



# MARYLAND AVIATION ADMINISTRATION

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## 2008 Design Standards

Volume II of III  
(Appendices A thru I)



DIVISION OF FACILITIES DESIGN

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February 2008

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# 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, Facilities Design in writing before design work may proceed. There will be no exceptions.

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

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

**Yes      No      N/A**

\_\_\_\_      \_\_\_\_      \_\_\_\_      3. Have past engineer's reports involving the project area and/or scope been reviewed? List reports reviewed.

\_\_\_\_\_  
\_\_\_\_\_

\_\_\_\_      \_\_\_\_      \_\_\_\_      4. Have record plans from the project area been reviewed? List project plans reviewed:

\_\_\_\_\_  
\_\_\_\_\_

\_\_\_\_      \_\_\_\_      \_\_\_\_      5. Does the project area include wetlands or other environmentally sensitive areas that need to be addressed? Have environmental issues been properly coordinated with the Office of Planning and Environmental Services?

\_\_\_\_      \_\_\_\_      \_\_\_\_      6. Has any required environmental documentation been coordinated with and approved by the Office of Planning & Environmental Services? Have necessary approvals been received? Can project proceed if approvals are not received?

\_\_\_\_      \_\_\_\_      \_\_\_\_      7. If required, have appropriate mitigation measures been included in the design?

\_\_\_\_      \_\_\_\_      \_\_\_\_      8. If required, has an FAR Part 77 obstruction survey been conducted? Have possible impacts on the project schedule been evaluated?

\_\_\_\_      \_\_\_\_      \_\_\_\_      9. Does the design call for obstructions to be removed or lighted? Have removal and/or lighting decisions been coordinated with the Office of Planning & Environmental Services and Office of 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: _____
_____	_____	_____	15. Have other required permits been received? List permits and application dates: _____ _____
_____	_____	_____	16. Has BG&E work been coordinated and finalized?  BG&E representative: _____
_____	_____	_____	17. Has Bell Atlantic work been coordinated and finalized?  Bell Atlantic representative: _____
_____	_____	_____	18. Has an application for frequency approval been submitted to FCC? Application date: _____
_____	_____	_____	19. Have Anne Arundel County Department of Public Works approvals and permits been received for water and/or sewer hook-ups?
_____	_____	_____	20. Has work been coordinated with the following agencies?
_____	_____	_____	a. State Highway Administration?
_____	_____	_____	b. Mass Transit Administration?
_____	_____	_____	c. Amtrak and Maryland State Railroad Administration?
_____	_____	_____	d. FAA -- Air Traffic Control and Facilities?
_____	_____	_____	e. FAA – Washington Airports District Office?
_____	_____	_____	f. FAA – Eastern Region?
_____	_____	_____	g. Federal Inspection Services (FIS) Agencies?
_____	_____	_____	21. Have surveying and mapping been completed?
_____	_____	_____	22. Has the Pre-Design Meeting been held (at 30% Design)? In certain cases a Pre-Design meeting will be required. OPE will provide direction.
_____	_____	_____	23. Have the 30% Design plans, specifications, and construction cost estimate been received, distributed, and reviewed? The 30% submission was distributed to: _____

Yes No N/A

\_\_\_\_ 24. Has the Preliminary Engineer's Report including been completed, distributed, and reviewed (at the 30% Design stage)? Does the report include supporting calculations? The report was distributed to: \_\_\_\_\_

\_\_\_\_ 25. Have the 30% Design review comments been addressed and resolved?

\_\_\_\_ 26. Have the 60% Design plans, specifications, and construction cost estimate been received, distributed, and reviewed? The 60% submission was distributed to: \_\_\_\_\_

\_\_\_\_ 27. Have the 60% Design review comments been addressed and resolved?

\_\_\_\_ 28. Have the 100% Design plans, specifications, Engineers Report, and construction cost estimate been submitted for review and approval? Does the report include supporting calculations? The 100% submission was distributed to: \_\_\_\_\_

\_\_\_\_ 29. Has the project been approved by the State Fire Marshal?

\_\_\_\_ 30. Have the final plans, specifications, and construction cost estimate been submitted?  
Submission date: \_\_\_\_\_

\_\_\_\_ 31. Have state wage rates been requested and received from the State of MD Dept. of Labor Licensing & Regulation?

\_\_\_\_ 32. Have Federal wage rates been requested and received from the 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  
SCHEDULE A**

**MAA Project No.:** \_\_\_\_\_

**Project Title:** \_\_\_\_\_

**Yes      No      N/A**

- |       |       |       |   |
|-------|-------|-------|---|
| _____ | _____ | _____ | 1. Has the project been coordinated through the Office of Airport Operations with affected tenants?                           |
| _____ | _____ | _____ | 2. Has the project been coordinated with the Office of Commercial Management where leases and tenant agreements are affected? |

**Traffic Control Plan**

- |       |       |       |  |
|-------|-------|-------|--|
| _____ | _____ | _____ | 1. Has the traffic control plan been coordinated with Airport Operations, State Highway Administration, and county government (i.e., detours, temporary pavement marking, lighting, signage, directional arrow board, etc.)? |
| _____ | _____ | _____ | 2. Have temporary markings on airfield pavements been specified to be painted? (The use of temporary tape markings must be approved by Airport Operations.)  |
| _____ | _____ | _____ | 3. Is adequate temporary lighting specified?   |
| _____ | _____ | _____ | 4. Are adequate customer/pedestrian protection, temporary signs, dust control measures, etc. specified?  |

**Civil and Landscaping**

- |       |       |       |   |
|-------|-------|-------|---|
| _____ | _____ | _____ | 1. Have adequate storm water management, erosion and sediment control measures during construction been specified?                  |
| _____ | _____ | _____ | 2. If needed, have special treatments for establishing ground cover (minimum requirement: topsoil, seed, and mulch) been specified? |
| _____ | _____ | _____ | 3. Have landscaping plans been approved by the MAA Maintenance Division?  |

**Electrical**

- |       |       |       |  |
|-------|-------|-------|--|
| _____ | _____ | _____ | 1. Have Mode II runway and taxiway signs been specified?         |
| _____ | _____ | _____ | 2. Have "switch hitter" runway centerline lights been specified? |

**Yes      No      N/A**

\_\_\_      \_\_\_      \_\_\_      3. Have runway condition sensors been included if specified by MAA?

\_\_\_      \_\_\_      \_\_\_      4. Have any required control tower facsimile panel modifications been included?

**Buildings**

\_\_\_      \_\_\_      \_\_\_      1. On major structures, has the Governor's Commission approved the architectural concept?

\_\_\_      \_\_\_      \_\_\_      2. Have the roof specifications been approved by the Department of General Services? Has modified bitumen roof been specified?

\_\_\_      \_\_\_      \_\_\_      3. Have temporary heat and air conditioning been provided?

\_\_\_      \_\_\_      \_\_\_      4. Have temporary water and sanitary sewer service been provided?

\_\_\_      \_\_\_      \_\_\_      5. Is temporary power provided?

\_\_\_      \_\_\_      \_\_\_      6. Have handicapped facilities been provided in accordance with ADA? Have these facilities been reviewed by the MAA 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 (glare) study been conducted and approved?

**Safety**

\_\_\_      \_\_\_      \_\_\_      1. Has FAA Advisory Circular 150/5300-9A been incorporated?

\_\_\_      \_\_\_      \_\_\_      2. Has FAA Advisory Circular 150/5370-2E been incorporated?

**Aesthetics**

\_\_\_      \_\_\_      \_\_\_      1. Is there any need or justification for special treatments for aesthetic reasons?

\_\_\_      \_\_\_      \_\_\_      2. Is there any need for artist's renderings and/or a special aesthetics review?

