in good, safe operating condition with sufficient supplies, materials and spare parts on hand to maintain the system in good working order for the duration of this project.
- C. The directional drilling machine shall consist of a hydraulically powered system to drill into the ground at a variable angle.
 - 1. The machine shall be anchored to the ground to withstand the pulling, pushing and rotating pressure required to complete the boring.
 - 2. The hydraulic power system shall be self-contained with sufficient pressure and volume to power drilling operations.
 - 3. The hydraulic system shall be free of leaks.
 - 4. The drill head shall be steerable by changing it's rotation and shall provide the necessary cutting surfaces and drilling fluid jets.

- D. The Guidance System shall be of a proven type and shall be set up and operated by personnel trained and experienced with this system.
 - 1. The Operator shall be aware of any magnetic anomalies and shall consider such influences in the operation of the guidance system if using a magnetic system.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Examine areas and conditions under which the new exterior telecommunications pathways are to be installed. Provide notification, in writing, of conditions detrimental to proper completion of the work.
- B. Verify field measurements and pathway routing conditions are as shown on drawings. Provide notification, in writing, of conditions deviating from drawings.
- C. Beginning of telecommunications pathway installation indicates Contractor acceptance of existing conditions.

3.2 CONDUIT SYSTEM PLACEMENT (GENERAL)

- A. Trench, conduit, and manhole details are shown on the Plans.
- B. Place new conduit system including handholes and manholes as shown on the project drawings. No pathway shall have more than 180 degrees (total) of bends between structures.
- C. Twelve (12) inch clearance from all existing utilities shall be maintained if at all possible. Telecommunication conduit ducts shall be installed below gas piping wherever possible.
- D. All conduits shall be thoroughly cleaned before laying or using.
- E. During construction the ends of the conduits shall be plugged to prevent water washing mud into the conduits, manholes, or buildings. Particular care shall be taken to keep the conduits clean of concrete, dirt, or any other substance during the course of construction.
- F. Unless otherwise noted on drawings, a minimum two foot (24") depth of cover is required above the top of all conduits.
- G. Transition to EMT conduit five feet (5') from building outside wall penetrations.

- H. All conduit bends are to be minimum 4' radius or larger as noted on drawings.
- I. Provide plastic conduit bell ends at each PVC conduit termination and for all conduit entering manholes.
- J. The new conduit shall extend through the wall into the building, tunnel, or crawl space a minimum of 4 inches.
- K. Building, tunnel, and manhole coredrills must be sealed around conduits with UCB approved waterproof plugging compound.
 - a. Seal openings around conduits that pass through inside building wall coredrills with UL listed foamed silicon elastomer compound.
 - b. Seal openings around conduits that pass through outside building walls with a complete Link-Seal assembly or equal for a waterproof seal. Slope conduit away from building.
 - c. Seal openings around conduits that pass through manhole walls with foundation foam on the interior of the core and silicone sealer on the inside and outside of the core for a waterproof seal.
- L. Handholes shall be placed with the long dimension in line with the conduit run. The conduit shall enter opposite ends of the handhole on the short sides so that the handhole shall not be used as a 90 degree bend in cable installations.
- M. All conduits entering bottom of handhole shall be flush with the inside wall. Dirt shall be removed 6" below the bottom of conduits entering the handhole and pea-gravel shall be placed on the bottom to help water dissipate.
- N. After conduit duct installation has been completed and concrete has set, pull test mandrel through all new conduit ducts to verify duct integrity and insure smooth interior surfaces free from burrs or obstructions that might damage cable sheaths. Following mandrel testing, draw cylindrical wire brush with stiff bristles through each conduit to clean the conduit and remove any concrete, dirt or other obstructions.
- O. Stub out conduits into cabinets only enough to attach connector and bushings with grounding lugs except conduits shall rise a minimum of two (2) inches above the finished floor.
- P. Install new pull rope in all new conduit and extending three feet into each building space.
- Q. Plug ends of the new conduit with watertight rubber conduit plugs, conduit caulking compound, or conduit caps to ensure foreign matter does not enter the buildings.

3.3 CONDUIT SYSTEM PLACEMENT (TRENCHING AND BACKFILL)

- A. Perform all trenching and backfill for new underground conduit system placement as shown on the Plans.
- B. Perform pavement removal and replacement as specified in P-505 and Section 033053. New and reopened trenches under asphalt roadways and parking lots must have a concrete cap or be encased in concrete.
- C. Perform trenching, backfilling, and compaction as specified in P-152.
- D. All utilities to be located by contractor and exposed, if necessary, prior to construction.
- E. Support multiple conduits on preformed nonmetallic separators to provide not less than 1" spacing between exterior surfaces of conduit. Spacing between separators shall be close enough to prevent sagging of conduits or breaking of couplings and watertight seals.
- F. Conduits shall be securely anchored in place with nylon tie-downs to prevent movement during the placement of concrete slurry (flow fill) and other backfill materials. Wire tie-downs are prohibited.
- G. Seal all conduit junctions and fittings watertight prior to pour of concrete slurry (flow fill). Conduit couplings shall be made in accordance with the manufacturer's recommendation for the particular type of conduit and coupling selected.

3.4 CONDUIT SYSTEM PLACEMENT (HORIZONTAL DIRECTIONAL DRILLING)

- A. The Engineer shall be notified 48 hours in advance of starting horizontal directional drilling work. The directional drilling shall not begin until the Engineer has inspected the proposed run and agrees that proper preparations for the operation have been made.
- B. No work shall commence until required traffic maintenance systems are in place as required by the Marylad State Highway Authority specifications.
- C. Site Preparation:
 - 1. Prior to any alterations to work site, the entry and exit points shall be marked for each bore.
 - 2. No alterations to the work site beyond what is required for operations shall be made.
 - 3. All activities shall be confined to designated work areas. Locate all bore and receiving pits within existing road right-of-way.
- D. Drill Path Survey:
 - 1. The entire drill path shall be accurately surveyed with entry and exit stakes placed in

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Technical Specifications Exterior Communications Pathways the appropriate locations within the areas indicated on drawings.

- 2. If a magnetic guidance system is being used, the drill path will be surveyed for any surface geomagnetic variations or anomalies.
- E. All applicable environmental regulations shall be adhered to.
- F. Following drilling operations, the equipment will be de-mobilized and the worksite restored to its original condition. All excavations will be backfilled and compacted to 95% of original density. Placement of topsoil and seeding shall be per T-901 and T-903. Perform pavement removal and replacement as specified in P-505 and Section 033053. New and reopened trenches under asphalt roadways and parking lots must have a concrete cap or be encased in concrete.

3.5 SAFETY

- A. All applicable state, federal and local safety regulations, including OSHA regulations regarding confined space entry, shall be adhered to and all operations shall be conducted in a safe manner.
- B. When covers of manholes, handholes, or vaults are removed, the opening shall be promptly protected with a barrier, temporary cover, or other suitable guard. Structures in the AOA shall not remain open over-night.
- C. All landside construction areas shall be fenced off during when construction is not active.

END OF SECTION 271900

APPENDIX E

SURVEY CONTROL MANUALS





MARTIN STATE AIRPORT SURVEY CONTROL MANUAL







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.


NAME OF STATION:	MTN-1	DATE EST	ABLISHED: Aug	ust 2005
ARYLAND STATE P	LANE COORDINATES (NAD 83):		·····
NORTHIN	G (Y):	601566.555	5 US ft.	183357.853 m
EASTING	(X):	1479508.946	9 US ft.	450955.229 m
ORTHOM	ETRIC HEIGHT (NAVD 8	(8): 7.7	2 US ft.	2.353 m
CONVER	GENCE ANGLE:		0°22'15.1"	
SCALE F	ACTOR:		0.99997943	
COMBINE	D SCALE FACTOR:		0.99998425	
	DINATES (NAD 83):	0010101 0401011 (NI)		
	J	9 19 01.04312 (N)		
LUNGITU		0 24 32.83307" (VV)	00.074	
ELLIPSOI		-100.628 US π.	-30.671 m	
VAILABLE CONVEN	TIONAL BACKSIGHT P	OINTS (FIELD DATA):		· · · · · · · · · · · · · · · · · · ·
POINT	AZIMUT	H DISTA	NCE (US FT.)	DISTANCE (m)
MTN A	51° 15' 5	0"	1027.33	313.131
	311° 19' 5	5"	1601 77	488 220

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.





NAME OF STATION: MTN-2 DATE ESTABLISHED: August 2005 MARYLAND STATE PLANE COORDINATES (NAD 83): 002624.3733 US ft. 183680.276 m MARYLAND STATE PLANE COORDINATES (NAD 83): 1478308.2055 US ft. 450886.633 m ORTHOMETRIC HEIGHT (NAVD 88): 10.39 US ft. 3167 m CONVERGENCE ANGLE: 0.99997633 0.99996451 GEOGRAPHIC COORDINATES (NAD 83): 0.752445 05001° (W) 0.99996451 LONGTUDE: 76*24460 05001° (W) 10171 0517473° (N) LONGTUDE: 76*24460 05001° (W) 10171 0517488 224 MIN-1 131*16*55° 1001.78 97.95 US ft. MIN-3 301*42*27° 1027.94 913.317 STATION DESCRIPTION: To reach me noncear 8th Point proceed NB paint filter work to the filte brown or		TIN STATE	AIRPORT	<u>(MTN) - SU</u>	RVEY CO	NTROL DAT	A
MARYLAND STATE PLANE COORDINATES (NAD 83): 602524.3733 US ft. 183680.276 m MARYLAND STATE PLANE COORDINATES (NAVD 88): 1/178306.2055 US ft. 450088.633 m ORTHOMETRIC HEIGHT (NAVD 88): 10.39 US ft. 3187 m CONVERGENCE ANGLE: 0.99997833 SCALE FACTOR: 0.99997833 COMBINED SCALE FACTOR: 0.99997833 GEOGRAPHIC COORDINATES (NAD 83): 1.37473" (N) LINITUDE: 38"19"11.57473" (N) LINITUDE: 79.79 US ft. -29.864 m	NAME OF STATION:	MTN-2		DATE ES	TABLISHED:	August 2005	
GEOGRAPHIC COORDINATES (NAD 83): LATITUDE: 39°19'11.57473° (N) LONGITUDE: 75°2448.05001° (W) ELLIPSOID HT: -97.95 US ft29.854 m AVAILABLE CONVENTIONAL BACKSIGHT POINTS (FIELD DATA): <u>POINT A2100UTH DISTANCE (US FL) DISTANCE (m)</u> MTN-1 131° 19'55' 1601.78 498.224 MTN-5 301° 42' 27' 1027.94 313.317 STATION DESCRIPTION: To reach the monument from the telfle circle at MTN aippot in front of the alt traffic control lower, proceed 5 to Atride Access point by Hargers 4-6. Passing through the fonce proceed NE to the second Stop sign. Turn right and proceed 5E past indications harging: Case with monument from the traffic circle at MTN aippot in front of the alt traffic control lower, proceed 5 to Atride Access point by Hargers 4-6. Point Read. Proceed 1874 feet (0.35 m.). Continue past the pump house and water tank to a gravelymes baine and the stellor on the right. Monume Point Read. Proceed 1874 feet (0.35 m.). Continue past the pump house and water tank to a gravelymes baine and the stellor on the right. Monume Point Read. Proceed 1874 feet (0.35 m.). Continue past the pump house and water tank to a gravelymes baine and the stellor on the right. Monume Point Read. Proceed 1874 feet (0.35 m.). Continue past the pump house and water tank to a gravelymes your of the above ground 5 E of punch mark in southerm gate post, 44.22 S of communications manhole in grassignevel drive, 75.27 SW of nail and shiner in pole with no number.	MARYLAND STATE PL/ NORTHING EASTING () ORTHOME CONVERGE SCALE FAC COMBINED	ANE COORDINAT (Y): (RIC HEIGHT (NA ENCE ANGLE: CTOR: SCALE FACTOR	TES (NAD 83): .VD 88): ::	602624.373 1478306.209 10.3	33 US ft. 55 US ft. 39 US ft. 0°22'05.5" 0.99997983 0.99998451	183 450	680.276 m 588.633 m 3.167 m
AVAILABLE CONVENTIONAL BACKSIGHT POINTS (FIELD DATA): POINT A22MUITH DISTANCE (US.ET.) DISTANCE (m) MTN-1 131 ⁴ 191 55' 1601.78 488.224 MTN-5 301 ⁴ 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 5 to Airside Access point by Hangars 4-6. North. At the intersection of TL.B and TL.G. turn right and proceed SE to airside more and will curve to the left, be North. At the intersection of TL.B and TL.G. turn right and proceed SE to Airside Access point by Hangars 4-6. Point Read. Proceed 1876 feet (0.5) mL. Continue past the pump house and weak proceed SE to Sinside Access point by Hangars 4-6. Point Read. Proceed 1876 feet (0.5) mL. Continue past the pump house and weak proceed SE to Sinside Access point by Hangars 4-6. Point Read. Proceed 1876 feet (0.5) mL. Continue past the pump house and weak proceed SE to Sinside Access point by Hangars 4-6. Description of TL.B and TL.G. turn right and proceed SE to Yield sign. Continue to Stop sign at Strawberry Point Read. Turn left on Straw North. Atte intersection of TL.B and TL.G. turn right and proceed SE to Yield sign. Continue to Stop sign at Strawberry Point Read. Turn left on Straw North. Atte intersection of TL.B and TL.G. turn right and proceed SE to Yield sign. Continue to Stop sign at Strawberry Point Read. Turn left and the souther sign at the pump interview of the one proceed for the feet (0.5) mL. Strawberry Point Read. Turn left and proceed SE to Strawberry Point Read. Turn left and proceed SE to Strawberry Point Read. Turn left and proceed SE to Strawberry Point Read. Turn left and the souther grave of the strawberry Point Read. Turn left and the souther size of the souther sis of the souther size of the souther size of t	GEOGRAPHIC COORDI LATITUDE: LONGITUDI ELLIPSOID	NATES (NAD 83) E: HT:	: 39°19'11.57 76°24'48.05 -9	473" (N) 001" (W) 7.95 US ft.	-29.854	· m	
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. In 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 Straw bork 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 Straw bork A22.06'SW of SW dege of Strawberry Point Road, 74.3'N of Santary Sewer manhole 1'above ground, 99.41'N of water valve 1'above ground, 6 E of punch mark in southern gate post, 44.22'S of communications manhole in gress/gravel drive, 76.27'SW of nail and shiner in pole with no number.	AVAILABLE CONVENTI POINT MTN-1 MTN-5	ONAL BACKSIG AZI 131° 301°	ht points (fi <u>muth</u> 19' 55" 42' 27"	ELD DATA): DISTA	ANCE (US FT.) 1601.78 1027.94	DISTAN	<mark>VCE (m)</mark> 488.224 313.317
HINER POLE NO HINER POLE NO HI	STATION DESCRIPTION To reach the monument from ti passing through the fence, pro North. At the intersection of T/L Point Road. Proceed 1874 fee located 29.06' SW of SW edge E of punch mark in southern ga	N: he traffic circle at MTN ceed NE to the secon B and T/L G, turn righ t (0.35 mi.). Continue of Strawberry Point Rc te post 44.22' S of co	I airport in front of d Stop sign. Turn r it and proceed SE t past the pump hou pad, 74.3' N of Sani	the air traffic contro ight and proceed S o Yield sign. Contir se and water tank tary Sewer manholo	bl tower, proceed S E past private pla nue to Stop sign at to a gravel/grass l e 1' above ground,	S to Airside Access p ne hangars. Road wil Strawberry Point Roa lane and the station o 99.41' N of water valu	oint by Hangars 4-6. Af I curve to the left, beari ad. Turn left on Strawbe on the right. Monument ve 1' above ground, 69.9
HINER POLE NO # "UNOd AUUBUNCH GRASS/ GRAVEL MSA ENT, COMM. HIN POST GRAVEL MSA ENT, COMM. HIN POST GRAVEL MSA ENT, COMM. HIN POST GRAVEL MSA ENT, COMM.			mmunications man	nole in grass/gravel	l drive, 75.27' SW c	of nail and shiner in po	ole with no number.
I H I NUT TO SCALE			mmunications man	TO SHA MAINT. SHOP	drive, 75.27' SW d	of nail and shiner in po	I' ABOVE GROUND



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MARTIN STA	TE AIRPORT	(MTN) - SUI	RVEY CONTR	ROL DATA
NAME OF STATION: MTN-3		DATE EST	ABLISHED: Aug	ust 2005
MARYLAND STATE PLANE COORI NORTHING (Y): EASTING (X): ORTHOMETRIC HEIGH CONVERGENCE ANGL SCALE FACTOR: COMBINED SCALE FA	DINATES (NAD 83): IT (NAVD 88): .E: CTOR:	603710.173 1475839.594 14.3	3 US ft. 6 US ft. 0 US ft. 0°21'45.9" 0.99998024 0.99998473	184011.229 m 449836.808 m 4.359 m
GEOGRAPHIC COORDINATES (NA LATITUDE: LONGITUDE: ELLIPSOID HT:	D 83): 39°19'22.46 76°25'19.34 -93	174" (N) 850" (W) 9.995 US ft.	-28.650 m	
AVAILABLE CONVENTIONAL BAC POINT MTN-4	KSIGHT POINTS (FI AZIMUTH 18° 54' 10"	ELD DATA): DISTA	NCE (US FT.) 2272.00	DISTANCE (m) 692.507
STATION DESCRIPTION: To reach the monument from the traffic circle passing through the fence, proceed NE to the station is on the left between aircraft tiedowns. set in solid yellow line at center of taxiway, 77 taxiway on same line, 100.55' NW of MAG Nai	at MTN airport in front of second Stop sign. Turn rig Monument is 292.71' NE 7.21' N of MAG Nail set in I set in solid yellow line at i	the air traffic control ht and proceed SE p of punch mark in wes solid yellow line at center of taxiway.	tower, proceed S to Ai past private plane hanga stern gate post to MD 58 center of taxiway in line	rside Access point by Hangars 4-6. Afters. Where the road curves to the left, th rs. Where the road curves to the left, th r7, 105.35' NE of MAG Nail on same line with Hanger #88, 35.74' N of N edge of MIDDLE RIVER VOL. FIRE CO.
STATIS			MD 587 PINE TREES HANGARS #88 NOT TO	CATE PUNCH IN POST PINE TREES
ATH-3		And Participation of the second secon	13.70° T1.21° (T0 TAL)	A.49' YELLOW LINE CRASS TIE-DOWN AREA TIN-3 C. MON.
	EEDING	<u></u>		



MARTIN STATE AIRPORT (MTN) - SURVEY CONTROL DATA				
NAME OF STATION: MTN-4		DATE EST	TABLISHED: Aug	just 2005
MARYLAND STATE PLANE COO	ORDINATES (NAD	83):		
NORTHING (Y):		605859.591	8 US ft.	184666.373 m
EASTING (X):		1476575.620	0 US ft.	450061.149 m
ORTHOMETRIC HEI	GHT (NAVD 88):	16.8	97 US ft.	5.142 m
CONVERGENCE AN	GLE:		0°21'51.9"	
SCALE FACTOR:			0.99998104	
COMBINED SCALE	FACTOR:		0.99998542	
CEOCRAPHIC COORDINATES (
GEOGRAPHIC COURDINATES (NAU 83):	10.050001 (N)		
	39-19-	43.65932" (N)		
	/0-250	U9.80871" (VV)	0 7 000	
ELLIPSOID HT:		-91.422 US π.	-27.865 m	
AVAILABLE CONVENTIONAL B	ACKSIGHT POINT	S (FIELD DATA)		····
POINT	AZIMUTH	DISTA	NCE (US ET)	DISTANCE (m)
MTN B	318° 58' 21"	<u></u>	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.





MARTIN STATE AIRPORT (MTN) - SURVEY CONTROL DATA				
NAME OF STATION: MTN-5		DATE ESTA	BLISHED: Aug	ust 2005
MADYLAND OTATE DLANE OCODE			·····	
MARYLAND STATE PLANE COURL	DINATES (NAD 83):			
NORTHING (Y):		603164.6275	JS ft.	183844.946 m
EASTING (X):		1477431.7132 เ	JS ft.	450322.087 m
ORTHOMETRIC HEIGH	T (NAVD 88)	5.92 (JS ft.	1.804 m
CONVERGENCE ANGL	E:		0°21'58.6"	
SCALE FACTOR:		(0.99998003	
COMBINED SCALE FAC	CTOR:	(0.99998493	
GEOGRAPHIC COORDINATES (NA	D 83):			
LATITUDE:	39°19'16.96	973" (N)		
LONGITUDE:	76°24'59.13	338" (W)		
ELLIPSOID HT:	-102	2.401 US ft.	-31.212 m	
AVAILABLE CONVENTIONAL BACI	KSIGHT POINTS (FI	ELD DATA):		
POINT	AZIMUTH	DISTANC	;E (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. 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.









MARTIN STA	TE AIRPORT (N	ITN) - SUR	VEY CON	NTROL DATA
NAME OF STATION: MTN-6		DATE ESTA	ABLISHED:	August 2005
MARYLAND STATE PLANE COORE NORTHING (Y): EASTING (X): ORTHOMETRIC HEIGH CONVERGENCE ANGL SCALE FACTOR: COMBINED SCALE FACT	DINATES (NAD 83): T (NAVD 88) E: CTOP:	604064.3021 1478107.5955 12.90	US ft. US ft. US ft. 0°22'04.0" 0.99998036	184119.168 m 450528.096 m 3.932 m
			0.99990493	
GEOGRAPHIC COORDINATES (NA LATITUDE: LONGITUDE: ELLIPSOID HT:	D 83): 39°19'25.8188 76°24'50.4595 -95.4	27" (N) 88" (W) 27 US ft.	-29.086	m
AVAILABLE CONVENTIONAL BAC POINT MTN A MTN-5 MTN-4 MTN-B	KSIGHT POINTS (FIEL AZIMUTH 130° 06' 04" 216° 54' 57" 319° 31' 29" 319° 21' 07"	D DATA): DISTAN	CE (US FT.) 2879.72 1125.29 2360.15 3436.89	DISTANCE (m) 877.740 342.989 719.375 1047.566
STATION DESCRIPTION: To reach the monument from the traffic circle passing through the fence, proceed NE to the North. At the intersection of T/L B and T/L G, tt Point Road. Continue to the pump house and Taxiway F and the station on the right. Station Monument is 123.36' W of taxiway light #35, 10 S of S end 6" solid yellow line on Taxiway 'J'.	at MTN airport in front of the second Stop sign. Turn righ rrn right and proceed SE to N water tank on the left. Turn is near the intersection of T 11.54' NE of center of electric	a air traffic control t t and proceed SE (ield sign. Continue left into gravel lane axiway F, Taxiway manhole 0.5' abov	ower, proceed S past private plan to Stop sign at Park at pump i J, and the entra re ground, 32.76	to Airside Access point by Hangars 4-6. After le hangars. Road will curve to the left, bearing Strawberry Point Road. Turn left on Strawberry house. Walk along fence and wetlands area to ance road to Lockheed Martin's hangar/facility 'SE of ground way light with no number, 31.33
*Monument is outside the APRL. this monument by way of Taxiway airport tower permission.	Access to 'F" requires			GRASS ROT
STATE		TO RUNWAY	TAXIWAY 'F' (FOXTROT)	MTN-6 50' CONC. MON. 101,54' BLUE LIGHT UTAXIWAY 'J' (JULIET) TO LOCKHEED MARTIN HANGAR 6" SOLID YELLOW LINE 6" DASHED YELLOW LINE
SURVEYED BY: JMT ENGIN	EERING	5		SPARKS, MARYLAND



MARTIN STA	TE AIRPORT	(MTN) - SURVEY CO	ONTROL DA	TA
NAME OF STATION: MTN-7	······································	DATE ESTABLISHED	: August 2005	
MARYLAND STATE PLANE COORD NORTHING (Y): EASTING (X): ORTHOMETRIC HEIGHT CONVERGENCE ANGLE SCALE FACTOR: COMBINED SCALE FAC	NATES (NAD 83): (NAVD 88): :: TOR:	US ft. US ft. US ft. US ft.		m m m
GEOGRAPHIC COORDINATES (NAD	83):			
LATITUDE:		(N)		
ELUPSOID HT:		(W) US ff	m	
		00 11.	111	
	SIGHT POINTS (FI	ELD DATA):		
POINT	AZIMUTH	DISTANCE (US F	<u>.) DISTA</u>	ANCE (m)
STATION DESCRIPTION:				
*SHALL NOT BE OCCUPIED FOR THIS POINT IS INTENDED FOR F RUNWAY CENTERLIN	SURVEY CONTRO RECOVERY OF THE IE ONLY	L. :		
AT THE 33 END OF THE	RUNWAY	XX 6' Chain-Link fence	X	·X
			NOT 1 282-006	O SCALE
		GRASS	MTN-7 CL MON	GRASS
		ONE 455 205E	145.36'	EDGE OF BLACK TOP
	Py To C		216.95 70TAL	Ver 1
1. × a Des				STROBE
MTN-7		CRASS	L RUNWAY	GRAS
AND ARVEY CON		TO TWY T	ŭ	TO TWY F
	Part of the second			
SURVEYED BY: JMT ENGINE	ERING		S	PARKS, MARYLAN

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NAME OF STATION: MARTAIR AZ MK DATE ESTABLISHED: 1985 NGS PID: JV6476 607285.0956 US ft. 185100.8676 m MARYLAND STATE PLANE COORDINATES (NAD 83): 607285.0956 US ft. 185100.8676 m MARYLAND STATE PLANE COORDINATES (NAD 83): 1074311.9473 US ft. 449371.18 m ORTHOMETRIC HEIGHT (NAVD 88): 20.71 US ft. 6.311 m CONVERGENCE ANGLE: 0'2113.9" 6.311 m CONVERGENCE ANGLE: 0'2113.9" 6.311 m COMBINED SCALE FACTOR: 0.99998159 0'2413.9" COMBINED SCALE FACTOR: 0.99998578 0.99998578 GEOGRAPHIC COORDINATES (NAD 83): 14743113 HT. -26.681 m LATITUDE: 39 19 57.88957 (N) 10001 HT: -26.681 m AVAILABLE CONVENTIONAL BACKSIGHT POINTS (FIELD DATA): POINT AZIMUTH DISTANCE (US FT.) DISTANCE (m) MTN B 1111'29'52" 1673.275 510.015 NTN-4 MTN A 122''12'00" 2675.150 815.387 STATION DESCRIPTION: SEE NGS DATASHEETS ATTACHED HORZ ORDER - B VERT ORDER - FLURD	MARTIN STAT	E AIRPORT (M	TN) - SURVEY CONTR		
NOS FUD. JUBARDO MARVLAND STATE PLANE COORDINATES (NAD 83): 07285.0956 US ft. 185100.8676 m MARVLAND STATE PLANE COORDINATES (NAD 83): 1474311.9473 US ft. 449371.18 m ORTHOMETRIC HEIGHT (NAVD 88): 20.71 US ft. 449371.18 m ORTHOMETRIC HEIGHT (NAVD 88): 10.71 US ft. 449371.18 m ORTHOMETRIC HEIGHT (NAVD 88): 20.71 US ft. 6.311 m CONVERGENCE ANGLE: 0.29998159 0.39998578 GEOGRAPHIC COORDINATES (NAD 83): 117101E: 39 19 57.88957 (N) LONGTUDE: 072 55 38.50226 (W) 10.00000000000000000000000000000000000	NAME OF STATION: MARTAIR AZ	MK	DATE ESTABLISHED:	1985	
NORTHING (V): 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: 0.2173.3.9" 6.311 m CONVERGENCE ANGLE: 0.99998159 6.311 m 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. LONGTUDE: 076 25 38.50226 (W) ELLIPSOID HT: -87.54 US ft. -26.681 m AVAILABLE CONVENTIONAL BACKSIGHT POINTS (FIELD DATA): DISTANCE (m) MTN E 11171 '29' 52" 1673.275 510.015 MTN B 111' 29' 52" 1673.275 510.015 815.387 STATION DESCRIPTION: <td ac<="" account="" and="" column="" th=""><th></th><th></th><th></th><th></th></td>	<th></th> <th></th> <th></th> <th></th>				
GEOGRAPHIC COORDINATES (NAD 83): LATITUDE: 39 19 57.88957 (N) LONGITUDE: 076 25 38.50226 (W) ELLIPSOID HT: -87.54 US ft26.681 m AVAILABLE CONVENTIONAL BACKSIGHT POINTS (FIELD DATA): POINT AZIMUTH DISTANCE (US FL.) 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 - FOURTH CLASS II	NORTHING (Y): EASTING (X): ORTHOMETRIC HEIGHT CONVERGENCE ANGLE SCALE FACTOR: COMBINED SCALE FAC	(NAVD 88): : TOR:	607285.0956 US ft. 1474311.9473 US ft. 20.71 US ft. 0°21'33.9" 0.99998159 0.99998578	185100.8676 m 449371.18 m 6.311 m	
LATTUDE: 39 19 57.88957 (N) LONGITUDE: 076 25 38.50226 (W) ELLIPSOID HT: -87.54 US ft26.681 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 - B VERT ORDER - FOURTH CLASS II	GEOGRAPHIC COORDINATES (NAD	83):			
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	LATITUDE: LONGITUDE: ELLIPSOID HT:	39 19 57.8895 076 25 38.5022 -87.5	7 (N) 6 (W) 4 US ft26.681 m		
POINT AZIMUTH DISTANCE (US.F.T.) DISTANCE (m) MTN B 111° 29' 52" 1673.275 510.015 MTN-4 122° 12' 00" 2675.150 815.387	AVAILABLE CONVENTIONAL BACK	SIGHT POINTS (FIELD	D DATA):		
STATION DESCRIPTION: SEE NGS DATASHEETS ATTACHED HORZ ORDER - B VERT ORDER - THIRD ELLP ORDER - FOURTH CLASS II	POINT MTN B MTN-4	AZIMUTH 111° 29' 52" 122° 12' 00"	DISTANCE (US FT.) 1673.275 2675.150	DISTANCE (m) 510.015 815.387	
HORZ ORDER - B VERT ORDER - THIRD ELLP ORDER - FOURTH CLASS II	STATION DESCRIPTION				
SEE NGS DATASHEETS ATTACHED HORZ ORDER - B VERT ORDER - THIRD ELLP ORDER - FOURTH CLASS II	STATION DESCRIPTION:				
HORZ ORDER - B VERT ORDER - THIRD ELLP ORDER - FOURTH CLASS II	SEE NGS DA	TASHEETS ATTACHE	ED		
1985 DEFECTORIES	HORZ ORDER - B VERT ORDER - THIRD ELLP ORDER - FOURTH CLASS II				
SURVEYED BY: JMT ENGINEERING SPARKS, MARYLAN	SURVEYED BY: JMT ENGINE	ERING		SPARKS, MARYLAND	