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

\_\_\_\_\_  
Engineer's Signature

\_\_\_\_\_  
Date

**FEDERAL AVIATION ADMINISTRATION  
PLANS AND SPECIFICATIONS REVIEW CHECKLIST**

**SCHEDULE B**

**Airport:** \_\_\_\_\_  
\_\_\_\_\_

**AIP No.:** \_\_\_\_\_

<b>Yes</b>	<b>No</b>	<b><u>Item</u></b>
_____	_____	1. Do the plans and specifications cover all the work included in the tentative allocation? If not, please explain.  _____ _____
_____	_____	2. Do the plans and specifications include any non-eligible development? If so, please identify
_____	_____	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 Modifications to FAA standards (MOS) included in Engineering Report? Have MOS been:  Requested:      Yes _____      No _____ Approved:      Yes _____      No _____
_____	_____	8. Does the development included in the plans and specifications conform with the approved Airport Layout Plan? If not, please explain. (Note: This can be controlled by including a general layout sheet in the plan set with all grant work items listed in the legend and shown at the location on the airport where it will be constructed. The location and size shown should agree with the approved ALP).  _____ _____
_____	_____	9. Are there any special environmental conditions or requirements that need to be incorporated in the plans and specifications? If yes, please explain. Has coordination with MAA Office of Planning and Environmental Services been satisfied?

		<u>Item</u>
Yes	No	
—	—	10. Have line of sight (shadow studies), ground radar interference and reflectivity studies for new or modified structures been submitted to the FAA prior to 30%?
—	—	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?
—	—	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 DBE goals shown in the specifications in conformance with sponsor's approved DBE plan?
—	—	15. Do Plans and Specifications include safety requirements of Advisory Circular 150/5370-2E, "Operational Safety on Airports During Construction"? Has the Construction Safety and Phasing Plan been approved?
—	—	
—	—	

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Title

\_\_\_\_\_  
Date

---

# APPENDIX B

## STANDARD FORMS



# MEETING MINUTES

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

[illegible]

# INTRODUCTION AND PURPOSE OF THE MEETING

A	AGENDA ACTION/DISCUSSION ITEMS	ACTION REQUIRED BY	DATE REQUESTED
B	OUTSTANDING ITEMS REQUIRING ACTION/DISCUSSION FROM PREVIOUS MEETING(S)	ACTION REQUIRED BY	DATE REQUESTED
	<u>Action:</u>		
<b>Distribution:</b> <b>cc:</b>			

**Contract Number  
Task Number and Title**

**Date**

ESTIMATING LEVEL: ☐ Budget

☐ Concept

☐ 30%

☐ 60%

☐ 100%

☐ Bid

ITEM	DESCRIPTION	UNIT	UNIT COST	QUANTITY	TOTAL	COMMENT
<b>CONSTRUCTION COST ESTIMATE</b>						
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)					
<b>SUBTOTAL A</b>					<b>\$0</b>	
Design Contingency (15% to 25% of A)				25%	\$0	
<b>SUBTOTAL B</b>					<b>\$0</b>	
General Conditions X% of B (If not included in Unit Costs)				10%	\$0	
Contractor O&P X% of B (if not included in Unit Costs)				15%	\$0	
Construction Security Plan (XX% of C)				5%	\$0	
<b>SUBTOTAL C</b>					<b>\$0</b>	
Construction Quality Control Plan (3% of C)				3%	\$0	
Miscellaneous Construction Allowance (5% to 10% of C)				10%	\$0	
<b>TOTAL CONSTRUCTION COST ESTIMATE</b>					<b>\$0</b>	
<b>ADDITIONAL PROGRAM COSTS</b>						
Estimated Design Fee (8% to 12% of Construction Cost)				12%	\$0	
Estimated CMI Fee (8% to 12% of Construction Cost)				12%	\$0	
<b>TOTAL CAPITAL PROGRAM COST ESTIMATE</b>					<b>\$0</b>	
Escalation Factor (if applicable)				0%	\$0	
<b>GRAND TOTAL</b>					<b>\$0</b>	
Level of Accuracy	<input type="checkbox"/> Quantity Take-Off	<input type="checkbox"/> General Square Foot			<input type="checkbox"/> Comparison with other installations/facilities	
List of Sole Source Items	1	3	5			
Included in this Contract	2	4	6			
List of Assumptions						



Fire/Law Enforcement Rapid Entry System

# AUTHORIZATION ORDER FORM

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


**Effective**  
**January 1, 2006**
**Section 1 BILLING INFORMATION - MUST MATCH CREDIT CARD INFORMATION IF USED.**

COMPANY / NAME

DATE ORDERED

STREET (NO P.O. BOXES)

SUITE / BUILDING

CITY

STATE

ZIP CODE

CONTACT NAME

PHONE NUMBER

P.O. NUMBER (GOV. AGENCIES ONLY)

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

**ORDER WILL NOT BE PROCESSED**
**Section 2 Without Authorized Signature**

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

Authorized Fire Agency Signature and Date

Print Name Clearly

PS-39-026-02-89

System Code

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

**Section 3 ORDER PRODUCT HERE**

Quantity	Part Number	Amount
		Total \$
		Total \$
		Total \$
<b>Shipping &amp; Handling</b>		If required, add \$7.00 per submastered item \$
1 lb. to 7 lbs.	\$7.00	Shipping and Handling \$
8 lbs. to 25 lbs.	\$17.00	Subtotal \$
26 lbs. to 50 lbs.	\$30.00	No St. Tax
51 lbs. to 75 lbs.	\$40.00	Sales Tax \$
75 lbs.+ call Knox for quote.		Reqd Pre-payment
Alaska, Hawaii, Canada or		Total \$
Priority Shipping, please		
call for rates.		

**PRE-PAYMENT INFORMATION REQUIRED**
**USE PRICE LIST ON LAST PAGE**
☐ Check or Money Order made payable to: **KNOX COMPANY** Federal I.D. #95-3617858

☐ VISA ☐ AMEX

☐ MC ☐ DISC

CARD NUMBER

EXP. DATE (MM / YYYY)

Cardholder Signature

**Section 4 INSTALLATION ADDRESS - REQUIRED BY FIRE DEPARTMENT**

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

ADDRESS

CITY

STATE

ZIP CODE

**Fire Department Approval**  
**Signature Required to**  
**Submaster Items**
☐ Check here to Submaster

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

**Section 5 SHIP TO ADDRESS IS REQUIRED**

SHIP TO CONTACT NAME

COMPANY NAME

STREET ADDRESS (NO P.O. BOXES)

CITY

STATE

ZIP CODE

E-MAIL ADDRESS

O/N

REC'D

Continued Page 1

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

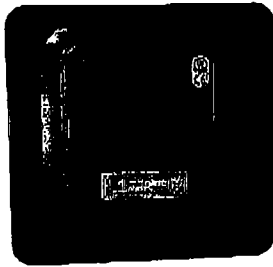
Knox Master Keys are provided to authorized fire departments or other registered entities on an as-needed basis solely for the use with Knox Rapid Entry System. No other use of the keys or their associated codes is authorized. Key codes associated with the Knox Master Keys and Keyways remain the property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

Authorized Dual Lock User Signature \_\_\_\_\_

Date \_\_\_\_\_

# Knox Rapid Entry System Product Catalog

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



#3227 Recessed

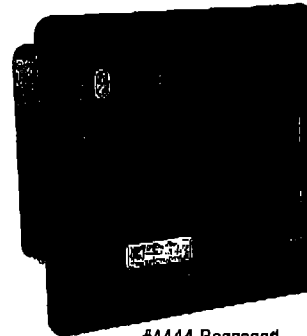


#3208 Surface

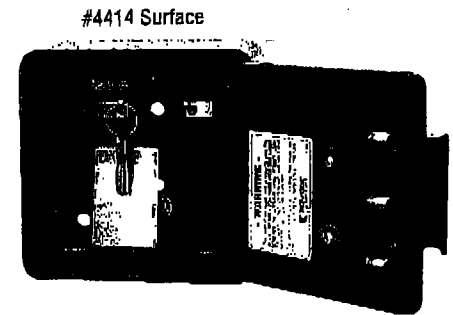
- Heavy-duty, high security construction
- Capacity for up to 10 keys and access cards
- 1/2" solid steel door
- Dimensions: Surface 5" H x 4" W x 3-1/4" D  
Recessed 7" H x 7" W Flange
- **Ship Weight: 10 lbs.**
- Colors: Black, Bronze, Aluminum
- Finish: Knox-Coat® Weather resistant proprietary coating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

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

## KNOX-VAULT™ 4400 Series - Heavy Duty



#4444 Recessed

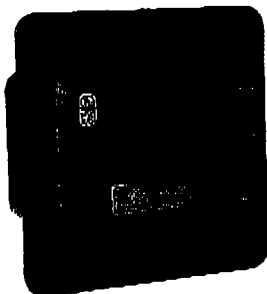


#4414 Surface

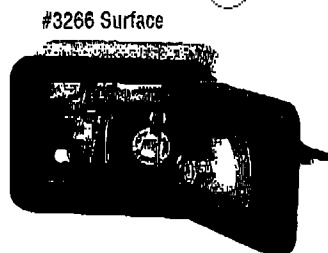
- Heavy-duty, high security construction
- 50 key capacity storage, for access cards, floor plan
- 5/8" solid steel door, re-locking mechanism with drill resistant hard-plate lock protector
- Dimensions: Surface 7" H x 7" W x 5" D  
Recessed 9-1/2" H x 9-1/2" W Flange
- **Ship weight: 29 lbs**
- Colors: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

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

## KNOX-BOX® 3200 Series w/ Hinged Door



#3275 Recessed



#3266 Surface

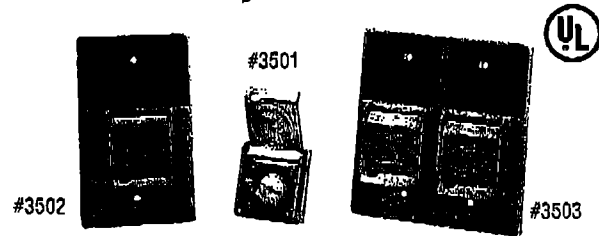


- Allows single-handed operation
- Stores both keys and access cards
- Ensures efficient emergency response
- Door attached with hinge, it's all one unit
- Dimensions: Surface 4" H x 5" W x 3-1/4" D  
Recessed 7" H x 7" W Flange
- **Ship Weight: 10 lbs.**
- Colors: Black, Bronze, Aluminum
- Options: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





## Knox® Key Switch 3500 Series



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

## Knox® Residential 1650 Series

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



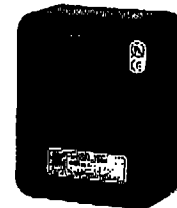
#1658  
Hinged Door



#1651  
Lift-Off Door  
w/ Door Hanger



#1650  
Lift-Off Door



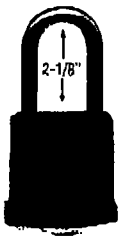
## Knox® Padlock

Agency I.D. Label Included



### Exterior - All Weather Conditions

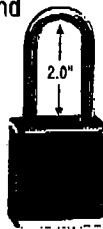
- Secures perimeter and fire access gates, and other fire department equipment
- Heavy duty brass body, stainless steel 3/8" diameter shackle
- Protective EPDM boot with shackle seal
- Metal keyhole cover



#3753

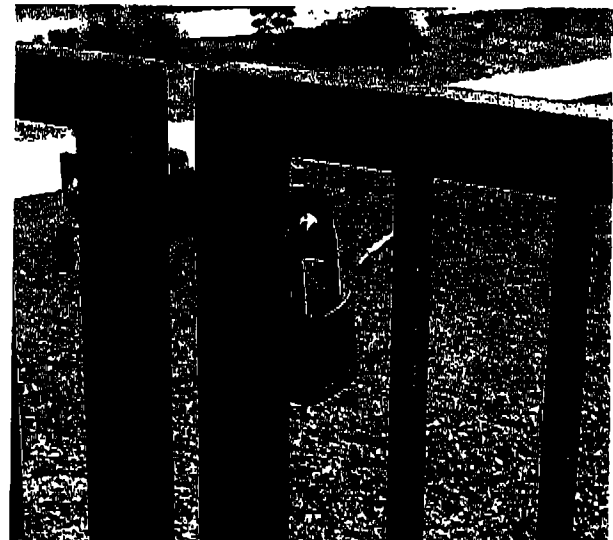
### Interior - Light Duty

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



#3754

**Ship Weight: 1.5 lbs**

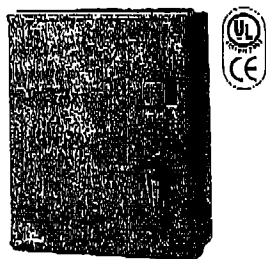


**WARNING:** Before ordering, measure hasp fittings to ensure proper shackle size.

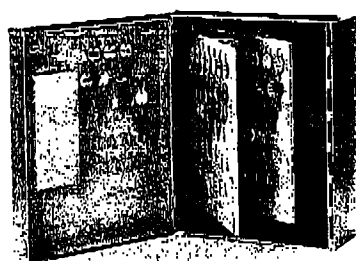
Knox® Master Keys are provided to authorized fire departments or other registered entities on an as-needed basis solely for use with the Knox Rapid Entry System. No other use of the keys or their associated codes is authorized. Key codes associated with the Knox Master Keys and Keyways remain the property of the Knox Company and are maintained by the Knox Company in Phoenix, AZ. For questions regarding this policy, contact Knox at 800-552-5689 or [knoxbox.com](http://knoxbox.com).

# Knox Rapid Entry System Product Catalog

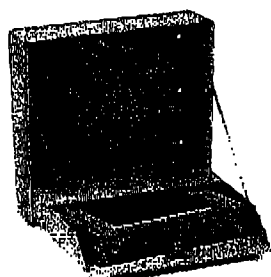
## Knox® Cabinet



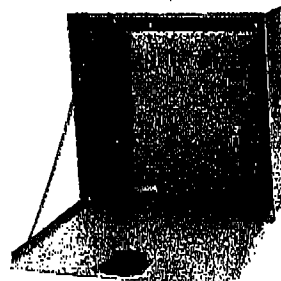
#1307 Dual Lock



#1308 w/ Optional Back Panel and Swing Panels.



#1100  
Not suitable for key storage.



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

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

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

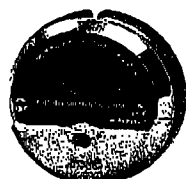
- **1201 Weather housing/Rain shield**
- Protect Knox cabinet from weather
- Weather housing has latch without lock
- Dimensions: 21" H x 20"W x 13-5/8"D
- **Ship Weight: 75 lbs**
- Color: Light grey
- Finish: Knox-Coat® Weather resistant proprietary coating system

## Knox® FDC Plug

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



#3011



#3010

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

## Knox® FDC Storz Cap

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



#3080



#3090

**2006 Price List - Order Online at [www.knoxbox.com](http://www.knoxbox.com)**

Prices and availability subject to change.

**KNOX-BOX®****3200 Series w/ Lift-Off Door Surface Mounted**

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

Ship Wt: 10 lbs.

**3200 Series w/ Lift-Off Door Recess Mounted**

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

Ship Wt: 10 lbs.

**3200 Series w/ Hinged Door Surface Mounted**

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

Ship Wt: 10 lbs.

**3200 Series w/ Hinged Door Recess Mounted**

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

Ship Wt: 10 lbs.

**KNOX-VAULT™****4400 Series Surface Mounted**

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

Ship Wt: 29 lbs.

**4400 Series Recess Mounted**

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

Ship Wt: 29 lbs.

**KNOX® KEY SWITCH**

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

Continued on back page



**006 Price List - Order Online at [www.knoxbox.com](http://www.knoxbox.com)**

Prices and availability subject to change.