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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 Units Scale Factor Converg. East

- 185,100.867 449,371.180 MT 0.99998159 +0 21 33.9 JV6476:SPC MD 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 $-1.00000418 \times 0.99998159 = 0.99998577$ - 1.00000418 x 0.99978633 = 0.99979051 JV6476!UTM 18 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 | JV6476I JV6144 MARTAIR 496.478 METERS 1115428.7 | JV6476|----------| JV6476 JV6476 SUPERSEDED SURVEY CONTROL JV6476 JV6476 ELLIP H (03/24/98) -26.61 (m) GP()41 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()11 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()41 JV6476 NAD 83(1986)- 39 19 57.88372(N) 076 25 38.51118(W) AD()1 - 39 19 57.49393(N) 076 25 39.65548(W) AD(JV6476 NAD 27) 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

M	ARTIN STATE AIRPO	RT (MTN) - SUR	VEY CONT	ROL DATA
NAME OF STATION	MTN A	DATE ESTA	BLISHED:	1989
NGS PID:	AA9279			
MARYLAND STATE NORTHI EASTIN ORTHO CONVEI SCALE COMBIN	PLANE COORDINATES (NAE NG (Y): G (X): METRIC HEIGHT (NAVD 88): RGENCE ANGLE: FACTOR: IED SCALE FACTOR:	0 83): 602209.3862 1480310.2956 5.4	US ft. US ft. US ft. 0°22'21.5" 0.99997967 0.99998459	183553.788 m 451199.481 m 1.64 m
GEOGRAPHIC COO	RDINATES (NAD 83):	<u> </u>		
LATITUI LONGIT ELLIPS(DE: 39 19 UDE: 076 24 DID HT:	9 07.34515 (N) 4 22.58368 (W) -102.92 US ft.	`-31.370 m	
AVAILABLE CONVE	NTIONAL BACKSIGHT POINT	TS (FIELD DATA):		
POIN MTN I MTN MTN MTN	AZIMUTH 3 315° 08' 07" 3 310° 06' 04" 4 314° 20' 41" 1 231° 15' 50"	DISTAN	CE (US FT.) 6296.22 2879.73 5222.33 1027.35	DISTANCE (m) 1919.092 877.743 1591.769 313.137
STATION DESCRIPT			<u> </u>	
	SEE NGS DATASHEETS A	ATTACHED		
HORZ ORDER - FIRS ELLP ORDER - FOU	ST RTH CLASS II			
FOR MUSIC	OR TO REPART	A REAL PROPERTY OF A REAL PROPER		
	A PARTICIPAL PROPERTY AND A PARTICIPAL PROPE	2 40 1 V 10 10		

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 - 4,353,087.565 378,774.082 MT 0.99978094 -0 53 28.2 AA9279:UTM 18 AA9279

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AA9279! Elev Factor x Scale Factor = Combined Factor AA9279!SPC MD $-1.00000492 \times 0.99997967 = 0.99998459$ $- 1.00000492 \times 0.99978094 = 0.99978586$ AA9279!UTM 18 AA9279 AA9279 SUPERSEDED SURVEY CONTROL AA9279 AA9279 ELLIP H (04/02/98) -31.31 (m) GP()42 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 STA	TE AIRPORT	(MTN) - SURVEY CONT	ROL DATA
NAME OF STATI	ION: MTN B		DATE ESTABLISHED:	1998
NGS PID: MARYI AND STA		INATES (NAD 83)		
NOR EAS ORT CON SCA CON	ATHING (Y): TING (X): THOMETRIC HEIGHT IVERGENCE ANGLI LE FACTOR: MBINED SCALE FAC	(NAVD 88): E: CTOR:	606671.9075 US ft. 1475868.8004 US ft. 16.8 US ft. 0°21'46.3" 0.99998135 0.99998573	184913.9672 m 449845.7101 m 5.12 m
GEOGRAPHIC C	OORDINATES (NA	D 83):	A	
LAT LON ELLI	ITUDE: IGITUDE: IPSOID HT:	39 19 51.73 076 25 18.73 91-	3216 (N) 3818 (W) .417 US ft27.864 m	
AVAILABLE COI	NVENTIONAL BACK	SIGHT POINTS (FI	ELD DATA):	
Pé Mar MTN MTN MTN	0INT RTAIR AZ MK I-4 I-6 I A	AZIMUTH 291° 29' 52" 138° 58' 21" 139° 21' 07" 135° 08' 07"	DISTANCE (US FT.) 1673.30 1076.79 3436.91 6296.23	DISTANCE (m) 510.023 328.206 1047.572 1919.095
STATION DESCI	RIPTION:			
	SEE NGS D	ATASHEETS ATTAC	CHED	
HORZ ORDER - I ELLP ORDER - F	FIRST OURTH CLASS I			
	MTN AD MTN A 1998 ARYLAN			

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DATASHEETS

1 National Geodetic Survey, Retrieval Date = NOVEMBER 8, 2005 ************* AI4374 SACS This is a Secondary Airport Control Station. AI4374 DESIGNATION - MTN B AI4374 PID - Al4374 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 Al4374. The horizontal coordinates were established by GPS observations Al4374.and adjusted by the National Geodetic Survey in March 2000. AI4374 Al4374. 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 Al4374.not indicate centimeter accuracy relative to other marks which are AI4374.part of the NAVD 88 network. AI4374 Al4374. The X, Y, and Z were computed from the position and the ellipsoidal ht. AI4374 Al4374. 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 Units Scale Factor Converg. East 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 $-1.00000437 \times 0.99998135 = 0.99998572$ AI4374!UTM 18 $-1.00000437 \times 0.99978491 = 0.99978928$ AI4374 AI4374 SUPERSEDED SURVEY CONTROL AI4374 AI4374 ELLIP H (03/31/00) -27.86 (m) GP()41 AI4374 Al4374.Superseded values are not recommended for survey control. Al4374.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums. Al4374.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







SURVEY CONTROL					
POINT	NORTHING	EASTING	ELEV.		
BWID	553596.51	1407273.55	154.41		
BWI F	548273.30	1407184.15	156.48		
BWIG	553233.77	1404563.51	166.38		
BWIH	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)

RUN CENTI MONU	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.

SEE DESIGN STANDARD FOR REFERENCES, DETAIL NOTES, MONUMENT TYPES, AND "HOW TO REACH"

REPORT DAMAGED OR DESTROYED BWI MONUMENTS TO THE MANAGER OF FACILITIES DESIGN, MARYLAND

REPORT DAMAGED OR DESTROYED NGS MONUMENTS TO NGS VIA THEIR WEB PAGE AT

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

PRIMARY VERTICAL VALUES ON PRIMARY CONTROL ARE BASED ON FIELD SURVEYS PERFORMED BY J. A. RICE

SECONDARY HORIZONTAL AND VERTICAL VALUES ARE BASED ON FIELD SURVEYS PERFORMED BY JOHNSON,

TOPOGRAPHY IS FROM AERIAL SURVEYS SHOWN ON THE AIRPORT LAYOUT PLAN BASE MAP DRAWING.

BWI DO PRIMARY CONTROL STATIONS (NGS 'B' ORDER) 548 SECONDARY CONTROL (NGS 1st ORDER) MAA 400 C DIBIWAY MONTH (DECOVERY ON V

	MAA-100 GP	KUNWAI MUNI	UNENIS (RECOVERTONLI)		
			PROJECT NO.		
JRVEY CO	NTROL SHEET		SHEET NO.		
0'	DATE SEPTEMBER 2	5, 2008			

Immediately report any damaged or destroyed monumentation.

Please notify NGS and the Manager of Facilities Design, Maryland Aviation Administration

BWI THURGOOD MARSHALL AIRPOI	RT-PRIMARY SURVEY CONTROL DATA
NAME OF STATION: BWI D	DATE ESTABLISHED: 1991
NGS PID: AB6219	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	9" (W)
ELLIPSOID HT: 47.1	2 US ft. 14.363 m
AVAILABLE CONVENTIONAL BACKSIGHT POINTS (COME	
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:	
	THE PARTY IN REPORT
SEE ATTACHED NGS DATASHEE	
	1901
LOCATION PLAN	
	DEEDL OBEAL
Martin Ar Hada	
The light is the light	
We want the second second second the	
	GRAL
	CONCRETE
	RAMP N GRASS
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A LANCE CE MALL IN	BWID
RUNWAY 10 CONTROL 1	- 1991
	The GRASS GRASS
Marine Walter Carlo was	
To set aus 22	
MILES X Liter XI (and paces	
SURVEYED BY: JMT ENGINEERING	SPARKS, MARYLAND

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ME OF STATION:	BWID		DATE ESTABL	ISHED: 1991	
S PID:	AB6219			READJUST	ED FEBRUARY 20
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		BWI I), AB6219, 3NE,	300CT2007	
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RVEYED BY:	JMT ENGINEERI	NG			SPARKS, MARY

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35 PID:	ADODIO		DATE ES	ABLISHED: 1	991 545 milet	
	AB6219			R	EADJUSTE	D FEBRUARY 20
1	National Geode	tic Survey,	Retrieval D	ate = JUNE 2	5, 2008	
AB6219	* * * * * * * * * * * * * * *	*******	*****	********	******	* * * * * * * * * * * *
AB6219	SACS -	This is a Sec	ondary Airp	ort Control	Station	
AB6219	DESIGNATION -	BWI D				
AB6219	PID -	AB6219				
AB6219	STATE/COUNTY-	MD/ANNE ARUND	EL			
AB6219	USGS QUAD -	RELAY (1974)				
AB6219						
AB 62 19		*CURP	ENT SURVEY	CONTROL		
AB6219						
AB6219*	NAD 83(2007)-	39 11 10.5380	O(N) 076	39 54.19499	9(W)	ADJUSTED
AB6219*	NAVD 88 -	47.063	(meters)	154.41	(feet)	ADJUSTED
AB6219						
AB6219	EPOCH DATE -	2002.00	1			
AB6219	а –	1,141,753.12	3 (meters)			COMP
AB6219	r —	-4,010,831.11	.4 (meters)			COMP
AB6219		4,008,374.84	o (meters)			
AB6219	EAPLACE CORR-	-5.39	(seconds)	100		DEFLEC99
AB6219	CECIP HEIGHT-	14.36	3 (meters)	(U2	(/10/07)	ADJUSTED
AB6219	GEOID HEIGHI-	-34.67	(meters)	154 00	10	GEOIDU3
AB6219	DIMAMIC HI -	47.03	8 (meters)	154.32	(Ieet)	COMP
AD0219 AD6210) a comme	an Tetinetaa /	on OF* Cand	idaana Taasa		
AD0219	Turne DID	Cy Estimates (at 95% Conr	ldence Level	l in cm)	
AD0219	туре ртр	Designation		NOI	th La:	ac Fritb
AD0419	NETWORK AB6210	BUT D				70 7 10
AB6219	MEIWORK AD0215	- DWI D		. بر 		
AB6219	MODELED GRAV-	980 094 8	(more l)			NAVD 88
AB6219		,	(MATE OO
AB6219	VERT ORDER -	FIRST CLA	SS II			
AB6219			shington Int	'l Airport	(BWI)	
AB6219 AB6219.	This mark is at	: Baltimore-Was	TTTTTGGGGTT TITC		· · · · · · ·	
AB6219 AB6219. AB6219	This mark is at	: Baltimore-Was	mingoon inc	-		
AB6219 AB6219. AB6219 AB6219.	This mark is at The horizontal	: Baltimore-Was coordinates we	re establis	hed by GPS o	bservat	ions
AB6219 AB6219. AB6219 AB6219. AB6219. AB6219.	This mark is at The horizontal and adjusted by	: Baltimore-Was coordinates we ' the National	re establis: Geodetic Su	hed by GPS our	bservat Tuary 20	ions D7.
AB6219 AB6219. AB6219 AB6219. AB6219. AB6219. AB6219	This mark is at The horizontal and adjusted by	: Baltimore-Was coordinates we [,] the National	re establis Geodetic Su	ched by GPS o crvey in Febr	bservat Tuary 20	ions D7.
AB6219 AB6219. AB6219 AB6219. AB6219. AB6219 AB6219 AB6219.	This mark is at The horizontal and adjusted by The datum tag c	: Baltimore-Was coordinates we the National f NAD 83(2007)	re establis Geodetic Su is equival	shed by GPS o rvey in Febr ent to NAD 8	bservat Tuary 200 33 (NSRS2)	ions D7. D07)
AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219.	This mark is at The horizontal and adjusted by The datum tag c See National Re	: Baltimore-Was coordinates we the National f NAD 83(2007) adjustment for	re establis Geodetic Su is equival more infor	whed by GPS of rvey in Febr ent to NAD 6 mation.	bservat tuary 20 33 (NSRS2)	ions 07. 007)
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AB6219 AB6219. AB6219 AB6219. AB6219. AB6219 AB6219. AB6219. AB6219. AB6219.	This mark is at The horizontal and adjusted by The datum tag of See National Re The horizontal The epoch date	: Baltimore-Was coordinates we the National f NAD 83(2007) adjustment for coordinates ar for horizontal	re establis Geodetic Su is equival more infor e valid at control is	whed by GPS of rvey in Febr ent to NAD & mation. the epoch da a decimal e	observat tuary 20 33 (NSRS2) ate disp equivale	ions 07. D07) layed above. nce
AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219	This mark is at The horizontal and adjusted by The datum tag of See National Re The horizontal The epoch date of Year/Month/I	: Baltimore-Was coordinates we the National of NAD 83(2007) adjustment for coordinates ar for horizontal ay.	re establis Geodetic Su is equival more infor e valid at control is	whed by GPS of rvey in Febr ent to NAD 6 mation. the epoch da a decimal 6	bbservat tuary 200 33 (NSRS2) ate disp equivale	ions D7. D07) layed above. nce
AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219	This mark is at The horizontal and adjusted by The datum tag of See National Re The horizontal The epoch date of Year/Month/I	: Baltimore-Was coordinates we the National of NAD 83 (2007) adjustment for coordinates ar for horizontal ay.	re establis Geodetic Su is equival more infor e valid at control is	shed by GPS o rvey in Febr ent to NAD 6 mation. the epoch ds a decimal 6	observat Tuary 200 33 (NSRS2) ate disp equivale	ions D7. D07) layed above. nce
AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219	This mark is at The horizontal and adjusted by The datum tag of See National Re The horizontal The epoch date of Year/Month/I The orthometric	: Baltimore-Was coordinates we the National of NAD 83(2007) adjustment for coordinates ar for horizontal ay. height was de	re establis Geodetic Su is equival more infor valid at control is termined by	shed by GPS of rvey in Febr ent to NAD 8 mation. the epoch ds a decimal a differentia	observat Tuary 200 33 (NSRS2) ate disp equivales al level	ions D7. D07) layed above. nce ing
AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219	This mark is at The horizontal and adjusted by The datum tag of See National Re The horizontal The epoch date of Year/Month/I The orthometric and adjusted in	: Baltimore-Was coordinates we the National of NAD 83(2007) adjustment for coordinates ar for horizontal ay. height was de June 2008.	ere establig Geodetic Su is equival : more infor :e valid at . control is :termined by	shed by GPS of rvey in Febr ent to NAD 8 mation. the epoch ds a decimal a differentia	observat Tuary 200 33 (NSRS2) ate disp equivales al level	ions D7. D07) layed above. nce ing
AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219	This mark is at The horizontal and adjusted by The datum tag of See National Re The horizontal The epoch date of Year/Month/I The orthometric and adjusted in No vertical obs	: Baltimore-Was coordinates we the National of NAD 83(2007) adjustment for coordinates ar for horizontal ay. height was de June 2008.	ere establis Geodetic Su is equival : more infor :e valid at . control is etermined by ck was made	whed by GPS of rvey in Febr ent to NAD & mation. the epoch da a decimal & differentia to the stat	observat Tuary 200 33 (NSRS2) ate disp equivale al level tion.	ions 07. 007) layed above. nce ing
AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219	This mark is at The horizontal and adjusted by The datum tag of See National Re The horizontal The epoch date of Year/Month/I The orthometric and adjusted in No vertical obs	: Baltimore-Was coordinates we the National of NAD 83 (2007) adjustment for coordinates ar for horizontal ay. height was de June 2008. ervational che	ere establis Geodetic Su is equival more infor e valid at control is etermined by ck was made	thed by GPS of rvey in Febr ent to NAD & mation. the epoch da a decimal & differentia to the stat	observat Tuary 200 33 (NSRS2) ate disp equivale al level tion.	ions 07. D07) layed above. nce ing
AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219	This mark is at The horizontal and adjusted by The datum tag of See National Re The horizontal The epoch date of Year/Month/I The orthometric and adjusted in No vertical obs The X, Y, and 2	: Baltimore-Was coordinates we the National of NAD 83 (2007) adjustment for coordinates ar for horizontal ay. height was de June 2008. ervational che were computed	ere establis Geodetic Su is equival more infor e valid at control is etermined by ck was made	whed by GPS of rvey in Febr ent to NAD & mation. the epoch da a decimal of differentia to the state	bbservat cuary 200 33 (NSRS2) ate disp equivale al level cion. the ell	ions 07. 007) layed above. nce ing ipsoidal ht.
AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219	This mark is at The horizontal and adjusted by The datum tag of See National Re The horizontal The epoch date of Year/Month/I The orthometric and adjusted in No vertical obs The X, Y, and 2	: Baltimore-Was coordinates we the National of NAD 83 (2007) adjustment for coordinates ar for horizontal ay. height was de June 2008. servational che were computed	ere establis Geodetic Su is equival more infor e valid at control is etermined by ck was made	whed by GPS of rvey in Febr ent to NAD & mation. the epoch da a decimal a differentia to the stat	bbservat cuary 200 33 (NSRS2) ate disp equivales al level cion. the ell	ions 07. 007) layed above. nce ing ipsoidal ht.
AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219 AB6219	This mark is at The horizontal and adjusted by The datum tag of See National Re The horizontal The epoch date of Year/Month/I The orthometric and adjusted in No vertical obs The X, Y, and 2 The Laplace cor	: Baltimore-Was coordinates we the National of NAD 83 (2007) adjustment for coordinates ar for horizontal ay. height was de June 2008. servational che were computed rection was co	ere establis Geodetic Su is equival more infor valid at control is etermined by ck was made from the p	whed by GPS of rvey in Febr ent to NAD & mation. the epoch da a decimal of differentia to the stat osition and DEFLEC99 do	bbservat cuary 200 33 (NSRS2) ate disp equivales al level cion. the ell erived d	ions D7. D07) layed above. nce ing ipsoidal ht. eflections.
AB6219 AB6219	This mark is at The horizontal and adjusted by The datum tag of See National Re The horizontal The epoch date of Year/Month/I The orthometric and adjusted in No vertical obs The X, Y, and 2 The Laplace cor	: Baltimore-Was coordinates we the National of NAD 83 (2007) adjustment for coordinates ar for horizontal ay. height was de June 2008. ervational che were computed rection was co	ere establis Geodetic Su is equival more infor valid at control is etermined by ck was made from the p mputed from	ched by GPS of rvey in Febr ent to NAD & mation. the epoch da a decimal a differentia to the stat osition and DEFLEC99 da	bservat cuary 200 33 (NSRS2) ate disp equivale al level cion. the ell erived d	ions D7. D07) layed above. nce ing ipsoidal ht. eflections.
AB6219 AB6219	This mark is at The horizontal and adjusted by The datum tag of See National Re The horizontal The epoch date of Year/Month/I The orthometric and adjusted in No vertical obs The X, Y, and 2 The Laplace cor The ellipsoidal	Baltimore-Was coordinates we the National of NAD 83 (2007) adjustment for coordinates ar for horizontal ay. height was de June 2008. ervational che were computed rection was co height was de	ere establis Geodetic Su is equival : more infor :e valid at : control is etermined by ck was made i from the p imputed from :termined by	shed by GPS of rvey in Febr ent to NAD 8 mation. the epoch ds a decimal a differentia to the stat position and DEFLEC99 da	observat Suary 200 33 (NSRS2) ate disp equivales al level tion. the ell erived d	ions D7. D07) layed above. nce ing ipsoidal ht. eflections.
AB6219 AB6219	This mark is at The horizontal and adjusted by The datum tag of See National Re The horizontal The epoch date of Year/Month/I The orthometric and adjusted in No vertical obs The X, Y, and 2 The Laplace con The ellipsoidal and is reference	: Baltimore-Was coordinates we the National of NAD 83 (2007) adjustment for coordinates ar for horizontal ay. : height was de i June 2008. servational che : were computed :rection was co . height was de ad to NAD 83.	ere establis Geodetic Su is equival : more infor :e valid at : control is etermined by eck was made i from the p omputed from etermined by	whed by GPS of rvey in Febr ent to NAD & mation. the epoch ds a decimal of differentia to the stat osition and DEFLEC99 da GPS observa	observat Tuary 200 33 (NSRS2) ate disp equivales al level tion. the ell erived d ations	ions D7. D07) layed above. nce ing ipsoidal ht. eflections.
AB6219 AB6219	This mark is at The horizontal and adjusted by The datum tag of See National Re The horizontal The epoch date of Year/Month/I The orthometric and adjusted in No vertical obs The X, Y, and 2 The Laplace con The ellipsoidal and is reference	: Baltimore-Was coordinates we the National of NAD 83 (2007) adjustment for coordinates ar for horizontal ay. : height was de i June 2008. Servational che : were computed :rection was co . height was de ad to NAD 83.	ere establis Geodetic Su is equival : more infor :e valid at control is etermined by eck was made i from the p omputed from etermined by	whed by GPS of rvey in Febr ent to NAD & mation. the epoch da a decimal of differentia to the stat osition and DEFLEC99 da GPS observa	observat Tuary 200 33 (NSRS2) ate disp equivales al level tion. the ell erived d ations	ions D7. D07) layed above. nce ing ipsoidal ht. eflections.

SPARKS, MARYLAND

NAME OF STATION: BV	VID	DATE	ESTABLISHED:	1991	······
NGS PID: AE	86219			READJUSTED FE	BRUARY 2007
AB6219					
AB6219.The dynam	ic height is com	puted by di	viding the b	NAVD 88	
AB6219.geopotent	ial number by th	e normal gr	avity value	computed on t	he
AB6219 Geodetic	Reference System	of 1980 (G	RS 80) elli	psoid at 45	
AB6219.degrees l	atitude (g = 980	.6199 gals.).		
AB6219					
AB6219 The model	ed gravity was i	nterpolated	from obser	ved gravity va	lues.
AB6219					
AB6219;	North	Eε	st Unit	s Scale Factor	Converg.
AB6219;SPC MD	- 168,736.	553 428,9	37.834 MT	0.99996449	+0 12 36.8
AB6219;SPC MD	- 553,596.	51 1,407,2	73.54 sFT	0.99996449	+0 12 36.8
AB6219;UTM 18	- 4,338,766.	916 356,1	94.692 MT	0.99985463	-1 03 08.0
AB6219		·			
AB6219!	- Elev Fact	or x Scal	e Factor =	Combined Fac	tor
AB6219!SPC MD	- 0.999997	75 x 0.9	9996449 =	0.99996224	
AB6219!UTM 18	- 0.999997	75 x 0.9	9985463 =	0.99985238	
AB6219				0.555666666	
AB6219		SUPERSEDED	SHRVEY CONT	ROI.	
AB6219					
AB6219 ELLIP H	(10/28/02) 14.	378 (m)		GP (142
AB6219 NAD 83/1	991)- 39 11 10.	53909 (N)	076 39 54.	19473 (M) AD () 1
AB6219 ELLIP H	(05/31/01) 14.	449 (m)		GP(142
AB6219	,,,	,		ол (,
AB6219.Supersede	d values are not	recommende	d for surve	v control.	
AB6219.NGS no lo	nger adjusts pro	jects to th	e NAD 27 or	MGVD 29 datum	19
AB6219 See file	dsdata.txt to de	termine how	the sumers	eded data were	derived
AB6219			one bapero	caca actor were	. GELIVEU.
AB6219 H.S. NATT	ONAL GRID SPATIA	L ADDRESS:	189111561953	8767 (NAD 83)	
AB6219 MARKER D	D = SURVEY DISK	d ADDALOD.	10000001000	0101 (MAD 03)	
AB6219 SETTING:	7 = SET IN TOP C	F CONCRETE	MONIMENT		
AB6219 STAMPING:	BMT D 1991	- CONCILLIE	IION OILLIN I		
AB6219 MARK LOGO	· NOS				
AB6219 PROJECTIO	. NOO N. DRCRSSRD 5 CK	NTIMETEDS			
AB6219 MAGNETIC.	N = NO MAGNETIC	MATEDIAN			
AB6210 STABILITY	M = MO MAGNETIC	MAILALAD	CONNOMIN	UDIECT TO	
ABO219_JIADILIII	. C - MAI HOLD,	DOI OF TIFE	. COMMONLY 5	UDJECI IO	
AD0219TJIADILIII	. JURFACE MOTION	TON HAC DET	ODTER AC ON	TENDLE BOD	
AD0219_SATELLITE	. CATFILITE OPCE	TON WAS REP DUATIONS	Werrenkan OT	LIABLE FOR	
ADUAISTRAILLLIL ARE210	. SAIEDLIE VOSE	VANITONS -	November 07	, 2007	
ADULIS ADECIO UTETOPS	Data 7		D	D	
ADOLIS DIDIURI	- Date C	ONUMERTED	keport	дλ	
ABOZIO HIDIORY	- 1991 - W	ONOMENTED	NOS		
AB6219 HISTORY	- 20001130 G		NGS		
AB6219 HISTORY	- 20071107 G	COD	JARICE		
AB6219					