**(KNOX® PADLOCK**

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

**(KNOX® RESIDENTIAL (Holds two keys maximum)**

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

**KNOX® CABINET****1300 Series - UL Listed**

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

— Ship Wt: 65 lbs. —

**1300 Cabinet Options**

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

**1100 Series**

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

**ACCESSORIES**

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

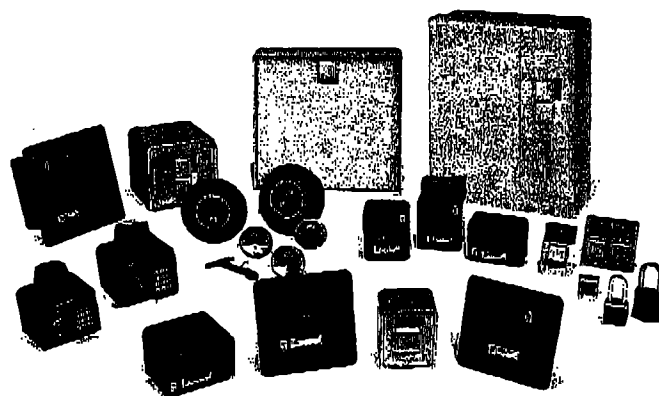
**KNOX® LOCKING FDC PLUGS**

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

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

**KNOX® LOCKING FDC STORZ CAPS**

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



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Fax 623-687-2299

E-mail: [info@knoxbox.com](mailto:info@knoxbox.com) • Web: [www.knoxbox.com](http://www.knoxbox.com)  
1601 W. Deer Valley Road, Phoenix, Arizona 85027

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# APPENDIX C

## CADD STANDARDS MANUAL





Maryland Aviation Administration

# CADD Standards Manual

VOLUME 1 DATED: FEBRUARY 2008



PEDASTAL

PLAS. LAM. JT

ONE PCE WELDED  
STAINLESS STEEL  
W. SOUND DEADEN

PLAS. LAM. JOINT

FLUS



**MARTIN**  
STATE AIRPORT



CARPET FINISHED  
CONCRETE SLAB

Cover Design By:  
Allen Carter

*Maryland Department of Transportation*

## PREFACE

This standard is updated and maintained by the Maryland Aviation Administration (MAA), Office of Engineering and Construction, Management Division of Facilities Design and has adopted the nationally accepted drawing practices of the U. S. National CADD Standards for *CADD Layering Guidelines*, *Uniform Drawing System and Plotting Guidelines*. It will assist in the production of uniform engineering documents, and provide efficient and effective means for management and technical data control.

This standard provides:

- a) Drawing practices for the preparation of architectural, engineering and space allocation drawings.
- b) Definitions and examples of the types of facility drawings to be prepared by and for the MAA.
- c) Guidelines for the creation of titles for drawings.
- d) Numbering, coding and identification procedures for standard and space allocation drawings, associated lists and documents referenced on these drawings and associated lists.
- e) Practices applicable to Computer Aided Design and Drafting (CADD).

Changes from the previous version of this standard focus on:

- a) Current technology trends that have gained widespread acceptance in government and industry.
- b) Use of electronic deliverables and delivery media.
- c) Synchronization with standard industry practices.
- d) Greater MAA-wide standardization to take full advantage of technological opportunities.
- e) Use of raster images in drawings.

This manual will be updated periodically. The manual is intended to be dynamic and will change to conform to future engineering drawing practices. The users of this manual are encouraged to use the "Manual Revision Form" on page ii to suggest revision(s) / addition(s) to the manual.

**MANUAL REVISION FORM**  
**SUGGESTED REVISION/ADDITION TO THE MANUAL**

**Date:** \_\_\_\_\_

**Log Number:** \_\_\_\_\_

**To:** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**From:** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**REVISION/ADDITION to Section:**      ☐ **Engineering Documents**      ☐ **Space Allocation**

**Manual Section(s):** \_\_\_\_\_  
\_\_\_\_\_  
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**Manual Paragraph(s):** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Manual Page(s):** \_\_\_\_\_  
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## 1.0 SCOPE

This manual outlines the requirements for the delivery of Computer Aided Design and Drafting (CADD) data files to the Maryland Aviation Administration (MAA) by its consultants. This manual establishes standard layers, title blocks, file names, line types and other conventions to be applied to all CADD files delivered to, used by or provided from MAA. This manual does not define design and drafting procedures for consultants to follow when developing files that are compliant with this standard. This manual will cover standard naming, object properties, delivery format and plotting. Standard naming and delivery format will allow for efficient storage and retrieval of files. Standard layer naming facilitates sharing of information between drawings and better visibility control of drawing objects. Standard object properties will help provide uniform appearance to CADD drawings. Standard plot settings will help overcome problems associated with producing similar looking plots from different plotters.

This document comprises of two parts, the first part up to and including section 4.0 Drawing Requirements addresses MAA's requirements applicable to construction drawings, installation permits, building permits and space allocation drawings. The second part, 5.0 addresses MAA's requirements specific to space allocation data.

### 1.1 Standard Definition

This standard prescribes general requirements for the preparation and revision of architectural, engineering and space allocation drawings that are prepared for facilities by and for the MAA.

MAA has implemented a series of standards, a spatial data repository, applications, policies and procedures that constitute the Airport Engineering Information System (AEIS). The AEIS serves as a central catalog and repository for engineering information used by MAA. This data is used within AEIS applications as well as other MAA systems that require this type of data. The AEIS also provides a structured workflow and a means of cataloging, archiving and retrieving project documents and information.

As the requirements of this process evolves and criterion are established for file, data attributes and protocols this standard will be updated to ensure CADD and engineering documentation conformance.

### 1.2 Document Classification

This standard shall apply, but not be limited, to the following drawing types regardless of source:

- a) Construction drawings for new and existing facilities.
- b) Installation permit drawings.
- c) Building permit drawings.
- d) Space Allocation drawings.
- e) Design, planning and record drawings

### 1.3 Manual Revisions

Where MAA CADD Standards do not contain the required detail for the work to be performed by the consultant/sub consultant, CADD Standards shall be developed by the consultant/sub consultant and transmitted to the MAA Project Engineer for approval using the provided [MANUAL REVISION FORM](#). These addenda will become part of the project specific CADD standards. This manual will be subject to revision in response to changes in technology and by the incorporation of changes to support consultant requirements at MAA's discretion.

### 1.4 Software Requirements

The MAA requires that all CADD files be in AutoCAD DWG format, the version number to be specified by the MAA Project Engineer and selected from the Approved Software Lists provided in this section. The standards defined in this manual are specifically for AutoCAD environments, for those consultants/sub consultants who do not use AutoCAD, it is their responsibility to ensure that files translated to AutoCAD adhere to these standards before delivery.

#### 1.4.1 Approved Software, CADD

AutoCAD Version 2006, or later Versions as approved by MAA.

#### **1.4.2 Approved Software, CADD Vertical Products**

Autodesk Architectural Desktop	Autodesk Field Survey	Autodesk Map
Autodesk Civil Design	Autodesk Land Desktop	Autodesk QuickCAD
Autodesk Civil Series	Autodesk Location Services Products	Autodesk Raster Design

## 2.0 APPLICABLE STANDARDS and PUBLICATIONS

When generating CADD documents the following standards and publications may be referenced for guidance.

### 2.1 MAA Manuals

This manual is to be used in conjunction with:

MAA's Design Standards Manual

MAA's GIS Data Standard, which includes a crosswalk between approved CADD and GIS layers

AEIS Data Quality Standard

AEIS Data Security Standard

AEIS Naming, Identification & Addressing Standard

### 2.2 Government Documents

#### Standards - Military

*[A/E/C CADD Standard Release 3.0 \(September 2006\) from the U.S.CADD/GIS Technology Center](#)*

#### Standards - Other Publications

- ♦ ASME-Y14.38M ASME Drawing & Terminology Standards
- ♦ NAS-SS-1000 Vol. 6 Facility Requirements for the National Airspace System
- ♦ FAA 7350.6 Location Identifiers
- ♦ FAA FSEP Facilities, Services and Equipment Profile Orders
- ♦ DOT Order 1360.6 Graphic Standards
- ♦ FAA Order 1000.15 Glossary
- ♦ FAA Order 7340.1 Contractions

### 2.3 Commercial Documents

- ♦ ANSI/AWS A2.4 Symbols for Welding & Nondestructive Testing
- ♦ ANSI/AWS A3.0 Welding Terms and Definitions
- ♦ ANSI B1.1 Unified Screw Threads
- ♦ ANSI/IEEE 2.16 Reference Designations for Electrical and Electronics Parts and Equipment
- ♦ ANSI/IEEE 91 Graphic Symbols for Logic Functions
- ♦ ANSI Y1.1 Abbreviations for use on Drawings and Text
- ♦ ANSI Y14.1 Drawing Sheet Size and Format
- ♦ ANSI Y14.2 Line Conventions and Lettering
- ♦ ANSI Y14.5 Dimensioning and Tolerance
- ♦ ANSI Y14.6 Screw Thread Representation
- ♦ ANSI Y14.7.1 Gear Drawing Standards - Part 1 for Spur, Helical, Double Helical and Rack
- ♦ ANSI Y14.7.2 Gear and Spline Drawing Standards Part 2 - Bevel and Hypoid Gears
- ♦ ANSI Y14.13 Mechanical Spring Representation
- ♦ ANSI Y14.15 Electrical and Electronics Diagrams
- ♦ ANSI Y14.15 Interconnection Diagrams
- ♦ ANSI Y14.17 Fluid Power Diagrams
- ♦ ANSI Y14.26.3 Dictionary of Terms for Computer- Aided Preparation of Product Definition Data
- ♦ ANSI Y32.2 Graphic Symbols for Electrical and Electronic Diagrams
- ♦ ANSI Y32.4 Graphic Symbols for Plumbing Fixture for Diagram used in Architecture & Building Construction
- ♦ ANSI Y 32.9 Graphic Symbols for Electrical Wiring and Layout Diagrams Used in Architecture and Building Construction

### 2.4 Order of Precedence

In the event of conflict between the documents referenced in [Sections 2.2 Government Documents](#) and [2.3 Commercial Documents](#), and the contents of this manual, the contents of this manual shall be considered the superseding requirement.