BWI THURGOOD MARSHALL AIRPORT-PRIMARY SURVEY CONTROL DATA							
NAME OF STATION:	BWID		DATE ESTABI	LISHED: 1991			
NGS PID:	AB6219			READJUST	ED FEBRUARY 2007		
0B6219		STATIC	W DFSCDIOTI	ON			
AB6219		DIALL	A PLOCKITI				
AB6219'DESCRI	BED BY NATION	VAL OCEAN SEP	NICE 1991 ((DAH)			
AB6219'THE ST	TATION IS LOC.	ATED IN THE N	IORTH PART (OF THE AIRPORT	AT THE EAST		
AB6219'CORNER	OF A LARGE (CONCRETE FRED	GHT RAMP.	IT IS 590 FT	(179 8 M) SW OF		
AB6219'THE CL	. END OF RWY :	15L, NW OF TH	HE INTERSECT	FION OF A TAXID	IAY CL AND AN		
AB6219'ILS HC	DLD LINE AND (ON RANGE WITH	H THE HOLD L	INE. IT IS 82	: 6 FT (25 2 M)		
AB6219'NORTH	OF THE CENTER	R OF A 3 FT	(0.9 M) X 4	FT (1.2 M) STE	EL DRAIN AND		
AB6219'21.9 F	'T (6.7 M) EAS	ST OF THE EAS	ST CORNER OF	THE RAMP (V-4	-91 CHSQ). IT		
AB6219'IS AT	THE TOP OF A	SLOPE AND JU	JST OUTSIDE	A STEEL QUARDE	RAIL FOR A		
AB6219'SERVIC	E ROAD. IT A	AN NOS DISK S	STAMPED BWI	D 1991 AND SET	IN THE TOP OF		
AB6219'A CONC	RETE POST FLU	JSH WITH THE	GROUND.				
AB6219		COR L DE L		100001			
AD0219 AD6210		DIAIIC	M RECOVERY	(2000)			
AD0219 AB6219/ DECOVE	V NOTE BY N	ATTONNI GEODE	TTC SHOVEN	2000 (100)			
AB6219'THE ST	ATTON IS LOC	ATED ON THE F	SILC DORVEI	SHINGTON			
AB6219'INTERN	JATIONAL AIRP(DRT AT THE EA	ST CORNER (DE A LARGE COM	העריה		
AB6219'FREIGH	IT RAMP.			n n bailot com			
AB6219'TO REA	CH THE STATIC	ON FROM GATE	L, KEEP PRO	CEEDING STRAIG	HT IN A		
AB6219'SOUTHW	JEST DIRECTION	V FOR 0.1 MI	TO A PERIME	TER ROAD, TURN	I RIGHT,		
AB6219'HEADIN	IG NORTH, AND	FOLLOW PERIM	METER ROAD F	FOR 0.65 MI TO	THE		
AB6219'STATIC	N ON THE LEFT	F AT THE TOP	OF A SLOPE	AND JUST OUTSI	DE A STEEL		
AB6219'GUARDF	AIL FOR THE H	PERIMETER ROA	LD.				
AB6219'THE ST	ATION IS 590.	O FT SOUTHWE	EST FROM THE	E CENTERLINE EN	ID OF		
AB6219'RUNWAY	? END 15L, 2:	1.9 FT EAST (OF THE EAST	CORNER OF A CO	MCRETE		
AB6219' MAINTE	NANCE AND FRE	SIGHT RAMP, 8	32.6 FT NORT	TH OF THE CENTE	CROFA3		
AD0219'DI 4-F	VOI SIELL DRI VE NOTE TH	RIN, AND THE TO OTATION DA	MONUMENI 1: Ve prem deci	S FLUSH WITH TH	IE GROUND		
ADO219 JORFAC	E. MOILIII.	LO DIATION DI	S DEEN DESI	IGNAIED A SACS.			
AB6219							
AB6219		STATIO	N RECOVERY	(2007)			
AB6219				,,			
AB6219'RECOVE	RY NOTE BY J	A RICE INC 2	2007 (MRA)				
AB6219 RECOVE	RED AS DESCR	IBED.	·				
I							

BWI	THURG	OOD MARSH	IALL AIRPOR	T-PRIMA	RY SUR	VEY C	ONTROL I	DATA
NAME OF ST.	ATION:	BWIF		DATE ESTA	ABLISHED:	1991		
NGS PID:		AA9297				READJL	ISTED FEBRU	JARY 2007
MARYLAND	STATE PL	ANE COORDINATI	ES (NAD 83):					
* N	IORTHING	(Y):		548273.296	US ft.		167114.03	35 m
* E	ASTING ()	():		1407184.150	US ft.		428910.58	37 m
i 📩 o	BTHOME	TRIC HEIGHT (NA	VD 88):	156 483	US ft		47.69	96 m
d d	ONVERGI	ENCE ANGLE:		100.100	0° 12' 35.9"		47.00	,
S	CALE FAC	CTOR:			0.99996314			
c	OMBINED	SCALE FACTOR			0.99996079			
OFOODADU	0.00000							
GEOGRAPHIC	ATITUDE	NATES (NAD 83):	202 10 17 00645					
L 1	ONCITUD	ç.	76° 20' 55 57914'	(IN) (IA/)				
E	LLIPSOID	с. НТ:	49.13	US ft.	14 975	m		
					1 1101 0			
AVAILABLE (CONVENT	ONAL BACKSIGH	T POINTS (COMP	UTED DATA)):			
	POINT	GEODETI	<u>C AZIMUTH</u>	DISTAN	ICE (US FT.)		DISTANCE (n	<u>n)</u>
N	10N-554	336°5	51'54.6'		1250.99		381.30	01
	10N-555	5°1	4'03.7"		1303.58		397.33	32
I IV	10N-556	10°3	7'05.6"		1668.49		508.55	58
STATION DES	SCRIPTIO	N:			WARS	The second	C. C. C. Lands - M.	A Star
					1.1	A second	MALL A	
					计算计	COL	The second	A standard
	*			e		Ser al	and the second	
		SEE ATTACHED	NGS DATASHEET	5		La top	11/11	
c) -							2 Th	
					1 20	A State	1 A	
					12			有自己
					1.	• 6.		
								2 34
LOCATION							99.	
1111-2-1	leter >		1 ACTA MISA		E.S.	1.4.4	- MOREN S	
		SACS	(335) A/A/1/1/	>			CUCAN	State And State
Areal						W.		A CONTRACT
		6 6	1111 - 1111			A log and the	and the second s	ALL STREET
		1 and	14/2/11	Ì				
OFFIC V	El MI.	1 1/2 /		Ş				
John Starting	13:00113	Al Sel		Ş				
A 188/188	. 15/11	b the first	E Lat	\mathbf{N}				DETAIL MAP
F- P BU	3 1911		an at 1 10	X				
W I	i Mit		al love					
A lit	WIE.			GRASS		/		
	- 111	St Nor				(GRASS	
111119	N.		138 / ///	K	1			
1 XXAI							RUNWAY 10-28	
4/12/	\ <.		JAM / /	$\begin{pmatrix} & & \\ & & \\ & & \end{pmatrix}$	20 0	8		
13 1111	1 2 2	ø.,	A ISLL	8 ⁴ / ,	LIGHTS	NOS	SURVEY CON	TROL
111 616/	the liter		213115	- Lin	ORANGE 3	BRASS	DISK IN CON	ICRETE
1/3/6/11	11.14		1.3/1/		PIPE 23		STAMPED	GRASS
7/3/1/	11-11-1			1/(5		BWI F	
$= \neq h$	12 -		S AND MED		341		1991 SER	VICE ROAD
	M =	Z	1	1/1	$\langle \rangle$	I N	1200	
(N85'47'W TRUE)			OC CA	E/ ~	1 /	. 1		VORTAC
0.140	SUC		7		23/	X K	GRASS	
40	1/1/7	J. V. For	10/5 22)		//	APP		
600	$//\gamma$	X (7) X [/]	1	NOT TO	SCALE	A		GRASS
MBR	$\langle \rangle \times$		ics'	$\langle \rangle$	$\langle \rangle$	Д		
SURVEYED E	BY:	JMT ENGINEERI	NG		N		SPARKS	S. MARYLAND


BWI -	THURGOOD MA	RSHALL AIRPO	RT-PRIMA	RY SURVEY CON	NTROL DATA
NAME OF ST	ATION: BWIF		DATE ESTAI	BLISHED: 1991	
NGS PID:	AA9297			READJUST	ED FEBRUARY 2007
1 AA9297	National Geode	tic Survey, Re ***************	trieval Da ********	te = JUNE 25, 20 *****	08
AA9297 AA9297	PACS - DESIGNATION -	This is a Prima BVI F	ry Airport	Control Station	
AA9297	PID -	119297			
AA9297	STATE/COUNTY-	MD/ANNE ARIINDEL			
AA9297	USGS OUAD -	RELAY (1974)			
AA9297		,			
AA9297		*CURREN	T SURVEY C	ONTROL	
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	CECTP HEIGHI-	14.975	(meters)	(02/10/0	(7) ADJUSTED
AA9497	GEOID HEIGHI-	-32.68	(meters)		GEOIDU3
A19297	DIMAMIC HI -	47.671	(meters)	156.4U (Ieet	.) COMP
A19297) er en une e	ees Familian to a	05% 0	-l 1	
AA9497	Trme DID	Cy Estimates (at Designation	95% Conri	dence Level in c	m)
AA9497	туре Рто	Designation		North	rast fillb
AA9297		BUT F		1 02	0 72 2 00
110207	MEIWORK AA9297			1.02	0.73 2.00
119297	MODELED GRAV-	980 092 5	(more l)		NAVD 88
119297	nobiliti oran	200,020.0	(mgor)		MAVD OO
AA9297	VERT ORDER -	FIRST CLASS	II		
AA9297					
AA9297.	This mark is at	Baltimore-Washi	ngton Int'	l Airport (BWI)	
AA9297					
AA9297.	The horizontal	coordinates were	establish	ed by GPS observ	ations
AA9297.	and adjusted by	the National Ge	odetic Sur	vey in February	2007.
AA9297					
AA9297.	The datum tag o	f NAD 83(2007) i	s equivale.	nt to NAD 83(NSF	(S2007)
AA9297.	See National Re	adjustment for m	ore inform	ation.	
AA9297.	The horizontal	coordinates are	valid at t	he epoch date di	splayed above.
AA9297	The epoch date	for horizontal c	ontrol is	a decimal equiva	lence
AA9297.	of Year/Month/D	ay.			
AA9297	m				
AA9297.	ine orthometric	neight was dete	rmined by	differential lev	reling
AA9297.	ana aajustea in No mortinal ala	oune 2008.			
AA9497	MO VELCICAL ODS	ervational Check	. was made	lo the station.	
AA3437	The Y V and 7	were computed f	rom the no	oition and the -	llingoidal bt
10207	inc A, I, and 2	were computed I	.com cne po	arcion and the e	aripsoidai nt.
19297	The Lanlace con	rection mas comm	uted from	DEFLEC99 derived	I deflections
119297		TTOOTON MOD COUL	WUCK IIUM	STREAM ACTIVE	
119297	The ellipsoids)	height was dete	rmined by	GPS observations	1
119297	and is reference	ed to NAD 83.	wy	The experience and to He	
AA9297					
AA9297.	The geoid heigh	t was determined	l by GEOIDO	з.	
				·····	
ISURVEYED E	SY: JMT ENGIN	IEERING			SPARKS, MARYLAND

BWI THURGOOD MARSHALL AIRPORT-PRIMARY SURVEY CONTROL DATA							
NAME OF STATION: BWI F	DATE ESTABLISHED: 1991						
NGS PID: AA9297	READJUSTED FEBRUARY 2007						
110207							
140207 The dynamic beight is computed b	r diriding the NAUD CO						
AA9297. The dynamic height is computed b	y dividing the MAOD oo						
Akazay, geopotential number by the norma	a gravity value computed on the						
AA9297.Geodecic Reference System of 198	U (GRS OU) EIIIPBOID AC 45						
[449297.degrees latitude (g = 980.6199 g	ais.).						
AA9297. The modeled gravity was interpol	ated from observed gravity values.						
AA9297	Teed United Control Tedal Col						
AA9297; NOECH	Last Units Scale Factor Converg.						
AA9297; SPC MD = 167, 114.035 4	28,910.587 MI 0.99996314 +0 12 35.91						
[AA9297; SPC MD - 548, 273, 30], 4	U7,184.15 SFI U.99996314 +U 12 35.9						
[AA9297; UIM 18 - 4,337, 145 570 3]	56,131.715 MT 0.99985486 -1 03 07.7						
AA9297! - Elev Factor X	Scale Factor = Compined Factor						
[AA9297:5PC MD - 0.99999765 X]	0.99996314 = 0.99996079						
[AA9297!0IM 18 - 0.99999765 X]	0.99985486 = 0.99985251						
AA9297 SUPERSE	DED SURVEY CONTROL						
[AA9297 ELLIP H (08/09/02) 14.986 (m	GP() 42						
AA9297 NAD 83 (1991) - 39 10 17.92754 (N) U76 39 55.57787(W) AD() B						
AA9297 ELLIP H (03/24/98) 15.057 (m	i) GP()41						
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 recomm	hended for survey control.						
AA9297.NGS no longer adjusts projects t	o the NAD 27 or NGVD 29 datums.						
AA9297.5ee Ille dsdata.txt to determine	now the superseded data were derived.						
AA9297							
AA9297 U.S. WATTOWAL GRID SPATTAL ADDRE	.55: 1850J561323/146(NAD 83)						
[AA9297] MARKER: $DD = 50$ KVEI $D15$ K							
AA9297 SETTING: 7 = SET IN TOP OF CONCR	CLE MONUMENT						
AA9297 SIRMPING: BWI F 1991							
AA9297 MARK LOGO: NOS	TT T T C						
AR9297 PRODECTION: PRODECTING 5 CENTIME							
[AA9297] MAGNETIC: N = NO MAGNETIC MATERI	AL TYDE CONNONLY CUDIECT TO						
AA9297 STABILITY: C ~ MAY HOLD, BUT OF	ITPE COMMONLY SUBJECT TO						
AA9297+SIABILIII: SURFACE MOTION	DEDODTED AC CHITTADLE EOD						
AA9297 SATELLITE: THE SITE LOCATION WAS	REPORTED AS SUITABLE FOR						
AA9297+SAILLLIIL: SAILLLIIL OBSERVATION	ns - November UI, 2007						
AA9297 HISTORY - Date CONditie	л керогс бу						
AAS2ST HISTORY - 1991 MONUMENT							
110207 HISTORY - 10041020 COOD	NCS						
AA9297 HISTORI - 19941030 GOOD	NGO						
AA5257 HISTORI - 19901009 GOOD	NGO NCC						
AAS2S7 HISTORI - 20001130 GOOD	NGD TARCE						
AAS2S7 HISTORI - 2007HIDI GOOD	UXKICE						

SURVEYED BY: JMT ENGINEERING

ME OF STATION:	BWIF		DATE ESTABL	LISHED: 1991		
GS PID:	AA9297			READJUS	STED FEBRUA	RY 2007
110202		C'T & T'	ON DECOTO	T OBI		
AAJ4J(AAJ4J)	OFT BY NATIO	JIAI. NAL OCRAN CI	ION DESCRIPT	TON		
AA9297 DESCRI	SED BI NALLOI	NAL OCEAN SE	RVICE 1991			
AA9297 THE ST.	ATION IS LOC.	ATED NEAR TH	IE CENTER OF	THE AIRPORT	JUST SOUTH	H OF
AA9297'THE IN	TERSECTION OF	r RUNWAYS 4-	-22 AND 10-2	8. IT IS ON	THE NORTH	WEST
AA9297'POINT	OF A LOW HILD	L AND ABOUT	1200 FT (36	5.8 M) WEST C	F THE VOR	TAC. I
AA9297'IS 524	.9 FT (160.0	M) SSW OF 7	THE SECOND R	UNWAY LIGHT E	AST OF TH	Ξ
AA9297' INTERS	ECTION ALONG	THE SOUTH H	EDGE OF RWY	10-28, 384.5	FT (117_2	M)
AA9297'EAST O	F THE THIRD I	RUNWAY LIGH	SOUTHWEST	OF THE INTERS	ECTION AL	ONG TH
AA9297'SOUTHE	AST EDGE OF 1	RWY 4-22, AN	JD 341.5 FT	(104.1 M) NOF	THEAST OF	THE
AA9297' INTERS	ECTION OF TH	E CL OF A NU	J/SE TAXIWAY	AND ITS HOLI	BAR. IT	IS 2.
AA9297'FT (0.1	7 M) SOUTH O	F A 3 FT (O.	.9 M) HIGH S	ECTION OF 2 1	NCH ORANGI	E
AA9297'PLASTI	C PIPE DRIVE	N INTO THE (GROUND AS A	WITNESS POST.	THE STA	TION I
AA9297'AN NOS	DISK STAMPE	D BWI F 199;	L AND SET IN	THE TOP OF A	CONCRETE	POST
AA9297'WHICH	PROJECTS 2 II	NCHES ABOVE	THE GROUND.			
119297		STAT	ION RECOVERY	(1994)		
AA9297 'RECOVE	RY NOTE BY N	ATTONAL GEOL	ETIC SURVEY	(1994 (JDR)		
109297'THE ST	NTION IS LOC	ATED ABOUT (3 MT (12 9 K	M) SOUTH-SOUT	HWEST OF	
AAD2D7 INC DI	IN BUTTMODE	MD AT T	J HI (IZ.J N JF BAITTMODF	LUNGUINGTON 1	MTEDNATIO	161
AA9297 DOWNIO	T INCT CONTU	A MD. AI II	IE DALIINORE	DIDULANC 4 20	INTERNATION	NAL TT
AA9297 AIRFOR	I UUSI SOUIN TUE NODTUUEC	OF THE INTI	LABECTION OF	RONWAIS 4-22	AND $10-20$	
AA9297.15 ON	INC NORTHWES	I POINT OF A	LOW MILL A	BOOT 1200 FT	(365.8 M)	WEST
AA9297 OF THE	VORTAC. CON	NTACT BILL I	ABEL, AIRPOR	T OPERATIONS,	AT (410)	
AA9297'859-70	18.					
AA9297'IT IS	524.9 FT (16)	0.0 M) SOUTI	H-SOUTHWEST	OF THE OF THE	SECOND R	UNWAY
AA9297'LIGHT	EAST OF THE	INTERSECTION	ALONG THE	SOUTH EDGE OF	' RUNWAY 10	D-28.
AA9297'384.5	FT (117.2 M)	EAST OF TH	E THIRD RUNW	AY LIGHT SOUT	HWEST OF	THE
AA9297' INTERS	ECTION ALONG	THE SOUTHE.	AST EDGE OF	RUNWAY 4-22,	AND 341.5	FΤ
AA9297'(104.1	M) NORTHEAS	T OF THE IN	FERSECTION C	F THE CENTERI	INE OF A	
AA9297'NORTHW	EST-SOUTHEAS	T TAXIWAY A	ND ITS HOLD	BAR. THE STA	TION IS A	
AA9297'STANDA	RD NOS DISK :	STAMPED!	3WI F 1991	- AND SET IN	THE TOP O	FA
AA9297 CONCRE	TE MONUMENT	WHICH PROJE	CTS 2 INCHES	ABOVE THE GR	ROUND.	
119297		STAT	ION RECOVERY	7 (1996)		
119297'RECOVE	RY NOTE BY N	ATTONAL GEO'	STTC SUDVEN	7 1996 (AJTL)		
119297 280072	RED 13 DESCO	TBED	CALLO DORVEI	Tree (real)		
AADADT RECOVE	LU AN DENCK	 	IAN DECAUEDS	7 720001		
AAJ4J/	זא ער שראנאנו	DIAI. Attonia cec:	LON RECOVERI	(4000) (3000 /*PE'		
AR9297 RECOVE	RI NULL BI N.	ATTOMAL GEOD	DETIC SURVEY	: 2000 (APF)		
AA9297' RECOVE	RED AS DESCR	IBED.				
AA9297		ሮፕስጥ	いいれい ロセクヘロゼロな	/ / A O O O O A		
		JIAI	ION RECOVERS	(2007)		
AA9297' RECOVE	RY NOTE BY J	A RICE INC	2007 (MRA)	(2007)		

SURVEYED BY:

JMT ENGINEERING





BWIT	HURGOOD MAR	SHALL AIRPOR	T-PRIMAR	Y SURVEY CONTR	OL DATA
NAME OF STA	TION: BWIG		DATE ESTAB	LISHED: OCTOBER 2007	
NGS PID:	DJ9002			READJUSTED F	EBRUARY 2008
lı	National Geode	tic Survey, Re	etrieval Da	ate = JUNE 25. 2008	
DJ9002	*********	*****	*******	* * * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * *
DJ9002	DESIGNATION -	BWI G			
DJ9002	PID -	DJ9002			
DJ9002	STATE/COUNTY-	MD/ANNE ARUNDEI			
DJ9002	USGS QUAD -	RELAY (1974)			
DJ9002					
DJ9002		*CURREI	IT 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
D19002	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 HEIGHI-	-34.65	(meters)		GEOIDU3
D19002	DINAMIC HI -		(meters)	166.30 (Ieet)	COMP
D09002	MODELED GRAV-	900,093.4	(mgar)		NAVD 88
D.19002	HODZ ODDED -	FTDCT			
0.19002	WEDT ODDED -	FIRDET CINE	2 TT		
DJ9002	FLLP OPDER -	SECOND CLASS	3 II 3 TT		
00002		SLOWP CHAS.			
DJ9002	The horizontal	coordinates were	e establis	hed by GPS observat	ions
DJ9002	.and adjusted by	the JMT ENGINE	ERING in F	ebruary 2008.	
DJ9002					
DJ9002	.The datum tag o	f NAD 83(2007) :	is equival	ent to NAD 83 (NSRS2	007).
DJ9002	See National Re	adjustment for 1	more infor	mation.	
DJ9002	The horizontal	coordinates are	valid at	the epoch date disp	layed above.
DJ9002	.The epoch date	for horizontal (control is	a decimal equivale	nce
DJ9002	.of Year/Month/D	ay.			
DJ9002					
D19002	.The orthometric	height was det	ermined by	differential level	ing
- DJ9002	.and adjusted in	June 2008.	•		
DJ9002	.No vertical ops	ervational chec.	k was made	to the station.	
D09002	The V V and 7	ware computed :	From the n	ogition and the all	in mainle 1 Inte
D09002	. The A, I, and A	were computed.	rrom cue p	osicion and the eli	ipsolual nt.
0.19002	. The Lanlace cor	rection was com	nuted from	NFFLFCQQ derived d	eflections
DJ9002	Lapiant out		pasca rrom	actived a	cricectome.
DJ9002	.The ellipsoidal	height was det	ermined by	GPS observations	
DJ9002	.and is referenc	ed to NAD 83.			
DJ9002					
DJ9002	.The geoid heigh	t was determine	1 by GEOID	03.	
DJ9002					
DJ9002	.The dynamic hei	ght is computed	by dividi	ng the NAVD 88	
DJ9002	.geopotential nu	mber by the norm	mal gravit	y value computed on	the
DJ9002	.Geodetic Refere	nce System of 1	980 (GRS 8	0) ellipsoid at 45	
DJ9002	.degrees latitud	e (g = 980.6199	gals.).		
DJ9002					
DJ9002	.The modeled gra	vity was interp	olated fro	m observed gravity	values.
				00	
JOUNVETED DI	. JWII ENGINE			SP	ANNO. MARYLAND

NAME OF STATION:	BWIG	DATE ESTABLISHED	OCTOBER 2007
NGS PID:	D.19002	BATE EGTABEIOTEB.	BEAD ILISTED FEBBLIABY 2008
			TIEADOOTED TED TOATT 2000
DJ9002			
DJ9002;	North	East Units	Scale Factor Converg.
DJ9002;SPC 1	MD - 168,625.990	428,111_813 MT	0.99996440 +0 12 15.2
DJ9002;SPC 1	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	SUPF	RSEDED SURVEY CONTRO	DI.
D/19002			
DJ9002.No.s	unerseded survey control	is available for th	is station
DJ9002	aperbeata bariey conoror	io araitabic for on.	is seacton.
DJ9002 II S	NATTONAL GRED SPATTAL AP	NDF55 185115536738	675 (NAD 83)
DJ9002_0.2.	FD. DD = SUDVEY DISK	PRESS. 1020000000100	6/5 (MAD 65)
DUDUUZ_HARR. D.TOOO2_SETT	ING. 7 = SET IN TOP OF CO	MCDETE MONITMENT	
DU9002_SET	PING: F SET IN FOF OF CO	AUCKETE HONOMENT	
DUGUUZ_SIAM.	LOCO, MDAVIA		
DUSOUS_MARK	ECTION. DECERCED E CENTIN		
DJ9002_PROJ.	ECTION: RECEDSED S CENTIE ETTC: N - NARVER FOUIDDED	LIERD NITH DID NIGHT	
DJ9002_MAGN.	LIIC: M = MARKER EQUIPPED	ON THE BAR MAGNEL	
DJ9002_SIAB	ILITY: C = MAY HOLD, BUT	OF TYPE COMMONLY SU	BJECT TO
DJ9UUZ+STAB	ILITY: SURFACE MOTION		
DJ9002_SATE	LLITE: THE SITE LOCATION	WAS REPORTED AS SUI	TABLE FOR
DJ9002+SATE.	LLITE: SATELLITE OBSERVAT	IONS - November 27,	2007
DJ9002			
DJ9002 HIS	TORY - Date Condi	tion Report	Ву
DJ9002 HIS	TORY - 20071127 MONUM	IENTED JMTMD	
DJ9002			
DJ9002	STAT	TION DESCRIPTION	
DJ9002			
DJ9002'DESC	RIBED 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 ' HANO	VER. OWNERSHIPBALTIMOF	RE WASHINGTON INTERN.	ATIONAL AIRPORT.
DJ9002'			
DJ9002'TO R	EACH FROM THE JUNCTION OF	I-97 AND MD 176, G	O WEST-SOUTHWEST ON MD
DJ9002'176	FOR 0.24 MI (0.39 KM) TO	AN INTERSECTION . T	URN RIGHT AND GO NORTH
DJ9002'ON M	D 162 FOR 2.32 MI (3.74 F	(M) TO A INTERSECTION	N. CONTINUE STRAIGHT
DJ9002'AHEA	D FOR 0 74 MI (1.20 KM) 7	TO A INTERSECTION.	TURN LEFT AND GO SOUTH
DJ9002'ON S	COTT DRIVE FOR 0.10 MI (C	.17 KM) TO A SIDE R	OAD LEFT. TURN LEFT
DJ9002'AND	GO SOUTHEAST ON ELM ROAD	FOR 0.25 MI (0.40 K	M) TO A RAMP ON THE
DJ9002'RIGH	T. TURN RIGHT AND GO SOU	ITHUEST ON THE RAMP	FOR 0.09 MT (0.15 KM)
DJ9002'TO T	HE MARK ON THE RIGHT.		
DJ9002'			
D.19002'TT T	S 192.8 FT (58.8 M) FIST	OF A METAL STON SHA	PED LIKE & HOT-STD
D.19002'BM.L	OON. 89 0 FT (27 1 M) NOT	THEIST OF & 30-TN /	76 CMI SPOUCE TOFF
D.TOUUS 188 5	FT (27 O M) NOPTH-NOPTH	JEST OF A STREET ITC	HT DOLF 62 2 FT /10 0
DU-5002 00.5	A LET OF A MATTER OF A MATTER OF A	NUMBEDED 110 ET O	HI FULL, 02.2 FI (19.0 FT (17 A W) MADTUURET
DJOOO2'N N	URINEAUT OF A WALER VALVE WE CENTEDI THE OF A DAVIES	DADITHS IST AND STR	FI (I/.~ M) NORIHWEDI IN THE TOD OF 3
D09002.0F I	ME CENTERLINE OF A PAVED	FARKING LOI AND SET	IN THE TOP OF A
009002,12-1	NCH (SO CH) ROUND CONCRET	LE PUDI.	



ME OF STATION	BWI H	DATE ESTABLISHED	
àS PID:	DJ9003	DATE ESTABLISHED. 0	CTOBER 2007
hall strong constitution			
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	No. of Concession, Name	And the second s	
	A CONTRACT OF	A CARL PROPERTY	
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			CONTRACTOR ON
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STAN 201-1		Sent Person	The survey of the
Ville Contraction	BWT N, JNW, D2JAN2008	MARTIN ST	IN COST

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BWIT	HURGOOD MAR	SHALL AIRPOR	T-PRIMAR	Y SURVEY CONTR	OL DATA
NAME OF STAT	ION: BWIH		DATE ESTAB	LISHED: OCTOBER 2007	
NGS PID:	DJ9003			READJUSTED F	EBRUARY 2008
4	Netional Coode	tia Surror Da	traincel De		
	**************************************	CIC DULVEY, RE	ecrieval Da	ICE = JUME 25, 2008	* * * * * * * * * * * *
D.19003	DESTGNATION -	выт н			
DJ9003	PID -	D.T9003			
DJ9003	STATE/COUNTY-	MD/ANNE ARIINDEI			
DJ9003	USGS QUAD -	RELAY (1974)			
DJ9003	_				
DJ9003		*CURREN	IT SURVEY C	ONTROL	
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	Ч -	-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)		GEOIDO3
D19003	DYNAMIC HT -	40.437	(meters)	132.67 (feet)	COMP
DJ9003	MODELED GRAV-	980,093.9	(mgal)		NAVD 88
D09003	HODZ ODDED	FINGT			
D09003	VEDT ODDER -	FIRDI FIRT CINCO	× TT		
D09003	FLUD ODDED -	STCOND CLASS	3 II 3 TT		
DJ9003		SECOND CERS.	. т.т.		
DJ9003.	The horizontal	coordinates were	• establish	ed by GPS observat	ions
DJ9003.	and adjusted by	the JMT ENGINE	ERING in Fe	bruary 2008.	10110
DJ9003					
DJ9003.	The datum tag o	f NAD 83(2007) :	is equivale	nt to NAD 83 (NSRS2)	007).
DJ9003.	See National Re	adjustment for r	more inform	ation.	
DJ9003.	The horizontal	coordinates are	valid at t	he epoch date disp:	layed above.
DJ9003.	The epoch date	for horizontal o	control is	a decimal equivale	nce
DJ9003.	of Year/Month/D	ay.			
DJ9003					
DJ9003.	The orthometric	height was dete	ermined by	differential level	ing
DJ9003.	and adjusted in	June 2008.			•
DJ9003.	No vertical obs	ervational check	t was made	to the station.	
D19003					
DJ9003.	Ine X, Y, and Z	were computed :	trom the po	sition and the ell	ipsoidal ht.
009003	The Lenlege way	waatian waa noo		BEELECOO demándo d	
DJ9003.	ine Lapiace cor	rection was com	putea from	DEFLEC99 derived d	eflections.
0.3003	The ellipsoidel	hoight was data	armined br	CDS observetions	
DU9003.	and is reference	ed to Nib 83	ermined by	GFS ODSELVACIONS	
0000003	and is reference	ca co map oo.			
DJ9003	.The geoid heigh	t was determined	1 by GEAIDC	13	
DJ9003	geora nergn				
DJ9003.	The dvnamic hei	aht is computed	by dividir	ng the NAVD 88	
DJ9003.	.geopotential nu	mber by the norm	mal gravity	value computed on	the
DJ9003.	Geodetic Refere	nce System of 19	980 (GRS 80)) ellipsoid at 45	
DJ9003.	degrees latitud	e (g = 980.6199	gals.).	•	
DJ9003					
DJ9003.	The modeled gra	vity was interpo	olated from	o observed gravity	values.

SURVEYED BY: JMT ENGINEERING

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 b	neight is computed]	by dividing the N	AVD 88			
DJ9003.geopotential	number by the norma	al gravity value	computed on the			
DJ9003.Geodetic Refe	erence System of 198	BO (GRS 80) ellip:	soid at 45			
DJ9003.degrees latit	:ude (g = 980.6199)	gals.).				
DJ9003						
DJ9003.The modeled g	gravity was interpo.	lated from observ	ed gravity values.			
DJ9003						
DJ9003;	North	East Units	Scale Factor Converg.			
DUGUUS;SPC MD	- 107,227.700 -	426,790.747 MI				
D.19003.11TM 18	- 310,010.39 1,- - 4 337 305 940	100,229 31 Bri 254 015 116 MT	0.999990324 + 0.1140.5			
D.19003	1,001,000.010	JJ4,013 IIO MI	0.99900241 -1 04 03.0			
D/19003 !	- 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	SUPERS	EDED SURVEY CONTR	OL			
DJ9003						
DJ9003.No superseded	i survey control is	available for th	is station.			
DJ9003						
DJ9003_U.S. NATIONAL	. GRID SPATIAL ADDR	ESS: 18SUJ5401537	306 (NAD 83)			
DJ9003_MARKER: DD =	SURVEY DISK					
DJ9003_SEITING: / =	SET IN TOP OF CONC. TH 2007	RETE MONUMENT				
DJ9003_SIXMPING: BW.	L H 2007					
DI9003 PROJECTION: 1	RECESSED 10 CENTIME	TERS				
DJ9003 MAGNETIC: M =	= MARKER EOUIPPED W	ITH BAR MAGNET				
DJ9003 STABILITY: C	= MAY HOLD, BUT OF	TYPE COMMONLY SU	BJECT TO			
DJ9003+STABILITY: SI	JRFACE MOTION					
DJ9003_SATELLITE: TI	HE SITE LOCATION WAS	S REPORTED AS SUI	TABLE FOR			
DJ9003+SATELLITE: S.	ATELLITE OBSERVATIO	NS - November 27,	2007			
DJ9003						
DJ9003 HISTORY	- Date Conditi	on Report	Ву			
DJ9003 HISTORY	- 20071127 MONUMEN	TED JMTMD				
DJ9003	GTATIO	N DECOLDETAN	·			
D09003	SIAIIO	N DESCRIPTION				
DJ9003 'DESCRIBED BY	JMT ENGINEERING 20	07				
DJ9003'THE MARK IS I	LOCATED ABOUT 3.9 M	I (6.2 KM) SOUTH	OF RELAY. 3.0 MI (4.9			
DJ9003'KM) SOUTH-SO	UTHEAST OF ELKRIDGE	AND 2.3 MI (3.7	KM) SOUTHEAST OF			
DJ9003 'HANOVER AT B.	ALTIMORE WASHINGTON	INTERNATIONAL AI	RPORT CONTACT			
DJ9003'AIRPORT OPER.	ATIONS AT 410-859-7	018 FOR ACCESS TO	THE MARK.			
DJ9003 '						
DJ9003'IT IS 601.7 1	FT (183.4 M) WEST O	F THE NORTHWEST C	ORNER 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 A	ND HEADWALL, 217.	6 FT (66.3 M)			
DJ9003 EAST-SOUTHEA	DI OF THE EAST END	OF A CONCRETE PIP	E AND HEADWALL, 121 4			
	JUDIAWLDI UN A PRUP. VF OF 1M Flat_utat	ANE CANNON 115.5	FI (35.2 M) DUULH UF THE TOD OF A 12-THEY			
DJ9003 (30 CM) ROIN	D CONCRETE POST	DIICH AND DEI IN	THE FOR OF A 12-INCH			
	. Jonordin i Volt					





BWI THURG	OOD MARSHA	LL AIRPORT	SECOND	ARY SU	RVEY C	ONTROL DA	TA
NAME OF STATION:	MON-549		DATE ESTA	BLISHED:	APRIL 200	5	
NGS PID:					READJUST	ED JUNE 2008	
		S (NAD 83):	551016 070	10.4		100010 005	
FASTING	NG (1):		551216.073 1404616 371	US II.		168010.995 M	
OBTHO	METRIC HEIGHT (NAV	(D 88):	130 387	US ft		39 742 m	
CONVER	RGENCE ANGLE:		(00.007	00°12'15.56"		00.7 42 M	
COMBIN	ED SCALE FACTOR:			0.99996901			
GEOGRAPHIC COOF	RDINATES (NAD 83):	20010147 10475	(NI)				
		76°40'28 05043"	(1N)				
ELLIPSO		23 27	US ft	7 091	m		
		20.27	0010	7.001			
AVAILABLE CONVEI	NTIONAL BACKSIGH	T POINTS (COMPL	JTED DATA):				
POINT	<u>GEODETIC</u>	CAZIMUTH	DISTAN	<u>CE (US FT.)</u>	DI	STANCE (m)	
MON-548	8 324°0	0'06.2'		629.19		191.778	
MON-550	0 143°2	8'44.4'		786.86		239.835	
STATION DESCRIPT	ION:					VAN MOOK	
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LOCATION PLAN							
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SURVEYED BY:	JMT ENGINEERIN	IG H				SPARKS, MAR	YLAND



BWI THURG	OOD MARSHA	LL AIRPORT	-SECONDAR	Y SURVEY C	CONTROL DATA
NAME OF STATION:	MON-550		DATE ESTABLIS	HED: APRIL 200	05
NGS PID:				READJUS	TED JUNE 2008
MARYLAND STATE P	LANE COORDINAT	ES (NAD 83):			
NORTHIN	IG (Y):		550585.396 US ft		167818.764 m
EASTING	(X):		1405086.897 US ft		428271.343 m
ORTHOM	ETRIC HEIGHT (NA	VD 88):	137.815 US ft	•	42.006 m
CONVER	GENCE ANGLE:		00°12	'19.29"	
COMBINI	ED SCALE FACTOR	:	0.999	96885	
GEOGRAPHIC COOR	DINATES (NAD 83)				
LATITUD	E:	39°10'40.85449'	' (N)		
LONGITU	IDE:	76°40'22.10373	' (Ŵ)		
ELLIPSO	ID HT:	30.68	US ft.	9.350 m	
AVAILABLE CONVEN	ITIONAL BACKSIGH	IT POINTS (COMP	UTED DATA):		
POINT	GEODET	<u>C AZIMUTH</u>	DISTANCE (L	<u>IS FT.)</u>	DISTANCE (m)
MON-549	323°	28'48.2'		786.86	239.835
MON-551	143°	57'32.8'		525.42	160.149
CTATION DECODIDT				INVOLVE LA 1	
STATION DESCRIPTI					VAN XOR
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SURVEYED BY:	JMT ENGINEER	ING			SPARKS, MARYLAND

BWI THURGOOD MARSHALL AIRPORT-PRIMARY SURVEY CONTROL DATA

NAME OF STATION: MON-550 NGS PID: DATE ESTABLISHED: APRIL 2005



BWI THURGOOD	MARSHALL AIRPORT	-SECONDARY SU	RVEY CONTROL	DATA
NAME OF STATION: MON	I-551	DATE ESTABLISHED:	APRIL 2005	
NGS PID:			READJUSTED JUNE 200	08
MARYLAND STATE PLANE (NORTHING (Y):	COORDINATES (NAD 83):	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 SCA	LE FACTOR:	0.99996874		
				_
	ES (NAD 83): 39°10'36 65516'	' (N)		
LONGITUDE:	76°40'18.17799'	(W)		
ELLIPSOID HT:	34.49	US ft. 10.513) m	
AVAILABLE CONVENTIONAL	L BACKSIGHT POINTS (COMP	UTED DATA):		
POINT	GEODETIC AZIMUTA	DISTANCE (US FT.	DISTANCE (m)	
MON-550	323 57 35.2	525.42	160.149	
MQ14-552	143*42 22.0	523.0	159.413	
STATION DESCRIPTION:				Ser Ser
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DRIV	EN TO REFUSAL ROD MONUN	MENT		
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SURVEYED BY: JMT	ENGINEERING		SPARKS,	MARYLAND

BWI THURGOOD MARSHALL AIRPORT-PRIMARY SURVEY CONTROL DATA NAME OF STATION: MON-551 NGS PID: DATE ESTABLISHED: APRIL 2005



SURVEYED BY:

JMT ENGINEERING



BWI THURGOOD MARSHALL AIRPORT-PRIMARY SURVEY CONTROL DATA NAME OF STATION: MON-552 NGS PID: DATE ESTABLISHED: APRIL 2005





SURVEYED BY:

JMT ENGINEERING

BWI THURG	OOD MARSHA	LL AIRPOR	T-SECON	IDARY SURVE	Y CONTROL	DATA
NAME OF STATION:	MON-553		DATE ES	TABLISHED: APR	L 2005	2008
MARYLAND STATE P	LANE COORDINATE	ES (NAD 83):	1	ncA		
NORTHIN	IG (Y):		549523.66	65 US ft.	167495.14	l8 m
EASTING	(X):		1406074.09	97 US ft.	428572.24	l2 m
ORTHOM	ETRIC HEIGHT (NA)	VD 88):	143.97	73 US ft.	43.88	33 m
CONVER	GENCE ANGLE:			00°12'27.13"		
COMBINE	D SCALE FACTOR:			0.99996858		
GEOGRAPHIC COOR	DINATES (NAD 83):					
LATITUDI	E:	39°10'30.3251	4" (N)			
LONGITU	DE:	76°40'09.6160	2" (W)			
ELLIPSO	ID HT:	36.8	30 US ft.	11.215 m		
AVAILABLE CONVEN	ITIONAL BACKSIGH	T POINTS (COM	PUTED DAT	A):		
POINT	GEODETIC	C AZIMUTH	DISTA	NCE (US FT.)	DISTANCE (n	<u>n)</u>
MON-552	300°5	58'27.6'		425.31	129.63	34
MON-554	99°3(6'56.9"		622.71	189.80)2
STATION DESCRIPTI	ON:				CAN SEANN	N. C. Car
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LOCATION PLAN				BSD/7		TO SHARE IN A MARKING THE STORE
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SURVEYED BY:	JMT ENGINEERI	NG			SPARKS	



BWI THURGO	OOD MARSHAL	L AIRPORT	-SECON	DARY SU	RVEY CONTR	OL DATA
NAME OF STATION:	MON-554		DATE EST	ABLISHED:	MAY 2003	
NGS PID:					READJUSTED JUN	E 2008
MARYLAND STATE PL		S (NAD 83):	E 40 40 4 0 E		10710	100
NORTHING	э (Y): (Y):		549421.87	2 US ft.	167464	.122 m
OPTHOME		D 99\/	1406688.42		428759	1.491 m
CONVERG		D 88).	140.25	9 03 IL 00º12'32 02"	42	751 III
COMBINE	D SCALE FACTOR:			0.99996184		
GEOGRAPHIC COORD	DINATES (NAD 83):					
		39°10'29.29695'	' (N)			
LUNGITUL		76°40'01.81960'	(VV)	10.077	-	
ELLIPSOI		33.00	0011.	10.077	111	
AVAILABLE CONVENT	FIONAL BACKSIGHT	POINTS (COMP	UTED DATA	A):		
POINT	GEODETIC	AZIMUTH	DISTA	NCE (US FT.)	DISTANCE	(m)
MON-553	279°37	7'01.8'		622.71	189	.802
MON-555	76°23	'30.4"		628.06	191	.434
MON-556	58°30	'07.3"		937.00	285	5.598
BWIF	156°5 ⁻	'50.7'		1250.99	381	.301
STATION DESCRIPTION	DN:					Ser Contractor
	DRIVEN TO REFU	SAL ROD MONU	MENT			
	WITH BERSTEN T	OP SECURITY SI	LEEVE & LII	5	N_2	
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LOCATION PLAN						
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RUNWAY 10.502 +200	2. 24	/	_		BERNSTEN	TOP SECURITY
(NAS'47'W TRUET					SLEEVE R	OD MONUMENT
11/ Java CM	1/ TIAtan	confa ma	7		TAV	1017-334
	X XIIF	from an	1		WWAY .	
VI GROOM		BWI-F	3		p,	
SI IDVEVED DV.		PACS Q			CDAT	
		M .			SPAR	UND. WART LAND



BWI THURGOOD I	MARSHALL AIRPORT	-SECONDA	ARY SURVE	Y CONTROL DATA
NAME OF STATION: MON	-555	DATE ESTAB	LISHED: MAY	2003
NGS PID:			REA	DJUSTED JUNE 2008
MARYLAND STATE PLANE C	OORDINATES (NAD 83):			
NORTHING (Y):	· · · · · · · · · · · · · · · · · · ·	549571.868 U	S ft.	167509 840 m
EASTING (X):		1407298 316 1	S ft	128945 385 m
		100 741 1		42 503
	ANOLE	139.741 0		42.593 m
CONVERGENCE	ANGLE:	00	°12'36.88"	
COMBINED SCAL	LE FACTOR:	0	.99996190	
GEOGRAPHIC COORDINATE	S (NAD 83):	NU /N1\		
LATTUDE:	39°10'30.75746	D" (IN)		
LONGITUDE:	76°39'54.06795	5" (VV)		
ELLIPSOID HT:	32.5	2 US ft.	9.913 m	
AVAILABLE CONVENTIONAL	DACKCICUT DOINTS (COM			
AVAILABLE CONVENTIONAL	BACKSIGHT POINTS (COMP	UIED DATA):		DICTANCE ()
POINT	GEODETIC AZIMOTH	DISTANC	<u>E (US FI.)</u>	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:				
			15	
		10 C		
DRIV	EN TO REFUSAL ROD MONU	MENT		
WITH	I BERSTEN TOP SECURITY S	SLEEVE & LID		
				El States
			12.	
LOCATION PLAN			100	
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14 MIA 1 2 3	Recipit			BEANSTEN TOP SECURIT
13 111 10 0.			Č C	SLEEVE ROD MONUMENT
1 The III File I	· · · / // .3/1 /		1.a.	40.78' MON-555
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STALL INTE	In A BWI-F	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		
	Pacs			
ISURVEYED BY: JMT	ENGINEERING			SPARKS, MARYLAN



SURVEYED BY:

JMT ENGINEERING

BWI	THURG	OOD MAI	RSHALL AIRP	ORT-	SECON	DARY SU	RVEY C	ONTROL	DATA
NAME OF S	STATION:	MON-556			DATE EST	ABLISHED:	MAY 2003		
NGS PID:							READJUS	TED JUNE 20	08
MARYLAND	STATE P	LANE COOF	DINATES (NAD 83	;):					
	NORTHIN	IG (Y):		•	549914.335	US ft.		167614 225	m
	EASTING	(X):		1	407485 581	US ft.		429002 463	m
	OBTHOM	ETRIC HEIG			137 635			41 951	m
	CONVER	GENCE ANG			101.000	00°12'39 30"	1	-1.551	
	COMPINE	ED SCALE E				0 00000000	1		
	JOWDINE	-D OVALL F				0.33330208	, 		
GEOGRAP	HIC COOP	DINATES (N	AD 83):						
	LATITUD	E:	39°10'34	.13562"	(N)				
	LONGITU	DE:	76°39'51	.67397"	(W)				
	ELLIPSO	ID HT:		30.42	ÜS ft.	9.271	m		
AVAILABLE	E CONVEN	TIONAL BA	CKSIGHT POINTS	(COMPU	TED DATA):			
	POINT	G	EODETIC AZIMUTH	1	DISTAN	ICE (US FT.)	<u> </u>	DISTANCE (m)	
	MON-555		208°52'51.3'			390.32	2	118.970	-
	MON-557		35°11'00.6"			467.20)	142.404	
	BWI F		190°37'08.1'			1668.49)	508.558	
STATION D	ESCRIPTI	ON:						States III	Valle Sal
								A STATE	
								A second second	
		DRIVEN 1	O REFUSAL ROD	MONUM	ENT				
		WITH BEI	RSTEN TOP SECU	RITY SL	EEVE & LID			11 -	No Va
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LOCATION	N PLAN						1	and the second	
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			CAN AND	11/18/14			PAR OF END		
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Sharper 1	A.C. SI	ling &				Q	/		
	& link	11/8	· VEV I	mitte			/		
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BUNWAY IN EAST	- MIL	XE	- Alt			80 S1	EEVE ROD	MONUMENT	/ >
(N85 47'W TRUE)			1/ (04 64			00	MON	556	1 8
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may	P())	AHJ/1	A CAR BWI-F	-1			GRASS	/	
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BWI THURG	OOD MARSHAL	L AIRPORT	SECONE	DARY SU	RVEY CC	NTROL DA	TA
NAME OF STATION:	MON-557		DATE ESTA	BLISHED:	MAY 2003		
NGS PID:					READJUSTE	ED JUNE 2008	
NORTLAND STATE P NORTHIN EASTING ORTHOM CONVER	LANE COORDINATE: G (Y): (X): ETRIC HEIGHT (NAVI GENCE ANGLE:	D 88):	550297.172 1407753.375 140.420	US ft. US ft. US ft. 00°12'40.53"		167730.914 m 429084.087 m 42.800 m	
COMBINE	D SCALE FACTOR:			0.99996205			
GEOGRAPHIC COOR	DINATES (NAD 83):	39°10'37.90985"	' (N)				
ELLIPSO	DE: DHT:	76°39 48.25537° 33.19	US ft.	10.118	m		
AVAILABLE CONVEN POINT	TIONAL BACKSIGHT GEODETIC	POINTS (COMP	UTED DATA) DISTAN	: CE (US FT.)	DIS	TANCE (m)	
MON-556 MON-558	215°11 31°47	l'02.8' '53.9"	2	467.20 737.87		142.404 224.903	
STATION DESCRIPTION						A AN AND IN FOR	A 10-14 10
STATION DESCRIPTION	UN .						
	DRIVEN TO REFU WITH BERSTEN T	SAL ROD MONUN OP SECURITY SI	MENT LEEVE & LID				
							A
LOCATION PLAN			5				
						DETAI	L MAP
					· .	Ato	
				CRASS	42.62	HBX	
			TRUMA	NOT NOT	32.23 TO SCALE	296 E ERNSTEN TOP SEC LEEVE ROD MONU	
			*	APPROX.	54.02	CRASS	/
RUNWAY 10.302 4200 CASCUTW (Duc) Ma 900					1	MAN 22.4	
MBR))		BWI-F PACS			/	/ R	
ISURVEYED BY:	JMT ENGINEERIN	G				SPARKS, MA	RYLAND

BWI THURGOOD MARSHALL AIRPORT-SECONDARY SURVEY CONTROL DATA NAME OF STATION: MON-557 NGS PID: DATE ESTABLISHED: MAY 2003



SURVEYED BY:

JMT ENGINEERING

BWI .	THURGO	DOD N	MARSHALL	AIRPORT	-SECON	IDARY SU	JRVEY (CONTRO	L DATA
NAME OF S	STATION:	MON-	·558		DATE ES	TABLISHED:	MAY 200	3	
NGS PID:		DJ90	01				READJUS	STED JUNE	2008
MARYLAN	D STATE PL	LANE C	OORDINATES	(NAD 83):	-				
	NORTHING	G (Y):			550925.72	24 US ft.		167922.4	97 m
	EASTING	(X):			1408139.86	67 US ft.		429201.8	90 m
*	ORTHOME	ETRIC H	IEIGHT (NAVD	88):	137.48	37 US ft.		41.9	06 m
	CONVERG	SENCE	ANGLE:			00°12'43.63	5"		
	COMBINE	D SCAL	E FACTOR:			0.9999623	5		
GEOGRAP	HIC COORD	DINATE	S (NAD 83):						
	LATITUDE		:	39°10'44.10837'	' (N)				
	LONGITU	DE:		76°39'43.31779'	' (W)				
	ELLIPSOI	D HT:		30.26	S US ft.	9.22	2 m		
		TIONAL	DAOKOLOUT D	ONTO COMP					
AVAILABL		HUNAL	BACKSIGHT	OINTS (COMP					,
	POINT MONLEET		GEUDETIC A		<u>DISTA</u>	ANCE (US FI	<u>.</u>	DISTANCE (<u>m)</u>
	MON 557		211 47 0	7.U		737.8	7	224.9	03
	MOIN-559		34 40 5	5.0		332.9	5	101.4	83
STATION	ESCRIPTIC	DN:					State and		CAN CANADA SAN A
OTATION L	Loonin me							N AMAC	
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LOCATIO	N PLAN				_				
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	K 1M	1.11		s 🌒					
SURVEYE	D BY:	JMT	ENGINEERING					SPARK	S. MARYLAND



BWI THURGOOD MARSHALL AIRPORT-SECONDARY SURVEY CONTROL DATA NAME OF STATION: MON-558 DATE ESTABLISHED: MAY 2003 NGS PID: DJ9001 **READJUSTED JUNE 2008** National Geodetic Survey, Retrieval Date = JUNE 24, 2008 1 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 41 906 (meters) 137 49 DJ9001* NAVD 88 -(feet) ADJUSTED DJ9001 DJ9001 GEOID HEIGHT--32.69 (meters) GEOIDD3 41.884 (meters) 137.41 (feet) COMP DJ9001 DYNAMIC HT -DJ9001 DINAMIC HI - 41884 (meter) DJ9001 MODELED GRAV- 980,093 5 (mgal) NAVD 88 DJ9001 DJ9001 VERT ORDER - FIRST CLASS II D-19001 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 DJ19001 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

JMT ENGINEERING

NAME OF STATIC	N: MON-	558		DATE ESTABLISHED: MAY 2003
NGS PID:	DJ900)1		READJUSTED JUNE 2008
DJ9001				
DJ9001 H	ISTORY	- Date	Condition	Report By
DJ9001 H	ISTORY	- 200305	MONUMENTE	D WHBCXM
DJ9001 H	ISTORY	- 20071101	GOOD	JARICE
DJ9001				
DJ9001			STATION	DESCRIPTION
DJ9001				
DJ9001'DE	SCRIBED B	BY J A RICE I	NC 2007 (M	RA)
DJ9001'TH	E MARK IS	LOCATED ABO	UT 4 0 MI	(6.5 KM) SOUTH-SOUTHEAST OF RELAY,
DJ9001'3.	6 MI (5.8	KM) SOUTHEA:	ST OF ELKR	IDGE AND 3.5 MI (5.6 KM)
DJ9001'EA	ST-SOUTHE	AST OF HANOV	ER AT BALT	IMORE WASHINGTON INTERNATIONAL
DJ9001 AI	RPORT. C	CONTACT AIRPO	RT OPERATI	ONS AT 410-859-7018 FOR ACCESS TO THE
DJ9001'MA	.RK.			
DJ9001'				
DJ9001'IT	' IS IN TH	IE CENTER OF	A GRASS IS	LAND BETWEEN TAXIWAY 'A' AND RUNWAY
DJ9001'4/	22, 69.3	FT (21.1 M)	EAST-SOUTH	EAST OF THE EAST-SOUTHEAST EDGE OF
DJ9001'TA	XIWAY 'A'	, 186.0 FT (56.7 M) NO	RTHWEST OF THE CENTERLINE OF RUNWAY
DJ9001'4/	22, 72.4	FT (22.1 M)	NORTHWEST	OF AN ELECTRICAL MANHOLE, 60.5 FT
DJ9001'(1	8.4 M) NC	ORTH OF AN EL	ECTRICAL M	ANHOLE AND 24.5 FT (7.5 M) NORTH OF A
DJ9001'DR	AINAGE IN	ILET.		
DJ9001'				
DJ9001'NC	TEACCES	S TO THE DAT	UM POINT I	S THROUGH & 5-INCH (13 CM) LOGO CAP

BWI	THURGO	DOD	MARSHAL	L AIRPORT	-SECON	DARY SU	RVEY CONTRO	OL DATA
NAME OF S	STATION:	MON	-559		DATE EST	ABLISHED:	MAY 2003	
NGS PID:		DJ90	00		1		READJUSTED JUN	E 2008
MARYLAN		LANE C	OURDINATES	5 (NAD 83):	EE1000.01	110 4	100000	160 -
	EASTING	α(τ): (X)•			1408328 201	5 US II. 5 US ff	100006	.102 III 326 m
*	OPTHOM			0.99)	127 09		420200	790 m
	CONVERC	GENCE	ANGLE:	u 00j.	107.000	00°12'45 14'	41	.702 11
	COMBINE	D SCAL	E FACTOR:			0.99996244		
GEOGRAP	HIC COORI	DINATE	S (NAD 83):	2091046 01 45				
		L: DE:		39-10 46.8145	5 (IN) 5" (\\/)			
	ELLIPSO	D HT:		29.8	5 US ft.	9.098	m	
						0.000		
AVAILABLI	E CONVEN	TIONAL	BACKSIGHT	POINTS (COMI	PUTED DATA	.):		
	POINT		GEODETIC	AZIMUTH	DISTA	NCE (US FT.)	DISTANCE	<u>(m)</u>
	MON-558		214°40	155.U		332.95	101	.483
	006-11010		27 03	00.7		541.05	164	.910
STATION D	ESCRIPTIC	ON:						MX SONZAN
		עופט					A Comment	
		WITH	BERSTEN TO	OP SECURITY S)		
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							a 11	
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LOCATIO	N PLAN							
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AND			. ?	JELIN N		/	2	
13 111	1/2/07	X		A Lak	DE1	ANSTEN TOP SECU		
1 2 2 1	11/3/1	1	· */	1311/2	₩, ¥, ^{SL}	EVE ROD MONUM	ENT OUT	
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-7 /2/1	NUN	1-160	A BERNER	1/2/15.	BONK KPT NOT	~ since 44.52		
= ¥	111			E ANSO		CONC	♥	
RUNWAY 10.502 x	- 11L	2.	-7:6	1		Щſ	GRASS /	
(NSS'47'W (ROE)	102/112				A V	- DRCP INLET	Ē	
	NO 25 /11		U/Alan	conf to says	7		12	
	///	N.	SX1/M	1 1000 12 J	4		HAND	
TO DOG	RIX	NI	11/2 (: (BWI-F PACS			/ *	
SURVEYE	DBY:	JMT	ENGINEERIN	G			SPAR	KS. MARYLAND