## 3.0 GENERAL

### 3.1 Drawing Definitions

The following sections define general A/E/C drawing types.

#### 3.1.1 Engineering Drawings

Engineering Drawings are formal representations used to convey the physical and functional end product design and/or installation requirements of an item. They may include pictorial, graphical, schematic or textual presentations.

#### 3.1.2 Construction Drawings

Construction Drawings are engineering drawings, which show the design of buildings, structures, or the related construction, and are normally associated with the architectural, construction and civil engineering operations. Construction drawings establish all the interrelated elements of the pertinent services, equipment, utilities, and other engineering skills.

#### 3.1.3 Installation Drawings

Installation drawings are engineering drawings, which show the installation requirements of equipment in facilities.

#### 3.1.4 Space Allocation Drawings

Space Allocation Drawings are used to provide an accurate record of existing space, identify tenants, square footages of occupancy.

### 3.2 Glossary

The following are definitions of terms used in this standard:

<b>AEIS</b>	Airport Engineering Information System.
<b>EDMS</b>	Electronic Data Management System
<b>EDRS</b>	Electronic Document Retrieval System
<b>AutoCAD</b>	AutoCAD is a full-featured CADD tool produced by Autodesk Inc. that handles both 2D and 3D (with additional add on) design. The native file format is DWG and it reads and writes DXF files.
<b>CADD</b>	Computer Aided Design & Drafting. Graphic software used by engineers and drafters to create and modify drawings in 2D and 3D.
<b>Drawing Sheet Format</b>	The sheet boundary lines, and title block geometry used to record administrative information about a CADD file.
<b>Drawing Sheet Sizes</b>	Standard sheet sizes are determined by the American National Standards Institute. Alphabetic characters name sheet sizes such as D, E and F.
<b>DWG</b>	AutoCAD's native CADD file format.
<b>DXF</b>	AutoCAD drawing exchange format for CADD files.
<b>Model File</b>	Model files are to be used to describe the facility's physical layout and components. This includes the building's walls, doors, windows, structural system, mechanical system, etc. All model files are drawn at full size (1-to-1). Model files can be 2D or 3D.
<b>Model Space</b>	AutoCAD Model Space is where the user creates a 2D or 3D full size (1-to-1) drawing. Model file types are created in Model Space.
<b>Paper Space</b>	AutoCAD Paper Space is where the user organizes different layouts for the purpose of plotting to an appropriate drawing scale through the use of viewports.
<b>Plot Stamp</b>	Plots of CADD drawing files should include a plot stamp, which should include the file name and path, date, time and the user name.
<b>Project Copy</b>	A project copy drawing is part of the project copy process, which manages concurrent design updates to a single released drawing.
<b>Raster</b>	Digital image process producing lines made of rectangular dots. Examples of raster formats are TIFF, JPG, BMP, GIF, etc.
<b>Reference File</b>	A CADD software capability that allows vector or raster files to be attached to sheet files and displayed, plotted, and (in the case of reference design files)

	used for construction purposes. This capability is generally used as a project organization tool to segregate the sources of project drawing files. Additionally, it allows designers to share drawing information electronically.
<b>Revised Drawing</b>	A drawing that has been revised or modified after submission.
<b>Sheet File</b>	Sheet files are to be used to assemble model files, text, title block and other information for plotting purposes. Each sheet file represents one plotted drawing. Generally, sheet files are plotted at 1-to-1 scale.
<b>SSI</b>	Sensitive Security Information, as defined by the Code of Federal Regulations (49 CFR 1520)
<b>TIFF</b>	Tagged Image File Format. Raster graphics format
<b>Vector</b>	Computer graphics comprised of mathematical representation of points, lines and other geometric entities.
<b>Workflow</b>	Automatic routing of documents to the users responsible for working on them.
<b>2D</b>	Two Dimensional
<b>3D</b>	Three Dimensional
<b>A/E/C</b>	Architectural, Engineering and Construction
<b>AIA</b>	American Institute of Architects
<b>ANSI</b>	American National Standards Institute
<b>GIS</b>	Geographical Information System
<b>CD-R</b>	Recordable Compact disk

### **3.3 Glossary of Acronyms for Use in Airport Documents**

-See Appendix C

## 4.0 DRAWING REQUIREMENTS

### 4.1 Drawing Production

MAA requires that all CADD files be in AutoCAD DWG format (compatible with AutoCAD version 2006, or later Versions if approved by MAA). The standards defined in this manual are specifically for AutoCAD environments, for those consultants/sub consultants who do not use AutoCAD, it is their responsibility to ensure that files translated to AutoCAD adhere to these standards before delivery.

#### 4.1.1 Drawing File Format

Electronic drawings shall be created and maintained in native AutoCAD vector file format (DWG); translations between vector file formats (DWG and DGN) should be avoided.

The following should be avoided:

- Drawing Exchange Format (DXF) - unless mandated by special requirement in this manual.
- Use of the following CADD entities: doughnuts, segments, solids and traces, point entities, custom fonts, patterns or line types or styles, special characters such as nested blocks, nested or circular Xrefs (reference files) and infinite lines.

All drawings shall be void of duplicate entities.

#### 4.1.2 Creation of CADD Files

All CADD drawing files should be created at full-scale (1-to-1). Drawing borders are referenced into paper space with insertion point 0, 0 and a scale of 1. Refer to Table 4-1, Scale Factor and Text Height Conversion Chart for standard engineering, architectural and mapping scale factors and text heights to be used in model space for full size drawings.

Plotted Scale	Scale Factor	Plotted Text Height			
		1/10"	1/8"	3/16"	1/4"
1/8"=1'-0"	96	9.6"	12"	18"	24"
3/16"= 1'-0"	64	6.4"	8"	12"	16"
1/4"=1'-0"	48	4.8"	6"	9"	12"
3/8"= 1'-0"	32	3.2"	4"	6"	8"
1/2"=1'-0"	24	2.4"	3"	4.5"	6"
3/4"=1'-0"	16	1.6"	2"	3"	4"
1"= 1'-0"	12	1.2"	1.5"	2.25"	3"
1 1/2"=1'-0"	8	.8"	1"	1.5"	2"
3"= 1'-0"	4	.4"	.5"	.75"	1"
6"= 1'-0"	2	.2"	.25"	.375"	.5"
12"= 1'-0"	1	.1"	.125"	.1875"	.25"
1"= 10'	120	1'	1.25'	1.875'	2.5625'
1"=20'-0"	240	2'	2.5'	3.75'	5'
1"=25'-0"	300	2.5'	3.125'	4.6875'	6.26'
1"=30'-0"	360	3'	3.75'	5.625'	7.5'
1"=50'-0"	600	5'	6.25'	9.375'	12.5'
1"=100'-0"	1200	10'	12.5'	18.75'	25.0'
1=10	10	1	1.25	1.875	2.5
1=20	20	2	2.5	3.75	5
1=30	30	3	3.75	5.625	7.5

Table 4-1, Scale Factor and Text Height Conversion Chart

#### 4.1.2.1 Drawing Sheet Format

MAA-approved drawing formats include common drawing features such as boundary geometry, title block data, filename, pathname, and title block geometry.

#### 4.1.2.2 Drawing Size

The MAA standard drawing size is D (24" X 36") full size and B (12" X 18") half size. Other sizes are allowed only as needed. Drawing sheet size and margins must follow the specifications shown in Table 4-2, Standard Drawing Sizes. Apply ANSI Y14.1 for any information not provided in this standard, but required on drawing sheet size.