	DN: MON-55	i9		DATE EST	TABLISHED	: MAY 2003	}
PID:	DJ9000					READJUS	TED JUNE 2008
1	National	Geodetic :	Survey, D	Retrieval Da	ate = JUN	E 24. 2008	}
D19000) *******	******	******	* * * * * * * * * * * *	******	****	*******
DJ9000	DESIGNATI	ON - 559					
DJ9000) PID	- DJ90	000				
D19000) STATE/COU	NTY- MD/J	ANNE ARUNDI	EL			
DJ9000	USGS QUAD	- RELJ	AY (1974)				
DJ9000	j –						
DJ900(J		*CURR	ENT SURVEY (CONTROL		
D39000)						
DJ9000)* NAD 83 (19	86)- 39 :	10 46.	(N) 076	39 40.	(W)	SCALED
DJ9000)* NAVD 88	-	41 782	(meters)	137.08	(feet)	ADJUSTED
DJ9000)						
DJ9000) GEOID HEI	GHT-	-32 69	(meters)			GEOIDO3
DJ9000) DYNAMIC H	т –	41.76) (meters)	137.0	1 (feet)	COMP
D19000) MODELED G	RAV- 9	980,093.5	(mgal)			NAVD 88
DJ9000)						
DJ9000) VERT ORDE	R - FIRS	ST CLA:	SS II			
DJ9000)						
DJ900().The horizo:	ntal coord	inates we	re scaled fi	rom a top	ographic m	ap and have
DJ9000).an estimat	ed accurac	cy of +/-	6 seconds.			
DJ900()						
DJ900().The orthom	etric hei;	yht was de	termined by	differer	tial level	ing
DJ900().and adjust	ed in June	2008.				
DJ900().No vertica	l observat	cional che	ck was made	to the s	tation.	
DJ900()						
DJ9000	.The geoid	height was	s determin	ed by GEOID	03.		
DJ900()						
DJ900().The dynami	c height :	is compute	d by dividi:	ng the Ni	VD 88	
DJ900() _* geopotenti	al number	by the no	rmal gravit	y value d	computed or	h the
DJ9000).Geodetic R	eference 🖇	System of	1980 (GRS 8	O) ellips	oid at 45	
DJ900() degrees la	titude (g	= 980.619	9 gals).			
DJ900(J						
D1900(.The modele	d gravity	was inter	polated from	m observe	d gravity	values.
DJ900()						
D1900();		North	East	Units	Estimated	Accuracy
D1900);SPC MD	- 16	7,980.	429,280.	MT	(+/- 180 n	meters Scaled
DJ900()						
DJ900()		SUPE	RSEDED SURV	EY CONTRO)L	
DJ9001	C						
DJ900() No superse	ded surve	y control	is availabl	e for th:	ls station.	
DJ900	C						
DJ900f	J_U_S. NATIO	NAL GRID S	SPATIAL AD	DRESS: 18SU	J565380 (I	IAD 83)	
DJ900)_MARKER: F	= FLANGE-1	ENCASED RO	D			
	SETTING: 4	9 = STAIN!	LESS STEEL	ROD W/O SL	EEVE (10	FT.+)	
DJ9004) STAMPING:	559 2003					
DJ900) DJ900)	and the second se	• FLUSH					
DJ900 DJ900 DJ900	PROJECTION	. I LOOM					
DJ900 DJ900 DJ900) PROJECTION) MAGNETIC:	I = MARKE	R IS A STE	EL ROD			
DJ900 DJ900 DJ900 DJ900) PROJECTION) MAGNETIC:) STABILITY:	I = MARKE: B = PROB.	R IS A STE ABLY HOLD	EL ROD POSITION/EL	EVATION (JELL	
DJ300 DJ300 DJ300 DJ300 DJ300 DJ300)_PROJECTION)_MAGNETIC:)_STABILITY:)_SATELLITE:	I = MARKE: B = PROB. THE SITE	R IS A STE ABLY HOLD LOCATION	EL ROD POSITION/EL WAS REPORTE	EVATION U D AS SUIT	JELL FABLE FOR	
D1900 D1900 D1900 D1900 D1900 D1900 D1900)_PROJECTION)_MAGNETIC:)_STABILITY:)_SATELLITE:)+SATELLITE:	I = MARKE: B = PROB. THE SITE SATELLIT	R IS A STE ABLY HOLD LOCATION E OBSERVAT	EL ROD POSITION/EL WAS REPORTE IONS - Nove:	EVATION U D AS SUIT mber 01,	JELL FABLE FOR 2007	
D7300 D7300 D7300 D7300 D7300 D7300 D7300 D7300)_PROJECTION)_MAGNETIC:)_STABILITY:)_SATELLITE:)+SATELLITE:)	I = MARKE B = PROB. THE SITE SATELLIT	R IS A STE ABLY HOLD LOCATION E OBSERVAT	el ROD POSITION/EL WAS REPORTE IONS - Nove	EVATION 1 D AS SUI mber 01,	JELL FABLE FOR 2007	
D7300 D7300 D7300 D7300 D7300 D7300 D7300 D7300 D7300) PROJECTION) MAGNETIC:) STABILITY:) SATELLITE:)+SATELLITE:)) HISTORY	I = MARKE: B = PROB. THE SITE SATELLIT - Date	R IS & STE ABLY HOLD LOCATION E OBSERVAT Condi	EL ROD POSITION/EL WAS REPORTE IONS - Nove tion	EVATION (D AS SUI) mber 01, Report)	JELL FABLE FOR 2007 By	
D1800 D1800 D1800 D1800 D1800 D1800 D1800 D1800 D1800 D1800	DPROJECTION DAGNETIC: DSTABILITY: DSATELLITE: D+SATELLITE: DHISTORY HISTORY	I = MARKE: B = PROB. THE SITE SATELLIT - Date - 20030	R IS A STE ABLY HOLD LOCATION E OBSERVAT Condi D5 MONUM	EL ROD POSITION/EL WAS REPORTE IONS - Nove tion ENTED	EVATION N D AS SUI mber 01, Report D WHBCXM	IELL FABLE FOR 2007 By	
D1800 D1800 D1800 D1800 D1800 D1800 D1800 D1800 D1800 D1800	D_PROJECTION D_MAGNETIC: D_STABILITY: D_SATELLITE: D+SATELLITE: D HISTORY D HISTORY D HISTORY D HISTORY	I = MARKE B = PROB. THE SITE SATELLIT - Date - 20030 - 2007	R IS A STE ABLY HOLD LOCATION E OBSERVAT Condi D5 MONUM 1101 GOOD	EL ROD POSITION/EL WAS REPORTE IONS - Nove tion ENTED	EVATION (D AS SUIT mber 01, Report 1 WHBCXM JARICE	IELL FABLE FOR 2007 By	

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'DESCRIBED BY J & 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.





BWI THURGOOD MARSHALL AIRPORT-SECONDARY SURVEY CONTROL DATA NAME OF STATION: MON-560 DATE ESTABLISHED: MAY 2003 NGS PID: DJ8999 **READJUSTED JUNE 2008** National Geodetic Survey, Retrieval Date = JUNE 24, 2008 1 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 D.T8999 -32.69 (meters) DJ8999 GEOID HEIGHT-GEOIDO3 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; East North 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

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

DJ8999

STATION DESCRIPTION

DJ8999'DESCRIBED BY J & RICE INC 2007 (MRA) DJ8999'DESCRIBED BY J & 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'AND 37 DJ8999'

DJ8999'NOTE--ACCESS TO THE DATUM POINT IS THROUGH A 5-INCH (13 CM) LOGO CAP.

BWI ⁻	THURGO	DOD MARSHAL	L AIRPORT	-SECON	DARY SU	RVEY CONTR	OL DATA
NAME OF S	STATION:	MON-561		DATE EST	ABLISHED:	MAY 2003	
NGS PID:		DJ8998				READJUSTED JUN	IE 2008
MARYLANI	D STATE P		S (NAD 83):				
	NORTHIN	G (Y):		552359.49	4 US ft.	168359	9.511 m
	EASTING	(X):		1408073.44	4 US ft.	42918	1.644 m
	ORTHOM	ETRIC HEIGHT (NAV	D 88):	140.58	4 US ft.	42	2.850 m
	CONVERG	GENCE ANGLE:			00°12'43.14"		
	COMBINE	D SCALE FACTOR:			0.99996257		
GEOGRAP	HIC COORI	NATES (NAD 83)					
acountri	LATITUDE	:	39°10'58 28222	2" (N)			
	LONGITU	DE:	76°39'44.09397	- () 7" (W)			
	ELLIPSOI	D HT:	33.3	6 US ft.	10.168	m	
AVAILABL	E CONVEN	TIONAL BACKSIGHT	POINTS (COMF	PUTED DATA	A):		
	POINT	GEODETIC	<u>; AZIMUTH</u>	<u>DISTA</u>	NCE (US FT.)	DISTANCI	<u>E (m)</u>
	MON-560	143°4	7'20.7'		840.79	256	6.273
	MON-562	288°58	3'08.9'		1425.29	434	4.429
	BMID	327°19	9'25.6'		1473.10	449	9.003
STATION							AND AN A AND AN AND
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RUNWAY 10,502 x. (N85'47'W TRUE)	700	tit	ta	IV	5.	BERNSTEN	TOP SECURITY
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may	RIX		BWI-F PACS			\backslash	
SURVEYE	D BY:	JMT ENGINEERIN	IG			SPA	RKS. MARYLAND



BWI THURGOOD MARSHALL AIRPORT-SECONDARY SURVEY CONTROL DATA NAME OF STATION: DATE ESTABLISHED: MAY 2003 MON-561 NGS PID: DJ8998 **READJUSTED JUNE 2008** National Geodetic Survey, Retrieval Date = JUNE 24, 2008 1 DJ8998 DESIGNATION - 561 DJ8998 PID - DJ8998 DJ8998 STATE/COUNTY- MD/ANNE ARUNDEL DJ8998 USGS QUAD - RELAY (1974) D.18998 DJ8998 *CURRENT SURVEY CONTROL DJ8998 DJ8998* NAD 83(1986)- 39 10 58. (N) 076 39 44 (ឃ) SCALED DJ8998* NAVD 88 -42.850 (meters) 140.58 (feet) ADJUSTED D.18998 DJ8998 GEOID HEIGHT- -32.68 (meters) GEOIDO3 DJ8998 DYNAMIC HT -42 827 (meters) 140 51 (feet) COMP 980,094.1 (mgal) DJ8998 MODELED GRAV-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. D.18998 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 SUPERSEDED SURVEY CONTROL DJ8998 D.18998 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

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

DJ8998 DJ8998 STATION DESCRIPTION DJ8998 DJ8998'DESCRIBED BY J & 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 & GRASS ISLAND BETWEEN TWO TAXIWAYS AT THE WEST EDGE OF A DJ8998'DITCH, 217 O 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.

BWI THURGOOD MARSHALL AIRPORT	-SECONDARY SURVEY CONTROL DATA
NAME OF STATION: MON-562	DATE ESTABLISHED: MAY 2003
NGS PID: DJ8997	READJUSTED JUNE 2008
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	' (Ŵ)
ELLIPSOID HT: 46.74	US ft. 14.246 m
AVAILABLE CONVENTIONAL BACKSIGHT POINTS (COMP	
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 MONU	MENT
WITH BERSTEN TOP SECURITY S	
SEE ATTACHED NGS DATASHEET	5
LOCATION PLAN	
BWI-D SACS	>
	DETAIL MAP
	JAY VAL
	TAXON
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L But It I BUILD	GRASS
A la	
AL-1 - 1.39 - 37 - 11/161	BERNSTEN TOP SECURITY
	MON-562
	GRASS
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Marine VIX 2 Conferration	
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SURVEYED BY: JMT ENGINEERING	SPARKS, MARYLAND

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BWI THURGOOD MARSHALL AIRPORT-SECONDARY SURVEY CONTROL DATA NAME OF STATION: MON-562 DATE ESTABLISHED: MAY 2003 DJ8997 NGS PID: **READJUSTED JUNE 2008** 1 National Geodetic Survey, Retrieval Date = JUNE 24, 2008 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 -32.67 (meters) DJ8997 GEOID HEIGHT-GEOIDO3 46.890 (meters) DJ8997 DYNAMIC HT -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

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 & 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-NORTHUEST OF AN ELECTRICAL TRANSFORMER DJ8997'NUMBERED 86-035 30 021 A, 37.5 FT (11.4 M) NORTHEAST OF THE CENTERLINE DJ8997'OF & SERVICE ROAD, 36.4 FT (11.1 M) WEST OF THE NORTHEAST END OF & 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.





BWI THURC	OOD MARSHALL AIR	PORT-RUNWAY	CENTERLINE	MONUMENTS
NAME OF STATION:	MAA-102	DATE ESTABI	LISHED: OCTOBER	2007
MARYLAND STATE P NORTHIN EASTING ORTHOM CONVER COMBINE	LANE COORDINATES (NAD 83) G (Y): (X): ETRIC HEIGHT (NAVD 88): GENCE ANGLE: ID SCALE FACTOR:			
GEOGRAPHIC COOR LATITUDI LONGITU ELLIPSOI	DINATES (NAD 83): E: 39° 09' DE: 76° 39' D HT:	50.17" (N) 43.67" (W) 21 US ft.	6.4 m	
AVAILABLE CONVEN <u>POINT</u> MAA-103	TIONAL BACKSIGHT POINTS (GEODETIC AZIMUTH	COMPUTED DATA): DISTANCE	<u>E (US FT.)</u> 200	e <mark>ISTANCE (m)</mark> 61.0
STATION DESCRIPTION	DN:			
*** SHALL NOT BE (THIS POINT IS IN RUNWA	DCCUPIED FOR SURVEY CONT TENDED FOR RECOVERY OF T Y CENTERLINE ONLY ***	ROL. HE		
CENTERL RUNWAY ±50' FROM E RUNWAY PA	INE 33L ND OF AVING			
				DETAIL MAP
	FOR NAVGATION PURPOSE NORTHING 545468.4 US ft.	S ONLY	12/1	
			33 	MAA-102 MAA-103
SURVEYED BY:	JMT ENGINEERING			SPARKS, MARYLAN











BWI THURGOOD MARSHALL AIRPORT	-RUNWAY CENTERLINE MONUMENTS
NAME OF STATION: MAA-108	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" LONGITUDE: 76° 40' 17.17" ELLIPSOID HT: 38	(N) (W) US ft. 11.6 m
AVAILABLE CONVENTIONAL BACKSIGHT POINTS (COMPU <u>POINT</u> MAA-109 RUNWAY	JTED DATA): <u>DISTANCE (US FT.)</u> 225 68.5 4-22
80 St - 107	
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	MAA- BOR CENTERST
FOR NAVGATION PURPOSES ONLY NORTHING 546500.3 US ft.+/- EASTING 1405489.7 US ft.+/-	Y MAA-108 MAA-109
SURVEYED BY: JMT ENGINEERING	SPARKS, MARYLAN







	DATE ESTADI (SHED: OCTODED 0007
	DATE ESTABLISHED: UCTUBER 2007
NORTHING (V).	
FASTING (Y).	
COMBINED SCALE FACTOR	
COMPARED SOALE I ACTOR.	
EOGRAPHIC COORDINATES (NAD 83)	
LATITUDE: 39° 11' 14.8	30" (N)
LONGITUDE: 76° 39' 48 9	28" (W)
ELLIPSOID HT:	33 US ft. 10.0 m
VAILABLE CONVENTIONAL BACKSIGHT POINTS (COM	IPUTED DATA):
POINT GEODETIC AZIMUTH	DISTANCE (US FT.) DISTANCE (m)
MAA-113	240 73.1
KUNWAY	15L-33K
*** SHALL NOT BE OCCUPIED FOR SURVEY CONTROL	- ENER
THIS POINT IS INTENDED FOR RECOVERY OF THE	100 ADI
RUNWAY CENTERLINE ONLY ***	AASTID.
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	and an instant
CENTERLINE	and the second
RUNWAY 15L	
+32' FROM END OF	
RUNWAT PAVING	
LUCATION PLAN	
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No Libert	
SURVEYED BY: JMT ENGINEERING	SPARKS, MARYL

BWI THURGOOD MARSHALL AIRPOR	T-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 LONGITUDE: 76° 39' 50.76 ELLIPSOID HT: 24	2" (N) 5" (W) 8 US ft. 8.6 m
AVAILABLE CONVENTIONAL BACKSIGHT POINTS (COMP <u>POINT</u> MAA-112 RIINWAY 1	PUTED DATA): <u>DISTANCE (US FT.)</u> 240 73.1 ISI_33R
STATION DESCRIPTION:	
*** SHALL NOT BE OCCUPIED FOR SURVEY CONTROL. THIS POINT IS INTENDED FOR RECOVERY OF THE RUNWAY CENTERLINE ONLY ***	TURNE OBER - 2
CENTERLINE RUNWAY 15L ±272' FROM END OF RUNWAY PAVING	Contraction of the second s
FOR NAVGATION PURPOSES ONI NORTHING 554223.4 US ft.+/-	LY DETAIL MAP
	C A. MAA-V13
	MAA-112 0 11 1
	BWI D SACS
SUBVEYED BY: JMT ENGINEEBING	SPARKS MARYLAND





APPENDIX F

RESTROOM DESIGN CUT SHEETS





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NOTE:

Manufacturers' product illustrations included in this Appendix have been selected as representative of products complying with this Standard, and are not intended to restrict or otherwise limit selection of individual products to those manufacturers:

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STAINLESS STEEL TOILET ENCLOSURES

THE CORINTHIAN METPAR TYPE: FP-500

Overhead Braced

MATERIALS: Stainless Steel Type 304

THICKNESS: Doors...... 22 Gauge, Finished to 1" (25.4mm)

Panels...... 20 Gauge, Finished to 1" (25.4mm)

Pilasters...... 20 Gauge, Finished to 1 ¼" (31.75mm)



Click on image to full size v the detail

CONSTRUCTION:

Doors:

Finished to 1" (25.4) thick, constructed of two sheets of 22-gauge, type 304 stainless steel formed and cemented under press honeycomb core. Door face sheets are welded at intervals around the entire perimeter. All edges to be finished with a 20-gi stainless steel interlocking molding. Corners are finished with pre-formed stainless steel (type 304) reinforcements. Doors s internal steel reinforcements to secure hardware items.

Panels:

Finished to 1" (25.4) thick, constructed of 2 sheets of 20-gauge type 304 stainless steel, formed and cemented under pressure honeycomb core. All partition edges are finished with a 20-gauge stainless steel interlocking molding. Corners will be finish pre-formed stainless steel (type 304) reinforcements.

Pilasters:

Finished to $1\frac{1}{4}$ " (31.75) thick, constructed of two sheets of 20-gauge, type 304 stainless steel, formed and assembled with a honeycomb core. Face sheets are electrically welded at intervals around the entire perimeter. All pilasters will have a 3" (7, #4 finish stainless steel plinth (18-8 type 304) and have straight, flat sides profile with rounded edges to match the pilaster pr Pilasters will have leveling bolts threaded to the pilaster support bracket. Floor mounting will be with #12 x $2\frac{1}{2}$ " (63.5) scre shields. Headrail is anodized aluminum .050" (1.27) wall thickness with anti-grip profile. The headrail is set into a 16ga. chr reinforcement which occupies the full width of the pilaster and is electrically welded in place for maximum strength.

FITTINGS:

Wall fittings are die cast chrome plated.

HARDWARE:

Each compartment will be complete with all hardware, door hinges, latch, stop and keeper, coat hook, as well as all necessar and fastenings for a complete installation. Hinges and door strikes are fastened by means of tamper- proof Torx-Pin Head t

bolts, which are polished chrome plated. All other screws to be tamper-proof Torx-PinHead chrome plated. Doors are to be concealed, "stay-set", fully adjustable, non-rising door mechanism. Upper hinge pin shall be 3/8" (9.525) diameter steel. All will have wrap-around flanges with a minimum of 5/8" (15.875) wrap onto pilaster. All doors will have a concealed ADA as slide latch with external "in-use" indicator.

FINISH:

All stainless steel material will have a #4 satin finish.

Baker	MICHAEL BAKER JR. INC. 801 Cromwell Park Drive Suite 110 Glea Burnie, MD 21061	PROJECT TITLE RESTR SHEET TITLE TOILET PART	ROOM DESIGN STANDARDS ITIONS AND DOOR HARDWARE-2	PROJECT NO. TASK 1314.20
		^{SCALE} NONE	DATE MARCH 2005	B-2




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MICHAEL BAKER JR. INC. PROJECT TITLE PROJECT TITLE PROJECT NO. MICHAEL BAKER JR. INC. Sol Cronwell Park Drive SHEET TITLE TASK 1314. Sheet Title TOILET PARTITIONS AND DOOR HARDWARE-6 TASK 1314.	and a state of the	Orea Durinty, MD 21001	SCALE	NONE DATE MADCH	2005	B-6

The Mills company offer 3 styles of toilet partitions and 2 styles of urinal screens

Sentinel Overhead Braced

Provides the most economical solution for heavy traffic or vandalism prone areas.



Floor Braced

The floor based compliments design with functional performance. This model is recommended with areas with high ceilings.

Ceiling Hung

The ceiling hung system is ideal for areas with low ceilings. This models fast and easy maintenance .



Urinal Screens

These two styles available are wall mount. Available in baked enamel or stainless steel.

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FAST TRACK 48 Hour Shipping In #4 Satin Finish. Floor Anchored/Overhead Braced, Floor Anchored, and Celling Hung. Call for details

Global Stainless Steel

GLOBAL stainlees steel toilet partitions are virtually indestructible and retain their gleaming beauty indefinitely. These units combine the strength of #304 stainless steel with a #4 stain finish or textured finish, formed and bonded to a honeycomb core. The face sheets are held rigid and permanently in place by an interlocking strip welded at each corner.

GLOBAL stainless steel compontents are impervious to just about any substance. Even scratches caused by deliberate vandalism can be removed by buffing. The elegance of GLOBAL stainless steel compontents complements any design scheme, either in new construction or for renovations.

View Specifications/Drawings Care and Maintenance Instructions



Honeycomb Core is made of cellular honeycomb. This type of core provides strong construction, maximum adhesion, and prevents delamination.



Welded Corners Corners of panels, pilasters and doors are welded to each other and to the adjacent face sheets



Construction Features

Theft - Resistant Fasteners Special driver installs fasteners which virtually eliminates unauthorized removal and ensure easy installation.





Options:

Plywood Core

No Sight Line

Eastern Style Height

Full Height Aluminum Brackets

Full Height Stainless Steel Brackets

Home | Materials & Colors | Specifications | Care & Maintenance | Contact Us

Baker	MICHAEL BAKER JR. INC. 801 Cromwell Park Drive Suite 110 Gen Parrie MD 21061	PROJECT TITLE SHEET TITLE T	RESTROOM OILET PARTITIO	DESI NS AN	GN STANDARDS D DOOR HARDWARE-8	PROJECT NO. TASK 1314.20
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Concealed Latch With emergency access and ADA lever handle.



Pilaster Mounting Pilaster adjustments, with floor-mounted jack-leveling device, are used on Embassy pilasters.

Gravity-positioning hinge provides safe, durable and maintenance-free support.

Bottom Door

Hinge



Alternate Pilaster Mounting This type of mounting is furnished on all Imperial and Regal pilasaters.

Upper Door Bracket

attached to the pilaster.

Bracket is an internal part of the door. A pin goes through the door and bracket

for three point bearing and operates in a nylon bushing in upper hinge bracket

One-piece stainless steel, type304, with #4 satin finish trim shoes are hemmed top and bottom for rigidity and sleek

Shee Construction appearance.

FLOOR ANCHORED/OVERHEAD BRACED TOILET COMPARTMENTS STAINLESS STEEL - TEXTURED LEATHER GRAIN



PART-1 GENERAL 1.01 DESCRIPTION

8.

- Textured leather grain stainless steal compartment work includes the following: A.
- Floor anchored/overhead braced partitions.
- Furnish all labor and materials necessary for the completion of work in this section as shown on the contract
- drawings and specified herein
- c. Work in this section shall include but is not limited to:
 - **Toilet** compartments Ź.
 - Hardware for toilet compartments
 - З, Shop drawings and working drawings Manufacturer's guarantee
- Related work specified elsewhere shall include accessories and anchorage/blocking for attachment of D.
- compartments 1.02 PRODUCTS
 - Submittel of shop drawings and details, for architects approval.
 - A sample of textured leather grain finish stainless steel and hardware samples shall be submitted for approval to the architect upon request. В.

PART-2 PRODUCTS

2.01 MANUFACTURER

Toilet compartments to be supplied by Global Steel Products Corp., Deer Park, New York 11729.

- 2.02 MATERIALS A.
 - Doors and panels shall be 1* thick, constructed of two sheets of 22-gauge, textured leather grain, stretcherleveled quality stainless steel formed and bonded under pressure with a non-foxic adhesive to a full-face honeycomb core.
- Pilasters shall be 1-1/4", constructed of two sheets of 22-gauge, textured leather grain finish stainless steet, 8. formed and bonded under pressure with a non-toxic adhesive to a full-face honeycomb core 2.03 CONSTRUCTION
- - Doors and panels shall be 1° thick. Panels over 48° shall be menufactured with four (4) face sheets (2) sheets aach side, seamed and spot weided together. The edges shall be sealed with a 22-geuge, stainless steel interlocking molding. Molding corners shall be welded to each other and to face sheets, and ground smooth to form a rigid frame around the component. A.
 - Pilasters shall be 1.14th hick. Edges shall be sealed with 22-gauge stainless steel interlocking molding. An inverted stirrup with a jack boil for leveling during installation and permanent height adjustment shall be welded within the base of each pilaster. "L" brackets shall be coupled to the stirrup bracket and floor for full range B. adjustment. A shoe shall conceal each mounting, having an internal cross section conforming to the pilaster.
 - Headrail shall be provided to bridge all compartments and brace the end freestanding pllasters to the wall; the

headrail to comprise anodized eluminum with satin finish, contoured to provide anti-grip features. 2.04 HARDWARE (NOTE: Refer to the ORDER INFORMATION CONTRACT for specific hardware to be supplied on your

- A. All exposed door hardware shall be of chromium-plated discast Zamao and shall be as noted;
 1. Upper door hinge is recessed and interfocked in door and includes a nylon pin within the plane of the door. Lower door hings is receased in door and includes mating hox and pintle nylon cams, which provide the bearing surface. The cams are adjusted to allow the door to rest at any position within a 270-degree range. Door hardware shall include a coat hook, bumper, a stop, keeper, and a concealed latch with emergency
 - 2.access.
 - Fasteners shall be of chrome-plated steel; door hinges will be mounted with theft-proof barrel nuts and 3.
 - machine screws; hooks and handles will be mounted with helt-proof, full-thread screws. Wall brackets shall be secured to walls with anchoring and/or expansion shields.
- B. Pilaster shoes shall be of type 304 stainless steel having a #4 finish.

PART-3 EXECUTION

- 3.01 PREPARATION
 - A. Examine areas to receive toget compariments for correct height and spacing of anchorage/blocking and
 - plumbing fixtures that may affect installation of comparison results and graving any discrepancies to the architect. Take complete and accurate measurements of complete toilet comparison tocations.
 - ₿.
 - Start of work constitutes acceptance of job.
 - 3.02 INSTALLATION
 - Install compartments in a rigid, straight, plumb and level manner as shown on the shop drawings and manufacturer's installation instructions. A.
 - R All doors and panels to be mounted at 12" above the finished floor unless otherwise specified.

 - Clearance at vertical edges of door shall be uniform top to boltom. No evidence of cutting, drilling and/or patching shall be visible on the finished work F.
 - Finished surfaces shall be cleaned after installation and be left free of all imperfections P
- 3.03 WARRANTY
 - Global Steel Products Corp. guarantees its textured leather grain stainless steel units, property maintained, against corrosion or discoloration for 5 years from the date of receipt by the customer. If materials are found defective during that period for the reasons listed above, the material will be replaced free of charge. No credits Α. or allowances will be issued for any labor or expenses relating to the replacement of components covered under the warranty plan. All such expenses are to be borne by the buyer.

2.17

	MICHAEL BAKER JR. INC.	PROJECT	TTLE RES	FROOM DES	IGN STANDARDS	PROJECT NO. TASK 1314.20
Baker	Suite 110 Glen Burnie, MD 21061	SHEET TIT	TOILET PA	ARTITIONS AN	DOOR HARDWARE-9 MARCH 2005	B-9





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SCALE

DATE NONE

MARCH 2005

B-11

TP HINGES

- Continuous Partition Hinges are Durable Add years of maintenance-free operation to any partition system.
- Support Partition Doors Along Their Entire Length -Markar TP Hinges run the complete length of the door to distribute weight evenly.
- Add Rigidity to Ceiling Hung Partitions Projects that require this type of mounting procedure need the added support given by the TP Hinge.
- Eliminate Open "Sight-Lines" Continuous hinge surfaces maximize privacy by eliminating visual intrusion. There are no openings along the hinge.
- □ Ideal for Damp or Corrosive Environments -Fabricated from heavy-duty 14 gauge 304 stainless steel or 6463-T5 anodized atuminum.
- Adjustable Spring-Loaded Hinges Torx Tip Cap adjusts the internal mechanism to close the partition door tightly, or to keep the door open to show vacancy.
- Left or Right-Handed All partition hinges can be used on either side of the door.