Size Designation	Vertical	Horizontal	Margin		
			Horizontal	Vertical	
				Left	Right
B	12"	18"	0.25"	0.75"	0.25"
D	24"	36"	0.50"	1.50"	0.50"

Table 4-2, Standard Drawing Sizes

#### 4.1.2.3 Sizing Drawing Formats for Scaled Drawings

Each facility shall be drawn in the CADD model file at full size (1 to 1). The CADD user then scales the data to fit the desired paper size at the correct scale through a view port in paper space using the zoom command and entering  $nXP$  where  $n$  is the scale factor required and  $XP$  remains constant. Table 4-3 provides the necessary scale factors needed to calculate the reduced plot size.

Plot Scale	Drawing Area Size (H x W) *		Scale Factor $nXP$
	B (9.5" x 13.25")	D (19" x 26.5")	
1/8"=1'-0"	76' x 106'	152' x 212'	0.0104XP
3/16"= 1'-0"	50.7' x 70.7'	101.3' x 141.3'	0.0156XP
1/4"=1'-0"	38' x 53'	76' x 106'	0.0208XP
3/8"= 1'-0"	25' x 35'	50.7' x 70.7'	0.0312XP
1/2"=1'-0"	19' x 26.5'	38' x 53'	0.0416XP
3/4"=1'-0"	12.7' x 17.7'	25.3' x 35.3'	0.0625XP
1"= 1'-0"	9.5' x 13'	19' x 26.5'	0.0833XP
1 1/2"=1'-0"	6' x 8.9'	12.7' x 17.7'	0.125XP
3"= 1'-0"	3' x 4.4'	6.3' x 8.8'	0.25XP
6"=1'-0"	1.6' x 2.2'	3.2' x 4.4'	0.50XP
12"=1'-0"	0.8' x 1.1'	1.6' x 2.2'	1XP
1"= 10'-0"	95' x 132.5'	190' x 265'	10XP
1"=20'-0"	190' x 265'	380' x 530'	20XP
1"=25'-0"	237.5' x 331'	475' x 662.5'	25XP
1"=30'-0"	285' x 397.5'	570' x 795'	30XP
1"=50'-0"	475' x 662.5'	950' x 1325'	50XP
1"=100'-0"	950' x 1325'	1900' x 2650'	100XP

\* NOTE: The area for the title block, notes, legend and key plan have been deducted from the sheet total area.

Table 4-3, Sheet Sizes, Drawing Field, and Scale Factors Examples

#### 4.1.3 Borders

Figure 4-1 shows the standard MAA border. Figure 4-2 shows the title block portion of the MAA border. The bubble call-outs in Figure 4-2 refer to Table 4-4, where each item is described. An example of the standard [border sheet](#) is available in AutoCAD format as part of this manual. It is included on the MAA CADD Standards CD accompanying this manual. The standard border includes the following features:

- ♦ Border
- ♦ Title Block
- ♦ Consultant Ident. Block
- ♦ Drawing Field
- ♦ P.E. Stamp Box
- ♦ Notes
- ♦ Legend
- ♦ Key Plan
- ♦ Graphic Scales
- ♦ North Arrow
- ♦ Plot Stamp (Full path name, User name, Date, Time)



Figure 4-1, Standard Border

Figure 4-2, Title Block

The following statement must be placed on all sheets that contain SSI as defined in the Code of Federal Regulations (49 CFR 1520). This statement should be placed in the area above the drawing title shown as item 6 in Figure 4-2 above.

*Warning: This document contains Sensitive Security Information that is controlled under 49 CFR parts 15 and 1520. No part of this record may be disclosed to persons without a "need to know", as defined in 49 CFR parts 15 and 1520, except with the written permission of the Administrator of the Transportation Security Administration or the Secretary of Transportation. Unauthorized release may result in civil penalty or other action. For U.S. government agencies, public disclosure is governed by 5 U.S.C. 552 and 49 CFR parts 15 and 1520.*

All borders shall include the following information with the exception of the key plan, which applies to plan sheets only:

Item	Block Description	Text Style	Text Size
1	Consultant Name and Address		
2	Initial Block	ROMANS	0.1250
3	Engineers Stamp Block		
4	Revision Date and Description Block	ROMANS	0.1250
5	Airport Logo and Name Block	ROMAND	0.1535
6	Project Title	ROMAND	0.2000
7	Sheet Title	ROMAND	0.1535
8	Key Plan		
9	Scale	ROMANS	0.1250
10	Date	ROMANS	
11	Drawing Number	ROMAND	0.1535
12	Contract Number	ROMAND	0.1535

**Table 4-4, Drawing Title Block Descriptions**

#### 4.1.4 Title Sheets


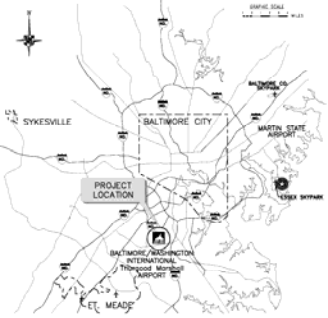



Figure 4-3 shows the standard title sheets for projects at both BWI and Martin State Airport. An example of each standard [title sheet](#) is available in AutoCAD format as part of this manual. They are included on the MAA CADD Standards CD accompanying this manual.

**The following information will be included on all title/cover sheets:**

- ♦ Airport Logo and Name
- ♦ Maryland Department of Transportation
- ♦ Maryland Aviation Administration, Office of Engineering & Construction Management
- ♦ **MAA CONTRACT NAME** (assigned by MAA )
- ♦ Contract No, MAA-CO-00-000 (last five digits assigned by MAA OP&E)
- ♦ Submission Name (e.g. 30% Design, Bid Documents, Conformed, As Built etc.) and date
- ♦ Sensitive Security Information (SSI, as defined by 49 CFR 1520) statement (if the document set contains SSI).
- ♦ Vicinity Map and Site Map. The site map should include gridlines that conform to the grid layout defined in the AEIS Naming & Addressing Standard. The combined extent of the area covered by all sheets provided should be clearly indicated on the site map.
- ♦ Consultant Name Block and Stamp Block
- ♦ Signature Blocks Including Signature Line and Date Line for: Airport Security, Fire Marshall and MAA Division of Facilities Design
- ♦ Drawing Index  
Should additional space be required provide separate index sheet immediately behind cover sheet. The comment '(contains SSI)' should be added after the title of any documents that contain SSI.

The following statement must be placed on the title sheet of drawing sets that contain SSI as defined in the Code of Federal Regulations (49 CFR 1520).

*Warning: This document contains Sensitive Security Information that is controlled under 49 CFR parts 15 and 1520. No part of this record may be disclosed to persons without a "need to know", as defined in 49 CFR parts 15 and 1520, except with the written permission of the Administrator of the Transportation Security Administration or the Secretary of Transportation. Unauthorized release may result in civil penalty or other action. For U.S. government agencies, public disclosure is governed by 5 U.S.C. 552 and 49 CFR parts 15 and 1520.*

 <div style="display: inline-block; vertical-align: middle; margin-left: 10px;"> <b>BALTIMORE/WASHINGTON INTERNATIONAL Thurgood Marshall AIRPORT</b> </div>					
<b>MARYLAND DEPARTMENT OF TRANSPORTATION MARYLAND AVIATION ADMINISTRATION OFFICE OF ENGINEERING &amp; CONSTRUCTION MANAGEMENT</b>					
<b>PROJECT TITLE</b>					
<b>CONTRACT NO. MAA-CO-XX-XXX</b>					
VICINITY MAP		INDEX OF DRAWINGS		SITE MAP	
					
<small>MAA DIRECTOR OF AIRPORT SECURITY</small> _____ <small>DATE</small> _____		<small>MAA FIRE MARSHAL</small> _____ <small>DATE</small> _____		<small>MAA DIVISION OF FACILITIES DESIGN</small> _____ <small>DATE</small> _____	
<b>COMPANY NAME / LOGO</b> <small>COMPANY NAME COMPANY ADDRESS CITY, STATE ZIP CODE COMPANY PHONE NO. COMPANY FAX NO.</small>	<b>SEAL</b>	<b>PROFESSIONAL CERTIFICATION</b> <small>I CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DAILY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND. LICENSE NUMBER _____ EXPIRATION DATE _____</small>	<b>CONSULTANT</b>	 <b>Maryland Aviation Administration</b> <small>DIVISION OF FACILITIES DESIGN</small>	<b>EMERGENCY NUMBERS</b> <small>FIRE/RESCUE/MEDICAL: (410) 888-7322 POLICE: (410) 888-7342 AIRPORT OPERATIONS: (410) 888-7318 AIRPORT MAINTENANCE: (410) 888-7326 B.G.E. EMERGENCY: (410) 888-0123</small>
<small>APPROVED BY _____ DATE _____</small>				<b>TYPE SUBMISSION</b> <small>DATE</small> _____	