Continuous Pin and Barrel type hinges have been engineered to withstand the extraordinary abuse and heavy traffic associated with toilet partition doors. Various models, designed to be function-specific, are constructed from heavy gauge stainless steel or aluminum. Markar Continuous Hinges distribute door weight and stress along the entire length of the door, so partition doors operate dependably year after year. Maintenance expense is dramatically reduced.

In addition to their strength and durability, TP Hinges provide important benefits. When less expensive multi-part hinge systems are used on partitions, they leave a gap along the door "sight-line", thus exposing the occupant. Markar's Continuous Hinge alternatives have twenty-eight bearing surfaces which eliminate the gap or sight-line completely.

To comply with ADA requirements many TP Hinge models are available with internal spring mechanisms. The adjustable Torx Tip Cap included with spring-loaded hinges permits the door to swing either fully closed or to a predetermined position.

To help prevent vandalism, certain models include a tamper-resistant Finishing Cover Cap that conceals all mounting hardware. TP Hinges provide safety and security while giving the toilet partition a clean appearance. For data on specific models, please request Data Sheet Series TP Hinge.

Torx Tip Cap shown with adjus ting tools and setting pins.

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Scranton, PA

otographed at Comtec Industries.

L .	MICHAEL BAKER JR. INC. 801 Cronwell Park Drive	PROJECT T	RESTROOM	DESI	GN STANDARDS	Π	PROJECT NO. TASK 1314.20
Baker	Suite 110 Glea Burnie, MD 21061	SHEET TIT	TOILET PARTITIO	NS AN	D DOOR HARDWARE-12		D 12
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Edge Mount



Ideal for use in damp or corrosive environments, this hinge was designed for 1-3/4" stainless steel doors and frames. The addition of optional tamper proof security screws make this an excellent hinge for abusive traffic.



FM-900-TP Spring-Loaded FM-500-TP Edge Mount

Standard Features

Material

Heavy-duty 14 gauge 304 stainless steel.

Finishes

US 32D satin stainless steel (630).

Pin and Barrel Type Hinge

- · 1/4" diameter stainless steel pin.
- · Long-life split nyton bearings. · 28 bearing surfaces.

Torx Adjusting Screw

- (with Spring Loaded hinges only) · Torx tip cap.
- · Internal stainless steel spring mechanism.
- · Adjust tension on door to close tightly for out-swinging ADA compliance. • Allows door to stay open in predeter-
- mined position.

Mounting Hardware

- · 10-24 flat head stainless steel
- machine screws.
- · No exposed mounting hardware.

Capacity

Supports weights up to 80 lbs.

Sizes

54" and 57"

Non-Handed

Use the same hinge for right or left handed doors.

Optional Features

- · US 32 bright polished staintess steel (629).
- 84 powder coated paint colors. Custom lengths (in Inches). Custom hole pattern.

- · Tamper-proof security screws.

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	Suite 110 Glea Burnie, MD 21061	TOILET PART	ITIONS AND DOOR HARDWARE-13	B-13
		SCALE NONE	DATE MARCH 2005	



FS-901-TP 1/8" Offset Spring-Loaded FS-501-TP 1/8" Offset

Full Surface





This hinge is to be used with a 1-1/4" pilaster and 1" door assembly. Stainless steel continuous toilet partitions are excellent for retrofit or constructing a new facility, where a high volume of abusive traffic can be found.



Standard Features

Material

Heavy-duty 14 gauge 304 stainless steet.

Finishes

US 32D brushed stainless steel (630).

Pin and Barrel Type Hinge

- · 1/4" diameter stainless steet pin.
- · Long-life split nylon bearings.
- · 28 bearing surfaces.

Torx Adjusting Screw

- (with Spring-Loaded hinges only)

- Adjust tension on door to close tightly
- for out-swinging ADA compliance, Allows door to stay open in predetermined position.

Mounting Hardware

- 1/4 20 pan head machine screws.
- -Cover caps conceal all mounting hardware.

Capacity

Supports weights up to 80 lbs.

Sizes

54" and 57"

Non-Handed Use the same hinge for right or left handed doors.

Optional Features

84 powder coated paint colors
Custom lengths (in inches).
Custom hole pattern.

- · Tamper-proof security screws.

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Baker MICHA 801 Cro Suite 11 Gten Bu	MICHAEL BAKER JR. INC. 801 Cromwell Park Drive	PROJECT T	ITLE RESTROOM	DESI	GN STANDARDS	project no. TASK 1314.20
	Suite 110 Glea Burnie, MD 21061	SCALE	TOILET PARTITION	S AND	DOOR HARDWARE-14	B-14
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FS-902-TP Flush Spring-Loaded FS-502-TP Flush

Full Surface





For pilasters and doors that are flush with each other, this style of hinge is excellent. Stainless steel continuous tollet partition hinges are just right for retrofit or constructing a new facility, where a high volume of abusive traffic can be found.



Standard Features

Material

Heavy-duty 14 gauge 304 stainless steel.

Finishes

US 32D brushed stainless steel (630).

Pin and Barrel Type Hinge

· 1/4" diameter stainless steel pin. · Long-life split nylon bearings. · 28 bearing surfaces.

Torx Adjusting Screw

(with Spring-Loaded hinges only)

- Torx tip cap.
 Internal stainless steel spring mechanism.
 Adjust tension on door to close tightly for out-swinging ADA compliance. • Allows door to stay open in predeter-
- mined position.

Mounting Hardware

1/4 20 pan head machine screws.
Cover caps conceat all mounting hardware.

Capacity

Supports weights up to 80 fbs.

Sizes

54" and 57"

Non-Handed Use the same hinge for right or left handed doors.

Optional Features

84 powder coated paint colors
Custom lengths (in inches).
Custom hole pattern.

- · Tamper-proof security screws.

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	Suite 110 Glen Burnie, MD 21061	TOILET I	ARTITIONS ANI	DOOR HARDWARE-15	B-15
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HG-906-TP 1/8" Offset Spring-Loaded HG-506-TP 1/8" Offset

Hinge Guard



Ideal for use with corrian or marble type partitions with 1-1/4" pilaster and 1" door. This hinge provides door and pilaster edge protection and is adjustable with optional AdjustaScrew fasteners for 1/2" width correction.



Standard Features

Material

Heavy-duty 14 gauge 304 stainless steel.

Finishes

US 32D satin stainless steel (630).

Pin and Barrel Type Hinge

- 1/4" diameter stainless steel pin.
 Long-life split nylon bearings.
 28 bearing surfaces.

Torx Adjusting Screw

- (with Spring-Loaded hinges only) Torx tip cap. Internal stainless steel spring mechanism.
- Adjust tension on door to close tightly for out-swinging ADA compliance.
- · Allows door to stay open in predetermined position.

Mounting Hardware

No exposed mounting hardware.

Capacity

Supports weights up to 80 lbs.

Sizes

54" and 57"

Non-Handed

Use the same hinge for right or left handed doors.

Optional Features

· US 32 bright polished stainless steel

- (629).
- 84 powder coated paint colors
 Custom lengths (in inches).
 Custom hole pattern.

- Tamper-proof security screws.
 AdjustaScrew for corrections of door fit problems up to 1/2".



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		SCALE NONE	DATE MARCH 2005	B-10



Hinge Guard



Ideal for use with corrian or marble type partitions, the slim, clean design provides door and pilaster edge protection. This hinge is also adjustable with optional AdjustaScrew fasteners for 1/2" width correction.



HG-907-TP Flush Spring-Loaded HG-507-TP Flush

Standard Features

Material

Heavy-duty 14 gauge 304 stainless steel.

Finishes

US 32D satin stainless steel (630).

Pin and Barrel Type Hinge

- 1/4" diameter stainless steel pin.
- -Long-life split nylon bearings.
- ·28 bearing surfaces.

Torx Adjusting Screw

- (with Spring-Loaded hinges only)
- · Torx tip cap.
- Internal stainless steel spring mechanism.
 Adjust tension on door to close tightly for out-swinging ADA compliance.
 Allows door to stay open in predeter-
- mined position.

Mounting Hardware

No exposed mounting hardware.

Capacity

Supports weights up to 80 lbs.

Sizes

54" and 57"

Non-Handed

Use the same hinge for right or left handed doors.

Optional Features

US 32 bright polished stainless steel (629).

- (629). 84 powder coated paint colors Custom lengths (in inches). Custom hole pattern. Tamper-proof security screws. AdjustaScrew for corrections of door fit problems up to 1/2"



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	Suite 110 Glen Burnie, MD 21061	TOILET PARTI	TIONS AND DOOR HARDWARE-17	D 17
		SCALE NONE	DATE MARCH 2005	D-1 /



Full Surface



This hinge was designed for detention facilities or areas where vandalism is common. The hinge can be mechanically fastened or welded in place for optimum security.



FS-910-TP Flush Spring-Loaded FS-510-TP Flush

Standard Features

Material

Heavy-duty 14 gauge 304 stainless steel.

Finishes

US 32D brushed stainless steel (630).

Pin and Barrel Type Hinge

- 1/4" diameter stainless steel pin.
- Long-life split nylon bearings.
 28 bearing surfaces.

Torx Adjusting Screw

(with Spring-Loaded hinges only)

- · Torx tip cap.
- · Internal stainless steel spring mechanism.
- · Adjust tension on door to close tightly
- for out-swinging ADA compliance.
- · Allows door to stay open in predetermined position.

Mounting Hardware

10-24 flat head stainless steel machine screws.

Capacity

Supports weights up to 80 lbs.

Sizes

54" and 57"

handed doors.

Non-Handed Use the same hinge for right or left

Optional Features

US 32 bright polished stainless steel (629).
 84 powder coated paint colors
 Custom lengths (in inches).

- · Custom hole pattern.
- · Tamper-proof security screws. · One way shoulder bolt and screws.

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Baker Suite 110 Glea Burnie, MD 21061	Suite 110 Glea Burnie, MD 21061	SHEET TITLE TOILET PART	TTIONS AND DOOR HARDWARE-18	D 10
		SCALE NONE	DATE MARCH 2005	D-10



STRENGTH OF COMPONENTS

12 GAUGE STAINLESS STEEL CONTINUOUS HINGES

Leaves

Material: 12gauge 304 stainless steel Tension: 85,000 P.S.I. Shear: 35,000 P.S.I.

Stress Analysis

The center of gravity of a door of uniform construction is located half-way between the top and bottom and half-way from edge to edge. The forces acting on the hinge are tensile and shear in the top half of the door and compression and shear in the bottom half. The leaf is 0.109 inches thick, so the cross-sectional area resisting tensile stresses is 4.5 in² for a 7-foot hinge and 6.5 in² for a 10-foot hinge.

Tensile Limite

- 7' door 4.5 in2
 - x 85,000 P.S.I. = 385,075 lbs + 12 (safety factor) = 32,100 lbs
- 8' door 5.0 in² x 85,000 P.S.I. = 440,675 lbs + 12 (safety factor) = 36,725 lbs
- 10' door 6.5 in² x 85,000 P.S.I. = 651,850 lbs + 12 (safety factor) = 46,000 lbs

Shear Limits

7' door 9.0 in² x 35,000 P.S.I. = 317,125 lbs + 12 (safety factor) = 26,425 lbs

8' door 10.25 in2 x 35,000 P.S.I. = 551,850 lbs

+ 12 (safety factor) = 46,000 lbs

10° door 13.0 in*

- x 35,000 P.S.I. = 454,450 lbs
- + 12 (safety factor) = 37,875 lbs

Fasteners

10-24 machine screw Type: Material: 1035 cold rolled steel Tension: 83,000 P.S.I. Area: 0.0145 in* 7' hinge 16 fasteners

x 0.0145 in² = 0.232 in² x 83,000 P.S.I. = 19,256 lbs + 12 (safety factor)= 1,604 lbs

RCINICAL HENO

- 8' hinge 18 fasteners x 0.0145 in² = 0.261 in² x 83.000 P.S.I. = 21,663 lbs + 12 (safety factor)= 1,805 lbs
- 10' hinge 20 fasteners x 0.0145 in² = 0.290 in² x 83,000 P.S.I. = 24,070 lbs + 12 (safety factor)= 2,005 lbs

1/4-20 machine screw Type: 1035 cold rolled steel Material: Tension: 83,000 P.S.I. Area: 0.0269 in²

- 7' hinge 16 fasteners x 0.0269 in² = 0.430 in² x 83,000 P.S.I. = 35,723 lbs + 12 (safety factor)= 2,977 lbs
- 8' hinge 18 fasteners x 0.0269 in* = 0.484 in* x 83,000 P.S.I. = 40,189 lbs + 12 (safety factor)= 3,349 lbs
- 10' hinge 20 fasteners x 0.0269 in² = 0.538 in² x 83,000 P.S.L = 44,654 lbs + 12 (safety factor)= 3,721 lbs

499 III	Per more micrometican econt Markar Prod	ucts, Inc. 68 WA	RD ROAD LANCASTER,	NEW YORK 14086 1-800-866-1658 (716) 685-4104	1 FAX (716) 605-3919
	MICHAEL BAKER JR. INC.	PROJECT TITLE	STROOM DES	SIGN STANDARDS	PROJECT NO. TASK 1314.20
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PRODUCT DETAIL

Refill Info Shipping Info

VuAll Cormatic® (P15) **High-Capacity Roll Towel** Dispenser

High capacity, key-locking towel dispensing system solution provides an attractive, hygienic, hands-free, portion-control solution.



ADD TO LIST 🕀

Item Description:

Our most popular, attractive, smokecapacity Cormatic® VuAll® roll towel you control costs with style. Our comi free roll towel dispensers feature no t or cranks that can serve as germ rese helps you meet higher public health s in pollution prevention and control yo costs through waste and maintenance self-locking dispenser is designed to c pilferage while making towel dispensi Choose our VuAll® dispenser for a co system solution that is suitable for an

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Features & Benefits:

- Attractive Design Attractive smoke-tinted dispensers washroom
- High Capacity Reduced maintenance intervals an of run-out

Portion-Control Mechanism Reduces solid waste by 25 to 35 plimiting the amount of product disi time

Ite	em #	Product Family	Pack	Inner Pa Count	ck
HV	200K	Hygiene		6 Count	t
Color	Dispenser	Dimensions Paper Grade Ply	Core Size	SCC	UPC # Reta Scanner Co
Smoke	Shipping Info	•		6500049706	

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	MICHAEL BAKER JR. INC. 801 Cromwell Park Drive	PROJECT TITLE	RESTROOM	DESI	IGN STANDARDS	PROJECT NO. TASK 1314.20
Baker	Suite 110 Glen Buruie, MD 21061		PAPER TO	WEL I	DISPENSER	B-21
		SCALE NON	E	DATE	MARCH 2005	D-21

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THE BARCLAY SERIES

The Barclay Series of fiberglass receptacles offers a variety of styles from classic to contemporary that complement and enhance their surroundings.

 \bigcirc

- Over 30 different colors in solid, matte, and Sand-xTM finishes are offered. Rose Gran-xTM and Gray Gran-xTM finishes are also available, see page 21.
- Units can be used indoors and outdoors.
- Seamless construction with molded gel-coat finish will not stain or tarnish and is scratch resistant.
- Ultra violet stabilizer is added to all models, torretard fading due to sunlight.
- Vinyl trim on edges prevents chipping and damage during maintenance.
- All models with two openings are available with a single opening as a custom order.
- Custom color matching and designs available.
- Optional Fire Retardant treated - Compliance with NFPA (National Fire Protection Agency) Life Safety Code #101
- Class I Fire Retardant Flame Spread 0-25
- Class II Fire Retardant Flame Spread 26-75 Optional anchoring kits available, see page 49 for details.
- ADA Compliant.



Folding retainer bands hold poly bags securely inside the receptacte.

FIRE SAFE / SELF-EXTINGUISHING FIBERGLASS RECEPTACLES



See page 20.



	Description	Madal	i inar	Ga	for Capa	olty		Stanson 2 March 19	
A	Wanta Bassada ata	Number	******	HB	PL.	GL	Olmensions	Visposal Opening Dimensions	Colur
1000	TRASIC FUELESIACIE	PU1830ARLQ	. PL/GL	· im	21	21	18 Dia x 30° H	A? File	ØRUWR.
2 0	waste Heceptacie	F624321	RB/PL/GL	57	刹	.31	94" Bio - 221 H	p Lid.	BRICKDEIFY
C	Waste Receptacle	FG24391	R8 / PL / GL	57	40	53	64 DIG. 4 DE 53	18 Ula.	Black
D	Wasie Receptacia	FG2432AA1	RB/PL/GL	\$ 3	Ăſ		24 Dill. X 39" H	two 13" W x 6.5" H	Pluin
E.	Waste Receptacio e	swf024381	BRIR	69	750 70	3f	24° D.a. x 32° H	8º Día.	Almond
F	Waste Receptacle	FG1.2730071	21	98.	30	•••••	24° Dia. x 39° H	13° Dia.	Warm Gray
G	Ash / Tresh	FOI 2790081111	. F.F.		22		27" Dia. x 30" H	12° Dia,	In
14	Urn	Elli tonanau	rt.		22		27" Dia. x 30" H	12" Dia.	Accel Kran.y
	in the second	101, 1024030	·····		·····		18" Dia. x 24" H		Maina
rus o	ines: His - Poly Bog Actoin 61 Golvonized Steel	er Bonds, PL - Germ-Fig Linez	fillor® Rigid Flastic Line	6,	trg	2432, F02438,	FG2432AR FG2438		

FG2432, F62439, FG2432AR, FG2438, FGL273001, FGL273005UT conext ship UPS

	MICHAEL BAKER JR. INC. 801 Cromwell Park Drive	PROJECT TITLE	A DESIGN STANDARDS	PROJECT NO. TASK 1314.20
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		SCALE NONE	DATE MARCH 2005	10-20

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Sanitary Napkin Receptacles / Disposal Units



Model 203: Economy wall mount sanitary napkin receptacle. Hinged top lifts to empty. White Enar only.

Model 204: Deluxe wall mount. Spring closing door with full length hinge. Easy lift out galvanized for emptying. White or Stainless Steel finish.

Model 205: The Standard of the Industry! Deluxe floor model fits under divider and serves 2 stalls closing door with full length hinge. Inner galvanized liner with dimpled bottom keeps it off the floor in white or stainless steel.

******	Model Number	Flnish	Product Name
•	203 WHT	White Gloss	Sanitary Napkin Receptacle - Wall
٠	<u>204 S/S</u>	Satin Stainless Steel	Sanitary Napkin Receptacle - Wall
•	204 WHT	White Gloss	Sanitary Napkin Receptacle - Wall
•	205 S/S	Satin Stainless Steel	Sanitary Napkin Receptacle - Floo
•	205 WHT	White Gloss	Sanitary Napkin Receptacle - Floo
•	206 WHT	White Gloss	Individual Sanitary Napkin Bag D
•	225	Liner	Individual Sanitary Napkin Bag

R.	MICHAEL BAKER JR, INC, 801 Cromwell Park Drive	PROJECT TITLE	RESTROOM DESIGN STANDAR	DS PROJECT NO. TASK 1314.20
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		^{SCALE} NO	DNE DATE MARCH 2005	B-24

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Trash Receptacies

Y

COLLEGENERADO.

Convertible Sanitary Napkin Receptacle



Deluxe Sanitary Napkin Receptacle

Price \$74.10 Save up to 7%

OSHA compliant. Floor model services two stalls. Sanitary—foot pedal opens lid. Antimicrobial Germ-Fighter® leakproof rigid plastic liner controls germs and odors. Easy-empty side opening design. Heavy-duty steel, contains 30% recycled steel content. Powder coated finish. Uses plastic liner bags (EXCLB1718) sold separately. 9-1/4w x 9-3/4d x 11h. Shpg. wt. 9 lbs.

Hinged Ild. Stays open for disposals, then closes tightly. Empties from the bottom; hands never touch the contents. Wall mountable

(screws not included). Uses Liners (HOS260) sold separately. 8w x



Napkin Receptacle Liners

Price \$25,75 Save up to 21%

Kraft waxed paper liners for Convertible Sanitary Napkin Receptacle (HOSND1E) sold separately, Sanisac, and all standard wall units. 500 liners per carton. Shpg. wt. 12 lbs.



Sanitary Napkin Receptacle, Plastic Liner Bags

Priced from \$40.73 to \$50.54 Save up to 11%

Floor model fits under stall divider. Serves two stalls with double swinging spring-closing push-doors on full-length plano hinges. Galvanized inner liners. Plastic Liner Bags (EXCLB1718) sold separately. 9w x 9d x 11-1/2h.

4 pages

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5 items

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1 (E				
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Baker	Suite 110 Glen Burnie, MD 21061	SHEET TILE	RECEPTACLES-4	D.05
f		SCALE NONE	DATE MARCH 2005	B-25

Channel Frame



8-165 SERIES

B-165 SERIES FRAMED MIRRORS One-piece B-165 SERIES FRAMED MIRRORS Chepiece channel frame is ½2' x ½3' x ½3' x 13 x 13 mn) with bright polished finish and mitered corners. Phillips-head frame screw permits easy replacement of rattor. No. 1 quality, ¼4' (Sonn) glass mirror electrolytically copperplated; guaranteed against silver-spollage for 10 years. Mirror contents and back profiled by shock absorbing material. Back is galvanized steel. Secured to concealed will hanger with twn thefraecitant locking returned. with two theft resistant locking screws.

STANDARD STOCK SIZES B-165 SERIES MIRROR

Model No.	Width	Height	
B-165 1624	16*	24	(41 x 61cm)
B-165 1824	18"	24*	(46 x 61cm)
ØB-165 1830	18*	30"	(46 x 76cm)
Ø8-165 1836	18"	36"	(46 x 91cm)
Ø8-165 2430	24°	30*	(61 x 76cm)
Ø6+165 2436	24"	36*	(61 x 91cm)
8-165 2448	24*	48 [×]	(61 x 122cm)
ØB-165 2460	24"	60*	(61 x 152cm)
8-165 3636	36″	36″	(91 x 91cm)
8-165 4836	48"	36°	(122 x 91cm)
B-165 6036	60°	36*	(152x 91cm)

SPECIAL-ORDER CUSTOM SIZE MIBRORS Maximum size mirror: 72" x 60" (183 x 152cm). To specify special sizes, use Series Number followed by width and height.



Channel Frame/Shelf



166 SEI 8-166 SERIES MURROR/SHELF COMBINATION Theft resistant chemical frame mirror with one place type 304, eathy inish stainless steel oneif, project dth one place elf: projects 5" (127mm). nd has 16" (10mm) retu dges on front and si les. Front return edge hemmi for maxi mum rigidity. Concealed 16 gauge (1.6mm) less style brackets attach shelf to minor fra

STANDARD STOCK SIZES

Model No.	Width	Height	
8-166 1824	18*	24	(46 x 61om)
8-166 1830	187	307	(46 x 76cm)
B-166 1836	18*	36″	(46 x 91cm)
8-166 2436	24*	36*	(61 x 91cm)

SPECIAL-ORDER CUSTOM SIZE MIRRORS Maximum size mirror: 24° x 60° (61 x 152cm). Maximum shelf length: 24° (61cm). To specify speciel sizes, uso Series Number followed by width and height.

Frameless, stainless steel

8-1556 SERIES FRAMELESS MIRRORS Bight polished stainless steel. Mirror has 14" (6mm) return concealing 44" (6mm) tempored masonite backing. Furnished with four mounting screws.

13

STANDARD STOCK SIZES B-1556 SERIES

Model No.	Width	Height	
8-1556 1620	15 1/2"	19 1%	(39 x 50cm)
(/B-1556 1824	17 验	23 1/2"	(44 x 60cm)
8-1556 1830	17 4%	29 12"	(44 x 75cm)
ØB-1556 2436	23 1/2"	35 3/2"	(60 x 90cm)

Tilt Mirrors



B-203 SERIES THT MIRRORS Provide \mathbf{b} visibility for wheelchair patients. Frame is type-Note visibility for wheeknat parameters, many a spec-304 stainless steel, satin finish. Special bevel design higs mirror. No. 1 quality, ¼° (Smm) glass mirror electrolytically copper plated. Mirror extends 4° (LOcm) from wall at top and tapers to 1° (25mm) at botto

STANDARD STOCK SIZES B-293 SERIES

	###Q18	Height	
B-293 1630	16*	30"	(41 x 76cm
B-293 1830	18″	30'	(46 x 76cm
Ø8-293 1836	18'	36*	(46 x 91cm
28-293 2436	24*	36'	161 x 91cm

8-294 SERIES TILTING MIRRORS TH forward to provide full visibility for wheelchair patients or return to unplut position, name is 3st x 3st (19 x 19mm), type-304 stainless steel angle, satis finish, Special bavel design hugs miror. No. 1 quality, 3st (6mm) glass miror electrolytically copper-plated. Top of miror tills 7st (13km) mon wall with self-locking meshanisms; bottom of miror mounts to wall with full length stainless steel hinge.

S IRRORS

19

STANDARD STOCK SIZES B-284 SERIES MIRROR

Model No.	Width	Height	÷
FB-294 1624	16'	24"	(41 x 61cm)
# 8-294 1620	16*	301	(41 x 76cm)

SPECIAL-ORDER CUSTOM SIZE MIRRORS um siza mimor: 30* x 36* (762 x 914mm).



8-942 FRAMELESS MIGROR (Secured From Front) Million is 11 %'' x 17 %'' (285 x 440mm) overall, %'' (6mm) deep, 18 gauge (1.2mm), type 430 stainless steel with bright polisbed finish.

B-9436 FRAMED MIRROR (Secured From Front) Reflective surface; type-304 bright polisited stripters steel. Frame: 14 guage (2mm), type-304 stabless steel with satia finish; %* (16mm) deep; conters heliser war and and polisied amouth, and the strength amount, infiner protected by ½" (13mm) thick fiberboard backing. Overall mirmir size: 1.2" x 1.6" (305 x 405mm).



Vandal-Resistant

Angle Frame

Angle Frame/Shelf



B-290 SERIES FRAMED MIRRORS One plece roll formed frame is 147 x 141 (19 x 10mm), type 304 atchiness steel angle with settin finish. Special bevel design hugs mirror. Corners are heliate welded, ground and polished smooth. No. 1 quelity, W² (form) glass mirror electrolylically copper shaked; guaranteeld against silvor spoilage for 15 years. Mirror edges protected with plastic filler strips to prevent chipping; back is protected by 3x² (form) thick, water-resistant, polyethylene padding. Galvanized steel back attached to frame with concealed screws. Secured to concealed wail hanger (shown below) with two theft-resistant locking acrews.

SPECIAL-ORDER CLISTOM SIZE 8-290 AND 8-292 SERIES MIRRORS Maximum size of one-piece mirror; 144⁴ x 72^o (366 x 183cm). Maximum frame size available: 186⁵ x 72^o (472 x 183cm) with two pieces of glass in one-piece frame furnished with 4-section motifing with polished statiless steel exposed finish covering seam where two pieces of glass but together. Shelves longer than 120^o (305cm) will be purplet to two sheares than 120^o (305cm) will be

MIRRORS

timisited as two pieces butlen together. To specify special sizes, use Series Number followed by width and height in inches. For example, B.280 70 x 30 (178 x 76cm) or B-292 132 x 48 (335 x 122cm).

DESIGNER'S NOTES To socially mitrors, use Series Number desired followed by width and height in Inches. Width dimension music reverse be stated first following Series Number.

B165, B166, B290, B292, B293, and B294 Series mirrors must be installed with width and height dimensions as ordered. Mirror back and wall height calinot be installed slide ways to reverse width and height dimensions.

SPECIAL-ORDER REFLECTIVE SURFACES

Polished Stainless Steel, Tempered and Laminated Glass Mirrors resist breakage and provide a measure of safety from broken glass, but differ in color and reflective quality from standard glass mirrors. Available on special order.

Deatde.

includes shelf.

STANDARD STOCK SIZES 8-290 SERIES MIRROR Model Ro. Width Helgh B-290 1824 19 24 (46 x 81.cm) #8-290 1830 18 30" (46 x 76cm) 18 24' (78-290 1836 (48 x 91cm) 39 30* 8-290 2430 (61 x 76cm) 24 24 \$8-290 2436 (61 x 91cm) 8-290 2448 48 (61 x 122cm) 24" 60" 72" 8-290 2460 (61 x 152cm) 8-290 2472 (61 x 183cm) 36' 36 B-290 3638 (91 x 91cm) (122 x 91cm) (163 x 91cm) 48" 36* 8-200 4836 B-290 7236

BARRIER-FREE WASHROOM GUIDELINES

MIRRORS. Bottom edge of reflective surface should be mounted no higher than 40" (1015mm) above

bits finish floor. A single full length mimor is recommended in each washroom because it is universally

IMPORTANT NOTE All Botalck framed initrois are manufactured to careful dimensions, as shown in all mirror tables on pages 18 and 19, Overall height of mirror/shelt models



B-282 SERIES MIRROR/SHELF COMBINATION Theft-resistant angle-frame mirror furnished with one-picec, types-304 satisf-finish stainless steel shell; projects 5° (127mm) and has ¾" (19mm) return edges on front and sides. Front return edge hermmed for maximum eighdly and satety. Comers are hellaro welded, ground and polished smooth. Concesied 18-gauge (1.6mm) stainless steel breakets antich shell to mirror frame.

STANDARD STOCK SIZES B-292 SERIES MIRROR/SHELF

Model No.	Width	Height	
8-292 1824	18*	24*	(46 x 61cm)
8-292 1830	18″	30*	(46 x 76cm)
8-292 1836	18"	36*	(46 x 91cm)
8-292 2436	24″	36*	(61.x 91cm)



B-290, B-292, B-165 AND B-166 SERIES MIRRORS, CONCEALED WALL HANGER FOR THEFT-RESISTANT MOUNTING Simplifies Installation.

Mirror is held flush to wall by integral brackets at top and bottom of mirror back locked by two concealed thathresistant screws on bottom of mirror back. Back is constructed of galvanized steel. Note: Pravide minimum ¼" (19mm) clearance at top of mirror for mounting on wall hanger, minimum 1" (25mm) clearance at bottom for angaging locking screws, and 1" (25mm) clearance on each side.

PRICE B-290 Series 1.7 B-292 Series 1.8 INDEX B-165 Series 1.0 B-166 Series 1.0

18 / USA & Canada QuickShip model. // USA QuickShip model.

	MICHAEL BAKER JR. INC. 801 Cromwell Park Drive	PROJECT TITLE REST	ROOM DESIGN STANDARDS	PROJECT NO. TASK 1314.20
Baker	Suite 110 Glen Burnie, MD 21061	SCALE NONE	MIRRORS-2	B-27

Grab Bars Comply With Barrier-Free Design Codes



 Constructed of settinifinish stainless steel tubing in 1 ¼" and 1 ¼" (30 and 40mm) diameters; concealed or exposed inxvinting.

- Peened nonslip gripping surface available on all Series. Add suffix .99 to model number.
- Bar 18 gauge (1.2mm), type 304 steinless steel.
- Bar passes through linge and is heliarc welded to
 form single structural unit.

EXPOSED MOUNTING

 Flange 38" (3mm) thick, type-304 stainless steel plate, 3" (75mm) diameter.

 Exposed mounting screw holes; vandal/resistant screws available as an optional accessory.



Series	Disineter	*Finish
*8.6106	1 1/2" (40mm)	Satin Finish
*B-490	1.¼4" (30mm)	Satin Finist

- Comply with structural strength requisements: grab bors that provide 1.4° (40mm) clearance from the wall can support loads in excess of 900 pounds (408kg) when properly installed, meeting ADA Accessibility Guidelines in U.S.A.
- Mandrel bending process ensures uniform bar diameter around curves.
- All joints and supports are contour cut and welded.
 Concealed anchors and fasteners available as an optional accessory.

DESIGNER'S NOTE

Any grab bar configuration not included within a Series row in the Grab Bar Configuration Chart is available on special order.

CONCEALED MOUNTING WITH SHAP FLANGE

- Cover snaps over mounting flange to conceal screws.
- Concealed mounting flange ½° (3mm) thick, type-304 stainloss steel plate, 2° W x 3 Ű H (50 x 80mm), with screw holes for concealed anchois.

 Cover is 22 gauge (0.8mm), type-304 stalnless steel with satin finish, 3 ¼⁴ (85mm) diameter.

Series	Diameter	* Finish		
*8-6806	1 12° (40mm)	Satin Finish		
*8-5806	1 ³ 4" (30mm)	Setin Anish		
Peened none	lip gripping surface	available. Add		
suffix .99 to	model number.			



BARRIER-FREE MASHROUM CUIDELINES GPAP GARS. Disnesser of grab bars should beri 1 44' to 13' 24' (30-40min) with 3 49' (30-min) clearance from De wall. GPAP bars should not totate in that fittings. The required mounting begint is universally 33' to 36' (840-915mm) from the contentime of the grab bar to the finish two. The structural strength of all grab bars and their mounting devices should withstand mote than 250 points of tone (1112'N). For all barrier the Dist contransenable, NdAvisial of Districtions and guest bettrooms, it is recommended that a 36' (315mm) mit, hoursoning two be installed on the back wall seer the toilet. This cart also be accompliabled with a sing the installed on the state well of pathtion nearest the toilet. This cart also be accompliabled with a single borgonital twowall grab bar.

36 🥤 USA & Canada QuickShip model. 🖉 USA QuickShip model.



INSTALL GRAB BARS WITHOUT BACKING.



WingBTM Grab Bar Fastening System secures all Bobrick Grab Bar Sories. For walls with a minimum of ⁵/8" (16mm) thick painted or tiled drywall, Can olso be used on ⁵/4" (13mm) thick drywall with added finished wait material. The fastener will support 300 ib. toad exceeding all building code and governmental agency guidelines including ADAAS in the United States.

✓251-4 WINGIT™ GRAB BAR FASTENER For 2 ³/₂³ and 3 ³/₂⁴ (65 and 90mm) or deeper hollow wells with finished wall surfaces ³/₂⁴ to 1 ³/₂⁴ (6 to 39mm) thick. One fastener required for each flange. Corrosion-resistant stainless steel. Patented.

Wingst¹⁴⁴ is a trademark of Wingli funovations, LLC.





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Baker	Suite 110 Glea Burnie, MD 21061	SHEET TITL	DIAPER CH	IANG	ING STATIONS-1	B-30
		SCALE	NONE	DATE	MARCH 2005	D -30

Recessed and Surface Mounted

8-223x24

FB-223 MOP AND BROOM HOLDER Type-304 stainless steel, satin finish. Anti-silp mop holders have spring-loaded rubbler cam that grips handles ½* to 144 (20-30nm) diameter. Holds mops 3 ¼* (85mm) from wall. Height 5* (125mm).

Madel No.	No. Holders	Length
\$8-223x24	з	24" (610mm)
Ø8-223x36	4	36" (915mm)



Model No.	No. Holders	No. Hooks	i Length
≸ B-224x30	3	2	30" (760mm)
ØB-224x36	4	3	36" (915mm)



#B-239 CLASSIC SERIES SHELF WITH MOP AND BROOM HOLDERS AND HOOKS Shelf is 18-gauge (1.2mm), type-304 stainless steel, satin flinsh; 13" H, 8" D (330 x 205mm). Anti-slip mop holders have sping-loaded rubber cam that grips handles 1%" to 1 ¼" (20-30mm) dia. Stainless steel hooks,

Model No.	No. Holders	No. Hooks	Length
ØB-239x34	3	4	34" (865mm)
B-239x44	4	5	44" (1120mm)

GB-633 STAINLESS STEEL CORNER GUARDS Eliminate expensive maintenance work. 18 gauge (1.2mm), type-304 stainless steel, safin finish. No sharp edges: Fumished with adhesive inounting for easy permanent installation: 3 ½% x 3 ½°. (90 x 90mm); £48° (1220mm) forg.





SPECIMEN PASS-THRU CABINET. Provides convenient passage for specimen from patient area to laboratory. Mounts in walls 3' to 5.34'' (75-1,45mm) thick. Type-304 stainless steel, sain finish



Self-closing doors. Interlocking mechanism prevents both doors from being open at the same time; provides sight barrier. Removable stainless steel twa, Rough Walt Opening; 11 ½/ W, 10 % / H (290 x 275mm); 3* to 5 %! (75-145mm) thick.

15055

B-2230 CLASSIC SERIES SURFACE-MOUNTED DIAPER CHANGING STATION Provides safe, convenient location for parent and child in public wastinooms at a budget price. Unit features a smooth concave changing area with rylon safety strap, two hooks for bags, purses and instruction graphics. Durable, high-impact polyethylene body resists odors and bacterial growth. Pneumatic cylinder provides controlled, slow opening and closing of bed. No hinge structure aposed on Interior or exterior surfaces. Bed secured to backplate with concealed full-length stalnless steel hinge rod with steel bushings embedded in the plastic. Unit supports loads up to 250 ib. (113kg) when properly installed. Equipped with liner disperiore that accommodates many commercially available folded lines. Unit measures 34 ½ W, 16 ½ H (B70m x 430 mm). When closed, surfacemounted unit projects 47 (102 mm) from wall; when open, bed projects 187 (455mm). Patented.





B-2210 SURFACE-MOUNTED DIAPER CHANGING STATION Provides safe, convenient location for parent and child in public washroom. Bed features smooth concave changing area with safety strap, hooks for bags and purses, and universal instruction graphics. Pneumatic cylinder provides controlled, slow opening and closing. Nonporous polyathylene resists odors and bacterial growth; matches Bobrick color #899 Grey. Unit has foam core for added durability. No hings structure exposed on Interfor or exterior surfaces. Bed secured to back plate with concealed full-length stainless steel hinge rod with steel bushings inhedded in plastic. Supports up to 250 lb (113kg) when properly installed. Equipped with multi-size liner dispenser that accommodates many commercially available folded liners and dental bibs, as well as Cfold or multifold paper towels measuring 6 ½* to 10 ½* long by 2 ½* to 4 ½* wide (165-270mm; x65-125mm). Unique design allows unit to be semi-recessed into wall opening 4* (102mm) deep. Unit measures 32* W, 20* H (815 x 510mm). When closed, surface-mounted unit projects 4* (102mm) from wall; semi-recessed bed projects 16 ½* (420mm). For semi-recessed bed projects 16 ½* (420mm). For semi-recessed bed projects 16 ½* (420mm). Patented.

78-2200 Similar to B-2210, but without multi-size liner dispenser. Patented.

2210-40 LINERS FOR DIAPER CHANGING STATION Optional accessory for multi-size liner dispenser in Model B-2210, Case of 500 absorbent paper liners with soil-resistant plastic backing.

B-2220 PÁRTITION-MOUNTED CHILDSEAT Provides safe location off of filoor for child with parent inside tollet compartment or fitting room. Featuré safety strap and inocks for bag or purse. Polyetilylene matches Bobrick



color #889 Grey. Supports up to 80 b (36kg) when properly installed. Closed unit measures 13° W, 18° H, 4 42° D (330 x 455 x 115mm). Seat projects 13 44° (335mm) from partition when open.

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Baker MICHAEL BAKER JR. INC. 801 Cromwell Park Drive Suite 110 Glen Burnie, MD 21061	PROJECT TITLE	PROJECT NO. TASK 1314.20		
	SHEET TITLE	DIAPER CHANGING STATIONS-2	D 21	
		SCALE NON	E DATE MARCH 2005	B-31

HEALTHCARE ACCESSORIES/CHILDCARE PRODUCTS

43



C800-Series Crash Rail

#8" rail with continuous aluminum retainer (except C860)#Exclusive connector plates and variety of mounting options

Continuous vinyl cushion to protect profile cover (except C860)

Economy models (C860 & C870) available for light- to medium-impact situations

Available in 21 standard colors with no minimums

Custom colors available with low minimum quantities required

Iowa Paint Manufacturing Company, Inc. 17th & Grand Avenue Des Moines, Iowa 50309 1-800-659-4455

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		SCALE	NONE	D	ATE	MARCH 2005	B-32

KOROSEAL WALL PROTECTION SYSTEMS KOROGARD^(r) C800-Series Crash Rails

KOROGARD C800-Series Crash Rails are 8" (203.2mm) high with a full-length vinyl bumper and continuous aluminum retainer. C800-Series Crash Rails combine a wide area of protection and a variety of mounting options to meet every impact need. KOROGARD rugged durability makes C800-

Series Crash Rails best suited for high impact areas.

KOROGARD C800-Series Crash Rails are backed by a limited five-year warranty. All crash rails are Class I/A fire rated and meet national building code standards. All KOROGARD linear profiles color coordinate with a multitude of KOROSEAL^(r) Wallcoverings for a systems approach to wall protection.

For more information on KOROGARD Crash Rails or the KOROSEAL Wall Protection System, please call your local KOROGARD distributor or 1-800-628-0449.

- Product Guide Specification
- Color Chart
- Installation Instructions
- Cleaning Instructions
- Warranty

HC800 SERIES ACCESSORY ITEMS

C801	Standard End Cap	
C803	90° Comer Cap	
C804	135° Corner Cap	
C805	Splice Kit	
C841	Extended End Cap	



MICHAEL BAKER 801 Cromwell Park Dr	RESTROOM DESIGN STANDARDS	PROJECT NO. TASK 1314.20
Suite 110 Glen Burnie, MD 2106	CRASH RAILS-2	B-33



KOROSEAL WALL PROTECTION SYSTEMS KOROGARD^(r) G200-Series Surface-Mounted Corner Guards

KOROGARD G200-Series Corner Guards consist of a formidable 3" (76.2mm) vinyl 1/4" (6.35mm) radius cover mounted over a continuous aluminum retainer. KOROGARD Corner Guards are an attractive and durable solution to unsightly.

damaged corners. G200-Series Surface-Mounted Corner Guards provide support in medium to high impact areas. The G210 Model is available for 135° angle corners.

KOROGARD G200-Series Corner Guards are backed by a limited five-year warranty. All corner guards are Class I/A fire rated and meet national building code standards. All KOROGARD linear profiles color coordinate with a multitude of KOROSEAL^(r) Wallcoverings for a systems approach to wall protection.

For more information on KOROGARD Corner Guards or the KOROSEAL Wall Protection System, please call your local KOROGARD distributor or 1-800-628-0449.



- Product Guide Specification
- Color Chart
- Installation Instructions
- Cleaning Instructions
- Warranty



	MICHAEL BAKER JR. INC. 801 Cronwell Park Drive	PROJECT TITLE REST	PROJECT NO. TASK 1314.20	
Baker	Suite 110 Glen Burnie, MD 21061	SHEETTILE	CORNER GUARDS-1	
		SCALE NONE	DATE MARCH 2005	D- 33

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	MICHAEL BAKER JR. INC. 801 Cronwell Park Drive	PROJECT TITLE RESTROOM DESIGN STANDARDS						PROJECT NO. TASK 1314.20	
Baker	Suite 110 Glen Burnie, MD 21061	SHEET THI			CORNER G	UARDS-2		D 26	
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	MICHAEL BAKER JR. INC.	PROJECT T	PROJECT NO. TASK 1314.20				
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aker	MICHAEL BAKER JR. INC. 801 Cromwell Park Drive Suite 110	SHEET TITLE	1/12/0 1		OCKEDC	GIANDA			ASK 1314.:


Republic's Standard Locker is recognized as the industry standard r durability, reliability and value. Year after year, generation after gentation, this sturdy locker has been meeting the most demanding expectations r quality, design and performance.

Republic® offers you a broad range of options, features and accessories a customize your lockers to meet any specific need or application.

- · Continuous vertical door strikes
- Heavy gauge frame hooks
- · Full-flanged, channel edged doors
- · Heavy duty guarded door handle
- Double-channel lock bar
- Full loop, 2", 5-knuckle hinges welded to frames, double-riveted to doors
- Double-lapped rear vertical corners in body
- · Overlapped upright/frame assembly connection

or fast delivery, many Standard Lockers are also available from epublic's Qwik Ship stock. Check with your local Republic distributor.



Lift handle is made of attractive, durable chrome plated die cast zinc. The rugged handle case protects the lift trigger from kicking and other abuse, and also serves as a padlock strike. Handle equipped with two rubber silencers to reduce mechanism noise.



Frame Hooks are made from heavy gauge steel for security and are set-in for minimum opening protrusion. Rubber silencers are attached to soften door slam.



Louvers are provided on all Standard Lockers. Single tier and double tier lockers have a block of six louvers located neur the top and bottom of each door.

Ser Sarah	MICHAEL BAKER JR. INC. 801 Cromwell Park Drive	PROJECT TITLE	RESTROOM D	ESIGN STANDARDS	PR	ојест но. TASK 1314.20
Baker	Suite 110 Glen Burnie, MD 21061	SCALE NON	LOC E DAT	CKERS-3 ^{FE} MARCH 2005		B-3 9

200

300

Cost hides Relative to Republic's Standard Locket at 100

100



Individual Sloping Tops provide a finished appearance, prevent trash accumulation on locker tops and discourage using locker tops as storage areas. The rise of the slope is % the locker depth. Standard flat tops are omitted.



Continuous Sloping Tops provide a smooth, finished appearance for lockers mauned along walls or in island groups. The rise of the slope is % the locker depth. Customize your installation with sloping top splices, valley convers and hip ends - all without exposed fasteners.



6" Legs may be furnished with all lockers. Front legs are an extension of vertical frames. Adjustable rear angle legs are provided for every third upright.



20 gauge Closed Front and End Bases, give a finished appearance to lockers with legs. Closed Bases also cover the hard to clean area under the lockers.



16gauge Zee Bases offer an attractive and economical way to raise lockers above the floor and create an overhang or "toe space". Available in 3", 4" and 6" heights.



Recess Trin really sets off your necessed lock er installations. The trim has a 3" face an a 1/4" top return. Integral corner caps an hairline johiss reinforced with welded-on splic. fingers leave a clean appearance. When used with Mondrian[®] or Designer lockers the trim can be set in a sculptured design (locker projects 1" beyond wall) or a flust design (locker projects 1/4" beyond wall).



Standard Box Locker Pull provides a convenient finger pull and serves as a padlock strike and lock hole cover. Made from 20 gauge stainless steel.



Benches and Pedestals have an overall height of 17%". Benches are 9%" wide x 1%" full finished thickness laminated maple. Pedestals consist of sturdy 1%" O.D. tubing with 10 gauge steel flanges welded to each end.



each end. Number plates feature & high black numerals on brushed aluminum to permit easy locker identification.

Moveable Banches consist of maple bench tops mounted to free-standing trapezoidalshaped pedestals. Pedestals made from 4"x3" aluminum bar stock, with black anodized finish.

9

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Baker	MICHAEL BAKER JR. INC.	PROJECT TITLE RESTR	OOM DESIGN STANDARDS	PROJECT NO. TASK 1314,20
	801 Cromwell Park Drive Suite 110 Glen Burnie, MD 21061	SHEET TITLE	LOCKERS-4	D 40
		SCALE NONE	DATE MARCH 2005	B-40



SCALE	NONE

DATE MARCH 2005

Vanguard Lockers PENCO



Penco has been building lockers for decades that last for decades, and the Vanguard line is the embodiment of what it takes to withstand

the daily use and abuse typically given to a locker. What you see first is the baked enamel finish, which is applied over a phos-

phalized smooth steel surface. There are 17 standard colors from which to choose, and the body parts are the same color as the doors.

Single and double lier lockers have multi-point latching that makes opening



and closing a door, an effortless task. The

patented die-cast Vanguard handle pulls out with a simple motion for opening. When you are ready to close the door, you may do so with one motion of one hand, since the springloaded latch clips will secure the door even while the door is locked, either with a built-in lock or padlock. The latch hooks have noise-reducing rubber bumpers.

Box locker doors have a functional friction catch latch that permits the use of built-in locks or padlocks.

The door frames have mortise and tenon construction and

are securely spot welded for lifetime rigidity. Every door frame has a vertical flange which creates a continuous door strike. All hinges are full loop, 5knuckle design, welded to the frame, and riveted to the door.

These features, available across the broad range of models and sizes, make Vanguard the first choice for many locker users. Most Vanguard lockers are available on a Quick Ship basis, unit-packaged with flat tops and 6" legs in the 028 Gray finish. Contact your Penco representative for details.

NOTE: 1, 2, 3, 4, 5 & 6 tier lockers are NUTE: 1, 2, 3, 4, 5 or 0 ser ruchers are ordered by the <u>opening</u>, 2 Person, Duplex, Dual and Box Over are ordered by the frame. 7, 8, 16 Person and Wall Mounted are ordered by the entire unit. Overall height does not include legs.



Vanguard Handle

Vanouard

Louvers

space for full hanging of clothing and other belongings. Each locker has a convenient shell for storage of books, hats or other small articles. Lockers 18" deep or more come with a coat rod in addition to coat hooks.

Single Tier

Single Tier - The most popular and

widely used locker offers maximum



Double Tier

Double Tier - Accommodates twice as many people as single tier lockers in the same floor

space, while still providing enough room for light outer wear and personal belonginas.



(Inc	ze hes)) Single Tier		Single Tier Double Tier					
w	ь	60" Opening Ht. 72" Opening Ht.		30" Opening Ht.	36" Opening Ht.	42" Opening Ht.			
		Cat. No.	Cat. No.	Cal. No.	(72 overal nl.) Cat. No.	(84" overall ht.) Cet. No.			
9	12	6101V	6151V	6201V	6221V	-			
ä	15	6103V	6153V	6203V	62231				
9	18	6105V	6155V	6205V	6225V				
12	12	6111V	6161V	6211V	632.04	000414			
12	15	6113V	6163V	62131/	60201	020 I V			
12	18	6115V	6165V	6216V	0233V	0233V			
12	21	6117V	6167V	6217V	6218V	02334			
15	12	6119V	61691/		000001				
15	15	6121V	6171V		02397	****			
15	18	6123V	6173V		02410	6261V			
15	21	6125V	6175V		6245V	6263V			
18	18	6131V	6181V			1			
18	21	6133V	61831/		02/47 V	••			
18	24	6135V	6185V		0249V				
24	18	61491/	1001		1				
24	21	R15RV	RIDOV	<i>.</i>	38.1	~			
24	24	8160V	0120V 6100V	~	32	1.00			



* 24" wide lockers are also available with double doors. Contact your representative.

FOR SAFETY PURPOSES WE STRONGLY RECOMMEND THAT ALL LOCKERS BE EITHER FLOOR OR WALL ANCHORED.





-				and the second sec	anna anna anna anna anna anna anna ann	Construction and the second se		*****			
w	D	20" Opening Ht. (60" overall ht.) Cat. No.	24" Opening Ht. (72" overall ht.) Cat. No.	15* Opening Ht. (60° overall ht.) Cat. No.	18° Opening Ht. (72°overall ht.) Cat. No.	12" Opening Ht. (60" overall ht.) Cat. No.	14-2/5" Opening Ht. (72" overall ht.) Cat. No.	12" Opening Ht. (72" overall ht.) Cat. No.	40" Opening Ht. (60" overal ht.) Cat. No.	52" Opening Ht. (72" overall fit.) Cat. No.	72" Opening Hi Cat. No.
12 12 12 12	12 15 18 21	6307V 6309V 6311V 6349V	6319V 6321V 6323V 6399V	6325V 6327V 6329V 6393V	6331V 6337V 6339V 6395V	6343V 6345V 6347V	6353V 6355V 6357V 6435V	6365V 6367V 6369V 6371V	- 	*	* *
15 15 15 15	12 15 18 21	- - - -			6431V 6433V	6351V 6397V	6359V 6361V	6373V 6375V 6377V	6510V 6506V 6437V	6500V 6501V 6503V 6505V	6591V 6533V 6535V
18 18	18 21	-	-	=				6379V 6378V	÷	1	

Additional sizes are available for most locker types. Consult your Penco representative.

FOR SAFETY PURPOSES WE STRONGLY RECOMMEND THAT ALL LOCKERS BE EITHER FLOOR OR WALL ANCHORED.

Baker June MD 21061
MICHAEL BAKER JR. INC. 801 Cromwell Park Drive Suite 110 Gien Burnie, MD 21061
PROJECT TITLE
RESTROOM DESIGN STANDARDS
SHEET TITLE
LOCKERS-7
SCALE NONE
DATE MARCH 2005

PROJECT NO. TASK 1314.20



Locker Accessories

Individual Closed Bases

PENCO

Front and end bases are designed to fit beween standard Penco 6" legs. They present a clean flush appearance and prevent the accumulation of dust and dirt under the lockers. (Not for use on All-Welded lockers.)







(slips over legs during locker assembly)

Zee Bases

Zee bases raise lockers without legs 4" off the floor when there is no concrete or wood base. They provide a toe



space in the front and a concealed flange for floor anchoring at the rear. A special 4" high rear leg can be ordered to simplify installation.

Zee Bases are available only in 72" lengths, and may need to be cut to fit at the time of Installation. Splices/End Bases are used at ends of rows, and where the front sections join. (Not for use on All-Welded lockers.)



Fillers

Penco provides standard fillers to adapt lockers to a wide range of field conditions and provide a protessional, finished appearance. They can be used to cover columns, pipes or other obstacles in a row of lockers, or fill the gap between the lockers and a wall.

A. Vertical Fillers

These come in three widths and are designed to be used in conjunction with Wall Angle Slip Joints for a solid fit and smooth linish. The slip joint conceals any raw edges caused by field cutting,



B. Top Fillers

Flat Top Fillers

Slope Top Fillers

Flat Top Corner Fillers

Slope Top Corner Fillers

.

Cat. No.

661321C 661322C 661323C

661371C 661372C 661373C

66138C

66139C 66140C

66100C

66101C

66102C

Size (Inches)

12 15

18

12 15 18 15 15 15

12

15 18 15

DH

w

15 15 15

15 18 15 18

12 12

18





B. Top Fillers

Top Fillers cover gaps between tops of lockers. They overlap the locker tops and can be field cut to allow for pipes, etc. There are separate designs for flat top vs. slope top, and in-line vs. corner applications.



SLOPE TOP CORNER FILLER

23

FOR SAFETY PURPOSES WE STRONGLY RECOMMEND THAT ALL LOCKERS BE EITHER FLOOR OR WALL ANCHORED.



PENCO

Recess Trim

Recess Trim - 3⁴ Recess trim bridges the gap between tockers and wall and/or soffits when the lockers are recessed into a wall.

	Recess Trim							
Size	e (Incl	ies)	Cat No.					
W	D	M	Car. NU.					
Side Trim, LH								
33	•	63 75	60465C 60469C					
	Sid	le Tr	rim, RH					
33	•	63 75	60466C 60470C					
		Top	Trìm					
74	(^	3	60456H					
		Spl	lice					
2	-	3	60105C					
Ou	tside	э Co	mer Splice					
8	2	3	66108C					







LOCKER GROWTH NUMBER OF LKBS & WDTH = LKNGTH OF GROUP ADD 1/16" TO EACH NOMINAL LOCKER WTDTH [12" = 12-1/16"] O VANGUARD WITH OPTIONAL FULL LOUVERS O VANGUARD WITH OPTIONAL RECESSED HANDLE O FIRE EXTINGUISHER/WASTE BIN DOOR (D VANGUARD WITH OPTIONAL RECESSED HANDLE C FIRE EXTINGUISHER/WASTE BIN DOOR (D VANGUARD WITH OPTIONAL VISUAL PERFORATIONS (E) RNVINCIBLE H



Locker Room Benches and Pedestals A natural accessory for any locker room. Benches add permanent comfort and order to the floor plan arrangement.



Bench Tops

Exceptionally strong. Made from selected hardwood and finished with clear lacquer. 9-1/2^e deep x 1-1/4^e thick. (Order Pedestals separately.)

Bench Pedestals

Penco offers a choice in bench pedestal styles, as shown below. Order two pedestals for benches 96" long or less; order three pedestals for benches over 96" long.

Benc	Bench Tops						
Size (Inches)	Cat Ma						
W	vat. my.						
36 48 60 72 84	09611 09600 09601 09602 09603						
96 108 120 132 144	09604 09605 09606 09607 09608						

A. Heavy Duty Bench Pedestal-16-1/4" High

Pedestal consists of a heavy duty steel tube welded to top and bottom flanges. Hardware for fastening to the bench only is included. Pedestal <u>must</u> be anchored to the floor. Order two or more per bench (see above). Available for quick shipment in 028 Gray; available in all 17 colors. Cat. No. 60822H

B. Stainless Steel Free Standing Pedestal-16-1/4" High

This pedestal has a 14" wide base which allows for moveable free standing use. Holes in the bottom are provided for optional floor anchoring. Hardware supplied for fastening to the bench top. Cat. No. 60827H

Mirror

Made of acrylic plastic that will not break in normal usage. Mirror has an adhesive backing for easy installation. Size is 6" wide x 8" high. Cat. No. 096370.



FOR SAFETY PURPOSES WE STRONGLY RECOMMEND THAT ALL LOCKERS BE EITHER FLOOR OR WALL ANCHORED.