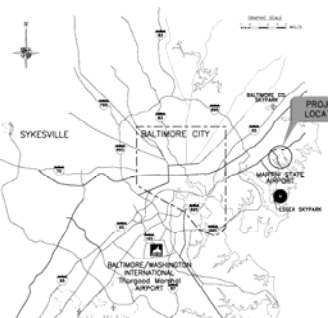



					
<b>MARYLAND DEPARTMENT OF TRANSPORTATION MARYLAND AVIATION ADMINISTRATION OFFICE OF ENGINEERING &amp; CONSTRUCTION MANAGEMENT</b>					
<b>PROJECT TITLE</b>					
<b>CONTRACT NO. MAA-CO-XX-XXX</b>					
VICINITY MAP		INDEX OF DRAWINGS		SITE MAP	
					
<small>MARTIN STATE FACILITIES MAINTENANCE</small> _____ <small>DATE</small> _____		<small>MAA DIVISION OF FACILITIES DESIGN</small> _____ <small>DATE</small> _____		<small>MARTIN STATE AIRPORT DIRECTOR</small> _____ <small>DATE</small> _____	
<b>COMPANY NAME / LOGO</b> <small>COMPANY NAME COMPANY ADDRESS CITY, STATE ZIP CODE COMPANY PHONE NO. COMPANY FAX NO.</small>	<b>SEAL</b>	<b>PROFESSIONAL CERTIFICATION</b> <small>I CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DAILY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND. LICENSE NUMBER _____ EXPIRATION DATE _____</small>	<b>CONSULTANT</b>	 <b>Maryland Aviation Administration</b> <small>DIVISION OF FACILITIES DESIGN</small>	<b>EMERGENCY NUMBERS</b> <small>FIRE/RESCUE/MEDICAL: 911 POLICE: 911 AIRPORT OPERATIONS: (410) 888-4821 AIRPORT MAINTENANCE: (410) 888-8813 B.G.E. EMERGENCY: (410) 888-0123</small>
<small>APPROVED BY _____ DATE _____</small>				<b>TYPE SUBMISSION</b> <small>DATE</small> _____	

Figure 4-3, Title/Cover Sheet Layout Examples

Modifications to the standard cover sheet and border require prior approval of the Office of Planning and Engineering.

#### 4.1.5 Drawing Numbering

The drawing sequence number for CADD drawing starts with an upper case letter specifying the discipline followed by a three digit sequential number, starting with 001 within each discipline code (i.e. C001, C002 ..., C00n; A001, A002 ... A00n). The discipline codes are listed below:

Discipline Code	Discipline	Discipline Code	Discipline	Discipline Code	Discipline
A	Architectural	G	General	P	Plumbing
C	Civil	H	Hazardous materials	Q	Equipment-Baggage
D	Demolition	I	Interiors	R	Real estate/lease
E	Electrical	L	Landscaping	S	Structural
F	Fire protection	M	Mechanical	T	Telecommunication
				Z	Contractor/shop drawing

Table 4-5, Drawing Number Discipline Codes

#### 4.1.6 Arrangement of Drawings

The drawings in a construction drawing set are listed by discipline in Table 4-6, Construction Drawing Set.

##### 4.1.6.1 Construction Drawing Sets

The drawings in Table 4-6 are commonly used in identifying a complete set of drawings for the construction of a new facility. Drawing sets for the construction of facility modifications must consist of a subset of the drawings listed in this table. Construction drawing sets shall be arranged by discipline in the following order.

DISCIPLINE	DRAWING CODE	DESCRIPTION
General	G	Cover, Index, Abbreviations, Symbols, Staging & Safety Plans
Real Estate/Lease	R	Property Boundaries And Legal Descriptions
Civil	C	Legend
Civil	C	Site
Civil	C	Boring Log
Civil	C	Under Slab Drainage
Civil	C	Building Site Plan
Civil	C	Grading Plan
Civil	C	Utility Plan
Civil	C	Details, Elevations And Sections
Civil	C	Site Improvements
Civil	C	Structural Canopy Details
Civil	C	Layout, Grading, Draining and Landscaping
Civil	C	Structural Details
Demolition	D	Removal of Existing Construction
Hazardous Materials	H	Hazardous Materials
Landscaping	L	Legend, Symbols and Abbreviations
Landscaping	L	Irrigation Plan
Landscaping	L	Planting
Landscaping	L	Irrigation and Planting Details
Architectural	A	Legend, Symbols and Abbreviations
Architectural	A	Floor Plan
Architectural	A	Reflected Ceiling Plan
Architectural	A	Roof Plan
Architectural	A	Elevations
Architectural	A	Sections
Architectural	A	Details
Architectural	A	Millwork
Architectural	A	Equipment

DISCIPLINE	DRAWING CODE	DESCRIPTION
Architectural	A	Furniture
Interiors	I	Interior Building Elements
Structural	S	Legend, Symbols And Abbreviations
Structural	S	Structural Foundation Plan
Structural	S	Framing and Decking Plan
Structural	S	Roof Framing Plan
Structural	S	Structural Details
Structural	S	Structural Steel Grounding
Structural	S	Erection Drawings
Mechanical	M	Legend, Symbols And Abbreviations
Mechanical	M	Equipment Schedule
Mechanical	M	Elevations
Mechanical	M	Generator and Fan Room Plan
Mechanical	M	Chiller Room Plan
Mechanical	M	Mechanical Room Plan
Mechanical	M	Roof Plan
Mechanical	M	Sections and Details
Mechanical	M	Details
Mechanical	M	Hot and Cold Piping Diagrams
Mechanical	M	Miscellaneous
Mechanical	M	Steam Piping Systems
Mechanical - HVAC	M	Under Floor Plan
Mechanical - HVAC	M	Floor Plan (Room Area)
Mechanical - HVAC	M	Ceiling Plan
Baggage Handling System	Q	General Notes, Legend and Abbreviations
Baggage Handling System	Q	Floor Plans
Baggage Handling System	Q	Enlarged Floor Plans
Baggage Handling System	Q	Sections
Baggage Handling System	Q	Details
Baggage Handling System	Q	Controls
Plumbing	P	Legend, Symbols and Abbreviations
Plumbing	P	Foundation Plan
Plumbing	P	Piping Plan
Plumbing	P	Riser Diagram
Plumbing	P	Sanitary Riser Diagram
Plumbing	P	Storm Riser Diagram
Plumbing	P	Roof Drain System
Plumbing	P	Details
Electrical	E	Legend, Symbols and Abbreviations
Electrical	E	Single Line Diagrams
Electrical	E	First Floor Lighting Plan
Electrical	E	Power and Communications Plan
Electrical	E	Grounding Plan
Electrical	E	Security Plan
Electrical	E	Equipment
Electrical	E	Motor Control Schematics
Electrical	E	Miscellaneous
Electrical	E	Details
Electrical	E	Panel Schedules
Telecommunications	T	Legend, Symbols And Abbreviations
Telecommunications	T	1st Floor Communications Plan
Telecommunications	T	Details
Telecommunications	T	Manhole and Cable Diagrams
Fire Protection	F	Legend, Symbols And Abbreviations
Fire Protection	F	Sprinkler System
Fire Protection	F	Fire Pump Location Plan
Fire Protection	F	Alarm Systems
Fire Protection	F	Fire Fighting Equipment
Fire Protection	F	Stand Pipe System
Z-Contractor	Z	Shop Drawings

Table 4-6, Construction Drawing Set

#### 4.1.7 Typical Sheets and Layouts for Construction Drawing Sets

The following sections provide examples of drawing sheets that are always included in a drawing set.

##### 4.1.7.1 Cover Sheet

See [Figure 4-3, Title/Cover Sheet Layout Example](#).