	MICHAEL BAKER JR. INC. 801 Cromwell Park Drive		RESTROOM	DESI	GN STANDARDS	project no. TASK 1314.20
Baker Suite 110	Suite 110 Gien Burnie, MD 21061	SHEET TITLE	L	OCKI	ERS-9	D 45
		SCALE	NONE	DATE	MARCH 2005	B-43

L3/8



LT501 Self-Rimming Lavatory



L1501.8

⅔ 20" x 17"ℜ Attractive design in

- vitreous china
- Spacious oval basinConceated front overflow

Vitreous china self-rimming lavatory. Complete with installation template and sealing compound.

LT501 Lavatory only with single hole faucet center

LT501.4
Lavatory only with 4" faucet
centers

LT501.8 Lavatory only with 8" faucet centers

Colors: Standard #81 Cotton Optional See price baok for additional volors

Funces Not Included

B



L1501.4

Reliance Commercial Line

	MICHAEL BAKER JR. INC. 801 Cromwell Park Drive Suite 110 Glen Burnie, MD 21051	PROJECT TITLE	RESTROOM	DESI	GN STANDARDS	PROJEC TAS	т NO. SK 1314.20
Baker		SHEET TITLE	LA	VATO	RIES-1		D 46
		^{SCALE} N	ONE	DATE	MARCH 2005		B-40

LT501 Self-Rimming Lavatory

DESIGN

Distinctive oval designed drop-in lavatory for easy installation on narrow counterlops.

B FUNCTION

Durable vitreous china offers years of quality use.

SPECIFICATIONS

Waste: Size: Basin: Materiak: Warranty: Shipping Weight: 1¹/4ⁿ O.D. 20ⁿW x 17ⁿD (5¹/4ⁿW x 11¹/4ⁿD Vitreous china One Year Limited Warranty LT501 / LT501.4 / LT501.8 20.5 lbs.

Shipping Dimensions: LT501/LT501.4/LT591.8 21%"L x 19%"W x 10%"H

Fixture dimensions meet ANSUASME standard A112.19.2M and CAN/CSA B 45 requirements.

Listing / Approvals: IAPMO/UPC, CSA, City of Los Angeles, State of Massachusetts, and others.

B

Meets the American Disabilities Act Guideliues and ANSI A117.1 requirements when countertop installed 864mm (34") from finished floor and lavatory installed 51mm (2") minimum from front edge.

These dimensions and specifications are subject to change without notice.





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Baker MICHAEL BAKER JR. INC. 801 Cromwell Park Drive Suite 110 Clere Bernie MD 21061	PROJECT TITLE RESTR	OOM DESIGN STANDARDS	 PROJECT NO. TASK 1314.20	
	SHEET TITLE	LAVATORIES-2	D 47	
No. 1997	,	SCALE NONE	DATE MARCH 2005	D-4 /

<u>SONNET</u>[™]

SELF-RIMMING COUNTERTOP LAVATORY VITREOUS CHINA

FEATURES

- Lavatory: Sonnet " 1-345-V or S vitreous china self-rimming countertop lavatory with oval basin and front overflow. (Countertop is not included.)
- Trim: Specify C-1003-G (4") or C-1113-G (8") Dial-ese supply and indirect lift waste fitting with aerator and indexed acrylic handles or select an alternate choice as shown in the plumbing brass section.
- Supplies:* Angle supplies 3/8* I.P.S. with wheel handle stops and flexible risers.
- Trap: Specify 8-5260 chrome plated cast brass adjustable "P" trap (1 1/4") with cleanout and waste to wall.

NOTES

- Size: Lavatory, 29" x 19"; Basin, 25 3/4" x
 12 1/4"
 - Fixture dimensions conform to ANSI/ASME A112.19.2M standard.
 - Sealant and installation instructions included.

BOUGH-IN SPECIFICATIONS

1-345-V or S



Continuous product traprovement is a Crane Plumbing policy. Therefore prices and specifications are sobject to elenge without prior natice. Due to veriablers in the printing process, product cellurg may vary slightly transfocial element base.



Not harrished by Crarse Photobing, Description for specification purposes only.

CRAFER 61/06 Pendod in H.S.A.



American Standard

ELLISSE[™] **COUNTERTOP LAVATORY**

ELLISSE COUNTERTOP LAVATORY

- Vitreous china.
- Self-rimming
- + Rear overflow
- · Supplied with template and color-matched sealant
- · Faucet ledge. Shown with 2000.101 Ceramix faucet (not included)
- 0076.013 Faucet holes on 203mm (8*) centers
- **0076.027** (Illustrated) Faucet holes on 102mm (4*) centers

0076.033

Center hole only

Nominal Dimensions: 610 x 508mm (24" x 20")

Bowl sizes: 457mm (18") wide, 324mm (12-3/4") front to back, 159mm (6-1/4") deep

Fixture Dimensions conform to ANSI Standard A112.19.2



LAV-017 ...

VITREOUS CHINA







NOTES: * DIMENSIONIS SHOWN FOR LOCATION OF SUPPLIES AND 'P' TRAP ARE SUGGESTED * FOR COUNTERTOP CUTCUT AND INSTALLATION INSTRUCTIONS USE TEMPLATE SUP-PLIED WITH LAVATORY. FITTINGS NOT INCLUDED AND MUST BE OPDERED SEFARATELY. HMPORTANT: Dimensions at Butures are nominal and may vary within the tange of toleraboes established by ANSI Standard A152.19.2. These measurements are subject to change or cancellation. No responsibility is assumed for use of superseded or vokied pages.

SPS 0076

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Revised 6/95

MICHAEL BAKER JR. J 801 Cromwell Park Drive		PROJECT TIT	RESTROOM	DESI	GN STANDARDS	PROJECT NO. TASK 1314.20
Baker	Suite 110 Glen Burnie, MD 21061	SHEET TITLE	LA	VATO	RIES-4	B_40
	SCALE	NONE	DATE	MARCH 2005	D-47	





General Description

The LAV GUARD undersink protective pipe cover is the "original" high-quality ADA piping protection system, proven at thousands of facilities across the USA. The designer-style, highly-durable LAV GUARD is soft and flexible, universally adaptable to any 1-1/4" or 1-1/2" P-trap/tailplece assembly and 3/4" or 1/2" angle stop valve assembly.

'The LAV GUARD will not fit Schedule 40 plastic P-traps.

Features and Benefits

- ADA-conforming design protects wheelchair users from scalding and sharp, abrasive surfaces. LAV GUARD protective covers have excellent insulation properties while maintaining a smooth, non-abrasive surface.
- Rotalable, flexible design makes on-site adjustment and installation easy. The LAV GUARD allows for on-site fitting to meet unexpected jobsite conditions and unusual piping configurations (see diagram). The LAV GUARD is easy to install. No trap disassembly is required.
- Patented Lock-Lid "covers angle stop valves while allowing for convenient servicing. The hinged Lock-Lid is molded into the angle stop valve cover, and latches shut-minimizing tampering.
- Unique, patented Snap-Clip" reusable tasteners simplify installation and servicing. New flush, non-abrasive fasteners install in seconds, are selftrimming leaving no sharp edges, and are tamper-resistant.



Internal rib design maximizes safely. Compared to other pipe covers on the market, the LAV GUARD internal rib design increases thermal resistance and provides soft, resilient cushioning (see diagram).

- Easy-to-clean, antimicrobial vinyl minimizes maintenance. The LAV GUARD is molded from impact-resistant, stain-resistant, antimicrobial vinyl. Its smooth surface makes the LAV GUARD exceptionally easy to clean and maintain
- Variety of models, colors, and accessories assure the right product for your needs. The LAV GUARD is available in six different models, in gray or white, with optional accessories to assure proper installation (see ordering chartí
- Strict code compliance minimizes risk. The LAV GUARD complies with ADA article 4.19.4, California P 1504B, ANSI A117.1, BOCA P 1203.4, New York and other state and local regulations.

Specifications

Material	Molded closed cell vinyl
Morinnai Wall	10100
Durometer	60-70 Shore A
Floish	Storbill Logh globs
UV Protection	Will not fade or discolor
Purability	vitual vandesmuchble
Fasteners	Reusable snap clips included
Colo	Light gray or class white
Compatibility*	Fits all 1 - 1/4" or 1 - 1/2" cast brass or tubular P-trap assemblies and 3/8" or 1/2" angle stop assemblies
Paintability	Apply activity Enamel -
Flame Characteristics	(ATB), O sec
ASTM D 835	(AEB), 0 mm
Therease Conductivity	Whalk of a Popla is Lair , and
Bacteria Resistance	Antimicrobial vinyl formula

* The LAV GUARD will not fit Schedule 40 plastic P-traps.

Cross-Section View



Gray and White Models Available

· · · · · · · · · · · · · · · · · · ·	
# 99	one angle valve and one supply tube cover
#100	one P-trap cover
#101	one P-trap cover, one angle valve, and one supply tube cover
#102	One P-trap cover, two angle valve covers, and two supply tube covers
#103	one P-trap cover, two angle valve covers, two supply tube covers, one 5' offset talipiece wheelchair strainer cover
#103K	same as #103 with one 6' Kohler offset tallpiece wheelchair strainer cover
#105	Accessories one 5' offset tallpiece wheelchair strainer assembly
#105K	one 6' Kohler offset tailpiece wheelchair strainer assembly
#EX99	Extensions one 16' extension for supply
#EX100	one 16" extension for waste arm or failpiece

Suggested Specification

ADA-conforming, wheelchair accessible lavatory P-trap and angle valve assemblies shall be covered with the molded, antimicrobial TRUEBRO, INC. LAV GUARD undersink protective pipe cover Model____ , Accessory Color

(while or gray). Cover shall be secured with Snap-Clip flush reusable fasteners, angle stop shall have Lock-Lid locking access cover.

For additional information on this and other time TRUEBRO products, contact:



	MICHAEL BAKER JR. INC.	PROJECT TITLE	RESTROOM	DESI	GN STANDARDS	 PROJECT NO. TASK 1314.20
Baker	801 Cromwell Park Drive Suite 110 Glen Burnie, MD 21061	SHEET TITLE	LAVA	TORY	GUARD-2	D #1
		SCALE NO	DNE	DATE	MARCH 2005	B- 51

American Standard

TRIMBROOKTM 1.0 URINAL VITREOUS CHINA

TRIMBROOK 1.0 URINAL

- Vitreous china
- · Low-consumption (3.8 Lpf/1.0 gpf)
- Flushing rim
- Siphon jet flush action
- · Extended sides for privacy
- · 3/4° inlet spud
- · Outlet connection threaded 2" inside (NPTF)
- 2 wall hangers
- Fixture only
- Meets ANSI flush requirements of 0.7 to 1.0 GPF
- G561.017 Top spud

Nominal Dimensions: 445 x 311 x 679mm (17-1/2" x 12-1/4" x 26-3/4")

Fixture Dimensions conform to ANSI Standard A112.19.2

To Be Specified

- Color: C White C Bone C Silver
- G Flush Valve: Sloan Royal 186-1
- O Alternative Flush Valve:





 When installed so top of rim is 432mm (17") from finished floor. MEETS THE AMERICAN DISABILITIES ACT GUIDELINES AND ANSI A117.1 REQUIREMENTS FOR PEOPLE WITH DISABILITIES

> NOTES: FLUSH VALVE NOT INCLUDED AND MUST BE ORDERED SERVARTELY. PROVIDE SUITABLE REINFORCEMENT FOR ALL WALL SUPPORTS. MPORTANT: Demonstone of Rouses are nominal and may vary within the range of therances established by ANSI Standard A12 18.2. These measuremones are subject to change or cancellation. No responsibility is assumed for use of superseded or volted pages.

> > TBU-065

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PROJECT TITLE PROJECT NO. **RESTROOM DESIGN STANDARDS** MICHAEL BAKER JR. INC. TASK 1314.20 Baker 801 Cromwell Park Drive SHEET TITLE Suite 110 URINALS Glea Burnie, MD 21061 **B-52** SCALE DATE NONE **MARCH 2005**



CT 708 Wall Hung Flushometer Toilet, 1.6 GPF



CT 708 - Wall Hung Flushometer Toilet SC534 - Commercial Toilet Seat TMT1HNC - 32 - Manual Toilet Flushometer Valve Powerful siphon jer flush
 Elongated rim
 Low consumption (6Lpf/ 1.6 Gpf)

Available with performance matched TOTO Flushometer Valve.

Vitreous china wall hung flushometer toilet with elongated rim. Low consumption (6Lpf/1.6 Gpf) siphon jet flush.

CT708
1~1/2" top spud inlet, less seat.

CT708V
I-1/2" back spud inlet, less seat.

© SS114 SoftClose: Seat and lid gently close with a touch of a band, Elongated, closed front seat with lid.

C SC134 Elongated, open front seat with cover.

© SC534 Elongated, open front seat less cover.

TOTO wall hung toilets require a supporting carrier (supplied by others). Follow carrier manufacturers' installation instructions.

Calors; Standard 801 Cotton Optional See price back for additional culors

Rocommondest fluctumeter volvo: ROTO Manual and Electronic Fluck Valvas are highly recommended for maximum performance:

B

Reliance Commercial Line

	MICHAEL BAKER JR. INC.	PROJECT TITLE RESTROOM DESIGN STANDARDS		PROJECT TITLE RESTROOM DES			PROJECT NO. TASK 1314.20
Baker	Suite 110 Glen Burnie, MD 21061	SHEET TITLE	WA	ER C	LOSET-1	TASK 1314.20	
		SCALE	NONE	DATE	MARCH 2005		B-53

CT 708 Wall Hung Flushometer Toilet, 1.6 GPF

PERFORMANCE

The TOTO low consumption flushometer toilet received high ratings during ANSI/ASME testing at independent laboratorics. Designed with a powerful siphon jet flush, the bowl offers a large water surface and a 100% glazed trapway.

SPECIFICATIONS

Water Use: 1.6 Gpf/6.0Lpf Flush System: Siphon jet Min. Water Pressure:

15 psi (Flowing) Water surface: 12-5/8" x 10-1/4" 2-1/8" Trap dia: Trap seal: 2-5/8" One Year Limited Warranty Warranty: Material: Vitreous china

Shipping Weight: CT708-Bowl

49 lbs. CT708V-Bowl 53.5 lbs.

Shipping Dimensions: CT708-Bowl 15-1/2"L x 15-1/2"W x 26-3/8"H CT708V-Bowl 17-1/8°L x 16"W x 26°H

Recommended carrier: Any Jay R. Smith siphon jet support (Four-bolt).

Fixture dimensions and hydraulic performance meet or exceed ANSI/ASME standard A112.19.2M and CAN/CSA B 45 requirements,

Listing / Approvals: IAPMO/UPC, CSA, City of Los Angeles, State of Massachusetts, and others.

6

Meets the American Disabilities Act Guidelines and ANSI A117.1 requirements where installed so top of rim is 17" from the finished floor.

These dimensions and specifications are subject to change without notice.



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	MICHAEL BAKER JR. INC.	PROJECT TIT	RESTROOM	DESI	GN STANDARDS	PROJECT NO. TASK 1314.20
Baker	Suite 110 Glen Burnie, MD 21061	SHEET TITLE	WAT	WATER CLOSET-2	D 54	
		SCALE	NONE	DATE	MARCH 2005	B- 54





Standard Installation **Retrofit Installation** 45mm (1%*) 000000 M Note: If carrier bolt doesn't extend/is flush with china, use retrofit caps (#TMOS7)

CT 708V Back Spud

MOLTEX® HEAVY DUTY SOLID PLASTIC **HIGH IMPACT** Extra heavy duty 9500C ROUND Moltex comfort seat, solid (5320.114) **Duraloy plastic** 16" to 17 elongated, open front toilet seat, built-in bumpers, rugged unbreakable external 5%" check with stainless ELONGATED steel posts. 18** 10 19 White 5% Black 9700 Round 9500 Elongated 9900C Elongated © Copyright Church, Inc. All rights reserved. Click for Page Home Back Page **Guided** Tour ConNet/CAPS@ 0t.Avr. 14 PROJECT TITLE PROJECT NO. **RESTROOM DESIGN STANDARDS** MICHAEL BAKER JR. INC. TASK 1314.20 Baker 801 Cromwell Park Drive SHEET TITLE Suite 110 WATER CLOSET-3 Glen Burnie, MD 21061 **B-55** DATE SCALE NONE **MARCH 2005**

Designed for demanding institutional applications. Available in six models, all made with easy to clean Wonder-Wall sandwich panels. Models S-115 and S-125 made for the physically challenged.

Commander models S-115 and S-125 are designed and built for people who are physically challenged. Both models are available in finishes (1), (2) and (3). S-115 is ADA compliable. S-115 and S-125 have the same high quality features as the standard Commander series.

Standard equipment includes a model 180AA pressure balanced mixing valve with stops, in-line vacuum breaker with wall and hand held shower head with 69" flexible stainless steel hose and a supply elbow with flange. A 24" slide guide with hanger hook, one wrap around $1^{1}/e^{\mu}$ grab bar (horizontal) and one straight

 $1^{1/2"}$ grab bar (vertical) are also included. Shower walls are reinforced to securely anchor all accessories. The folding wheelchair transfer shower seat is phenolic; the seat frame and supports are made of stainless steel tubing. The 1" stainless stee curtain rod is hung on brass chromium-plated brackets. A 10 oz GSA approved curtain, pins and brass chromium-plated soap dist are standard features, grab bars, seat and other accessories are in accordance with ANSI standard A-117.1-1980. Commander models S-115 and S-125 are available in alternate sizes and finishes.



14

COMMANDER® SHOWER CABINETS

Commander shower cabinets are made for demanding institutional use. Special Wonder-Wall panels and top frame are made of galvanized-bonderized steel finished in (1) baked enamel inside and out, (2) stainless steel inside and out or, (3) stainless steel inside, baked enamel outside. Wonder-Wall panels with a 1" core and water impervious insulation significantly reduces noise and vibration. Floors are durable, one-piece pre-cast terrazzo. Cove corner interior walls are formed with 1" radii at all four corners for easy cleaning. There are no corner joints, cracks or crevices to leak or to harbor germs and grime.

On Commander models with back and side walls, panels are joined with anodized aluminum extruded molding.

Standard equipment includes a model 190AA pressure-equalizing valve with stops, shower head, arm and flange. Also included are a stainless steel curtain rod, chromium-plated brass brackets, curtain and chromium-plated brass soap dish.



	WHATIS NEW PR	COV GRADLEY	SALES LOCATIONS ABO by category - application pl	UT US CUSTOMER SER hotos - application guide contact us 1 site MAP	VICE V lines - warra
	INFORMATION Plumbing Fixtures: Sh	owers			ana ang ang ang ang ang ang ang ang ang
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	Tech Data	CAD Files	Installation Instructions	Valve Selections	Send m liter
	Tech Data Sheet PDF (100k) Introduction to Bradley Showers (247k)		HN200 Barrier-Free Shower - Title 24 Compliant (with hand- held hose spray) (236k) Shower Operation & Service Guide (767k)	Hot & Cold Equa-Flo Pressure Balancing Mixing Valve Tempered	Plumbing Fi Sweets
	Shower Accessories				
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	MICHAEL BAKER JR 801 Cromwell Park Drive	. INC. REPET TITLE	ESTROOM DESIGN S	STANDARDS	PROJECT NO. TASK 1314.2
Bake	Suite 110	Silles Hills	SHOWERS-3	3	

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HN250 Barrier-Free Model HN250 Ideal for Bamer- Flexible Supply I Completely Prea Hydrostatically T	Shower - Title 24 Com Free Shower Rooms Hoses Make Rough-In Easie Issembled, Surface-Mounted ested to 150 PSI	ap ilant er I Wali Unit		
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Shower Accessories				
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	INFORMATION Plumbing Fixtures: Show			CONTACT US 1 SITE MAP I	SITE STARCH
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	Tech Data	CAD Files	Installation Instructions Shower Operation & Service Guide (767k)	Valve Selections Hot & Cold Equa-Fio Pressure Balancing Mixing Valve	Send m liter Ptumbing Fi Sweets
	Showers (247k) Shower Accessories Tech Data and	I Install Sheets PDFs	require the	Tempered	AutoCAD R1
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aker	MICHAEL BAKER JR. INC. 801 Cromwell Park Drive Suite 110	PROJECT TITLE	RESTROOM DESIGN	N STANDARDS S-5	PROJECT NO. TASK 1314.20
. <u>18</u> 2	Glea Burnie, MD 21061	SCALE NONE	DATE N	1ARCH 2005	B-60

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Baker MICHAEL BAKER JR. INC. 801 Cromwell Park Drive Suite 110 Gien Burnie, MD 21061 BCALE NONE BATE MARCH 2005 PROJECT TITLE BRESTROOM DESIGN STANDARDS BHEET TITLE DATE MARCH 2005 FIAT mop service receptors of Molded-Stone® set the industry standard for quality and reliability. In addition, our complete line of MSB accessories provide the plumbing professional, engineer, and specifier with a complete package; designed, engineered and backed by FIAT's commitment to the best in mop service basins.



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Wall mounted fitting. Chrome plated with vacuum breaker, integral stops, adjustable wall brace, pail hook and 3/4" hose thread an spaut. Body inlets 8" center to center, four arm handles. Center of center, jour ann handres. Center of spout outlet from back of wall flange 8°. The 830-AA Faucet meets or exceeds all of the regularments of ANSI A-112.16.1-1975, "Finished and Rough Face filtering" entertaint Brass Plumbing Fixture Fittings", as tested by U.S. Testing Laboratories (copy of report available upon request). The 830-AA Faucet Is CSA approved per file number LM 57412-1, Class 6811 01.

ACCESSORIES



Model 832-AA 30" Iona flexible h duly 5/8" rubber hose, cloth reink with 3/4" chrame coupling at one Bracket is 5" long x 3" wide, staintes with rubber glp.

ACCESSORIES



Model 889-CC 24" long x 3" wide, stainless steel with three (3) rubber log! grips.



Model E-88-AA For Molded-Stone Mop Basins.



Model 1239-88 For Terrazzo Mop Basins,



Model E-77-AA For Molded-Stone Mop Basins.



Madel 1453-88 Flat type stainless



Model No. 833-AA



For use with sither Molded-Stone or precast Terrazzo Mop Basins, made of heavy gauge statuless steet and is used to protect wails adjacent to the receptor. Two ponels are supplied for corner installations, a third panel is required for a recessed installation. The wall guard models are identified as follows:

MSG 2424; MSG 3232; MSG 3624; MSG 3636





Trim Designs

Mortise Locksets ML2000 Series



Lustra

Complies with codes requiring lever to return to within 1/2" (13mm) of door face. Brass, bronze or stainless steel

LWA

Lever: Wrought Rose: Wrought Door thickness: 1⁵/s" (35mm), 1⁵/4" (44mm), 2¹/4" (57mm)

G

LWB

Lever: Wrought Rose: Cast Door thickness: 1⁵/s" (35mm), 1³/4" (44mm), 2¹/4" (57mm)

LSA

Lever: Cast Rose: Wrought Door thickness: 1⁵/s" (35mm), 1³/4" (44mm), 2¹/4" (57mm)

LSB

Lever: Cast Rose: Cast Door thickness: 1³/s" (35mm), 1³/4" (44mm), 2¹/4" (57mm)

Dimensions: <u>inches</u> millimeters

ML2000.8

	MICHAEL BAKER JR. INC. 801 Cromwell Park Drive	PROJECT TITLE RESTR	OOM DESIGN STANDARDS	PROJECT NO. TASK 1314.20
Baker	Suite 110 Glen Burnie, MD 21061	SHEET TITLE MORT	ISE LOCKSET DOOR LEVER	D (2
		SCALE NONE	DATE MARCH 2005	B-63





APPENDIX G

CODES AND STANDARDS





NFPA Code or Standard	Title	Edition	Notes (see below)
1	Uniform Fire Code	2006	1
10	Portable Fire Extinguishers	2002	2
11	Low, Medium, and High Expansion Foam	2005	2
12	Carbon Dioxide Extinguishing Systems	2005	2
12A	Halon 1301 Fire Extinguishing Systems	2004	2
13	Installation of Sprinkler Systems	2002	2
14	Standpipe and Hose Systems	2003	2
15	Water Spray Fixed Systems for Fire Protection	2001	2
16	Foam-Water Sprinkler and Foam-Water Spray Systems	2003	2
17	Dry Chemical Extinguishing Systems	2002	2
17A	Wet Chemical Extinguishing Systems	2002	2
20	Installation of Stationary Fire Pumps	2003	2
22	Water Tanks for Private Fire Protection	2003	2
24	Private Fire Service Mains and their Appurtenances	2002	2
25	Inspection, Testing, and Maintenance of Water-Based	2002	2
	Fire Protection Systems		
30	Flammable and Combustible Liquids Code	2003	2
30A	Code for Motor Fuel Dispensing Facilities and Repair	2003	2
	Garages		
31	Standard for the Installation of Oil-Burning Equipment	2001	2
33	Spray Application Using Flammable or Combustible	2003	2
	Materials		
37	Installation and Use of Stationary Combustion Engines	2002	2
	and Gas Turbines		
51B	Fire Prevention During Welding, Cutting, and Other	2003	2
	Hot Work		
52	Vehicular Fuel Systems Code	2006	2
54	National Fuel Gas Code	2006	2
55	Compressed Gases	2005	2
58	Liquefied Petroleum Gas Code	2004	2
70	National Electrical Code	2005	2
72	National Fire Alarm Code	2002	2
75	Standard for the Protection of Information Technology	2003	3
	Equipment		
76	Standard for the Fire Protection of	2005	3
	Telecommunications Facilities		
80	Fire Doors and Fire Windows	1999	2
80A	Recommended Practice for Protection of Buildings	2007	3
	from Exterior Fire Exposures		
88A	Parking Structures	2002	2
90A	Installation of Air-Conditioning and Ventilating	2002	2

NFPA Code or Standard	Title	Edition	Notes (see below)
-	Systems		
90B	Installation of Warm Air Heating and Air-Conditioning Systems	2006	2
92A	Standard for Smoke-Control Systems Utilizing Barriers and Pressure Differences	2006	3
92B	Standard for Smoke Management Systems in Malls, Atria, and Large Spaces	2005	3
96	Ventilation Control and Fire Protection of Commercial Cooking Operations	2004	2
101	Life Safety Code	2006	1
105	Installation of Smoke Door Assemblies	2003	3
110	Emergency and Standby Power Systems	2005	2
170	Fire Safety Symbols	2006	3
204	Smoke and Heat Venting	2002	2
220	Types of Building Construction	1999	2
221	Fire Walls and Fire Barrier Walls	2000	2
241	Safeguarding Construction, Alteration, and Demolition Operations	2000	2
407	Aircraft Fuel Servicing	2001	2
408	Standard for Aircraft Hand Portable Fire Extinguishers	2004	3
409	Aircraft Hangars	2001	2
410	Aircraft Maintenance	1999	2
415	Airport Terminal Buildings, Fueling Ramp Drainage, and Loading Walkways	2002	2
418	Heliports	2001	2
502	Road Tunnels, Bridges, and Other Limited Access Highways	2004	3
505	Powered Industrial Trucks	2002	2
703	Standard for Fire Retardant–Treated Wood and Fire- Retardant Coatings for Building Materials	2006	2
704	Standard System for the Identification of the Hazards of Materials for Emergency Response	2001	2
780	Standard for the Installation of Lightning Protection Systems	2004	3
2001	Clean Agent Fire Extinguishing Systems	2004	2
5000	Building Construction and Safety Code	2006	4

NOTES TO NFPA STANDARDS AND CODES TABLE

1. Direct Adoption By State Fire Prevention Code – the Maryland State Fire Code directly adopts this Code or Standard (*Reference: TITLE 29. DEPARTMENT OF STATE POLICE, SUBTITLE 06, FIRE PREVENTION COMMISSION, CHAPTER 01, FIRE PREVENTION CODE, Amended Effective August 1, 2004*). Check the State Fire Prevention Code for possible amendments to the adopted Code or Standard.

2. Mandatory Requirements by Referenced Publication - Although not directly adopted by the State Fire Prevention Code of Maryland, this Code or Standard is referenced by other adopted Standards or Codes and are therefore applicable. See NPFA 1, Chapter 2, for a complete listing of Referenced Publications, which are mandatory requirements.

3. Recommended Practice - Although not directly adopted by the State Fire Prevention Code, and not adopted by reference, this may be considered recommended practice by the OFM for certain projects. Check with the OFM for guidance regarding application of this Standard to particular projects.

4. NFPA 5000 is listed as a "Referenced Publication" by NFPA 1. However, the Maryland Fire Prevention Code specifically deleted it from adoption and substituted the IBC.