##### 4.1.7.2 Index Sheet

The index sheet shows a continuation of the drawing list from the title sheet, if required, all abbreviations used in the document set and a legend depicting all existing and proposed symbols. Reference Contracts pertaining to the active task document are to be included in the provided attributed block. The design firm is to contact the Contract Division of Facilities Design Document Management/Technical Support Section of MAA to assist in gathering this list of reference contracts and to obtain copies of the documents from the reference contracts. An example of each standard Index Sheet is available in AutoCAD format as part of this manual. They are included on the MAA CADD Standards CD accompanying this manual.

An example is shown in [Figure 4-4, Index Sheet Example](#), the columns shown are for illustration only and may be adjusted to accommodate more or less of one type of information.

DRAWING LIST		ABBREVIATIONS		SYMBOLS LEGEND	
		REFERENCE CONTRACTS		BIS ORCA	

<b>COMPANY NAME</b> DESIGN FIRM ADDRESS CITY, STATE, ZIP PHONE FAX E-MAIL		<b>DATE</b> PROJECT DRAWING NO. SHEET NO.		<b>BW1</b> BUREAU OF WATERWAYS INTERNATIONAL DESIGN & CONSTRUCTION GROUP		<b>MARYLAND DEPARTMENT OF TRANSPORTATION</b> MARYLAND AVIATION ADMINISTRATION OFFICE OF AIRSIDE & LANDSIDE MANAGEMENT DIVISION OF AIRSIDE MANAGEMENT		<b>TITLE SUBJECT</b> AIRSIDE & LANDSIDE PROJECT NO. SHEET NO.	
---	--	--	--	--	--	---	--	--	--

Figure 4-4, Index Sheet Example

##### 4.1.7.3 Other Sheets

MAA has developed standard General Notes sheets for airside and landside construction projects. These are available through the MAA Design Standards publication. The remainder of the drawing

sheets are discipline specific and to provide an example of all the sheets is beyond the intent of this standard.

#### 4.1.8 MDOT/MAA Logo Art

MAA provides the following logos in [electronic format](#) for use in CADD documents, included on the MAA CADD Standards CD:

- ♦ MDOT/MAA Logo
- ♦ MAA Logo
- ♦ BWI Logo
- ♦ Martin State Airport Logo

#### 4.1.9 Layers

For layer conventions, MAA has adopted the *CADD LAYER GUIDELINES*, NCS Edition, 2001, published by the American Institute of Architects (AIA). This document is a constituent of the National CADD Standards. Refer to Appendix A for additional layer names that may be used.

##### 4.1.9.1 Sheet File Layer Assignment

A sheet file is synonymous with a plotted CADD drawing file. A sheet file is a selected view or portion of referenced model files within a border sheet. The addition of sheet-specific information (e.g., text, dimensions, and symbols) completes the construction of the document. Table 4-7, Common Sheet File Layers, outlines layers that will be common in all sheet files in a set of construction drawings:

General Layer Names	General Layer Descriptions	Color #
G-ANNO-DIMS	Dimensions and Leaders	5
G-ANNO-IDEN	Identification Tags: Floor Id. #s; Room #s; Door #s; hardware group; Window #s; Equipment Id. #s; Furniture #s; Tenant Identification; Area calculations; Occupant or employee names; Elevation Id. #s; Component Id. #s	7
G-ANNO-KEYN	Key Notes	7
G-ANNO-LEGN	Legends	4
G-ANNO-NOTE	Notes	7
G-ANNO-NPLT	Construction Lines, non-plotting information	8
G-ANNO-PATT	Cross-hatching, patterns, poche	5
G-ANNO-REDL	Redline Annotations	10
G-ANNO-REFR	Reference Files	7
G-ANNO-REVS	Revisions	4
G-ANNO-SCHD	Schedules	7
G-ANNO-SYMB	Miscellaneous Symbols	4
G-ANNO-TEXT	Miscellaneous text and callouts with associated leaders	7
G-ANNO-TITL	Drawing Component Titles, Detail Titles, Section Titles, Elevations	3
G-ANNO-TTLB	Border and title block information	2

Table 4-7, Common Sheet File Layers

##### 4.1.9.2 Model File Layer Assignment

A model file contains the physical components of a building or site (e.g., columns, walls, windows, ductwork, piping, etc.). To facilitate the set up of layers in model files in conformance with AIA guidelines, AutoCAD has included this layering standard in its software. Using AutoCAD, open the Layer Manager, right click and then select *New Layer from Standard*. At the *New Layer from Standard* dialog box select for Discipline Designator, Major class, Minor classes and status as required (see Figures 4-5, 4-6, 4-7 and 4-8).

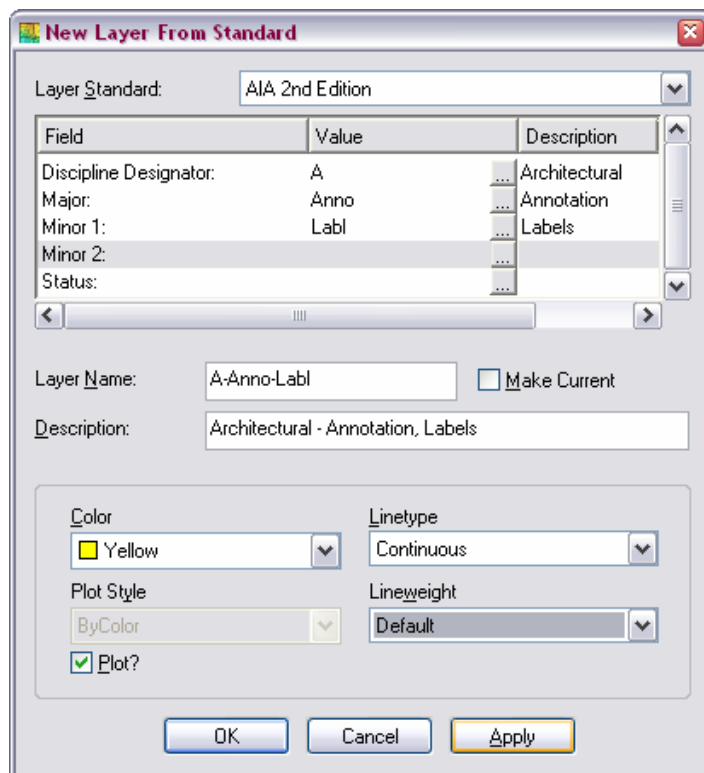


Figure 4-5, Layers - Layer Key Style Dialog Box

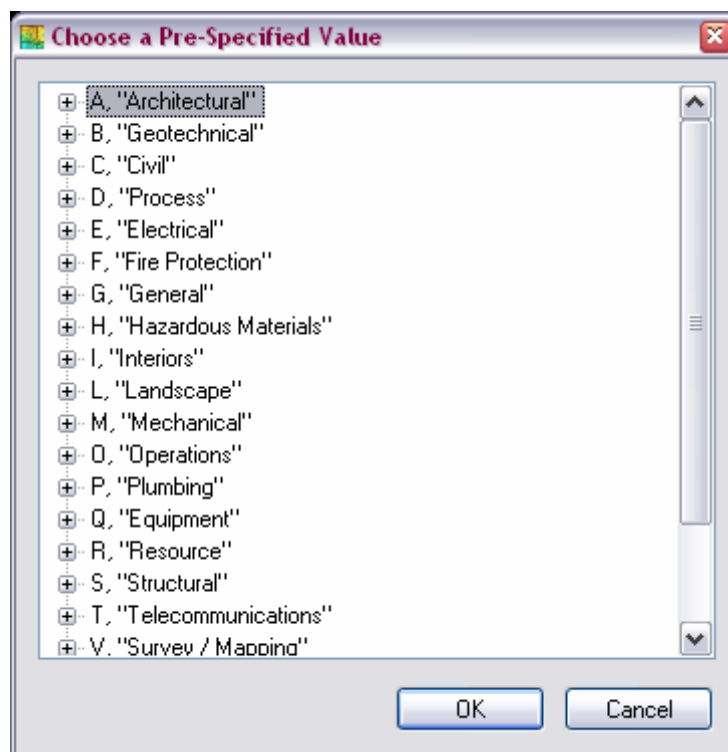


Figure 4-6, Layers - Discipline Designator Dialog Box



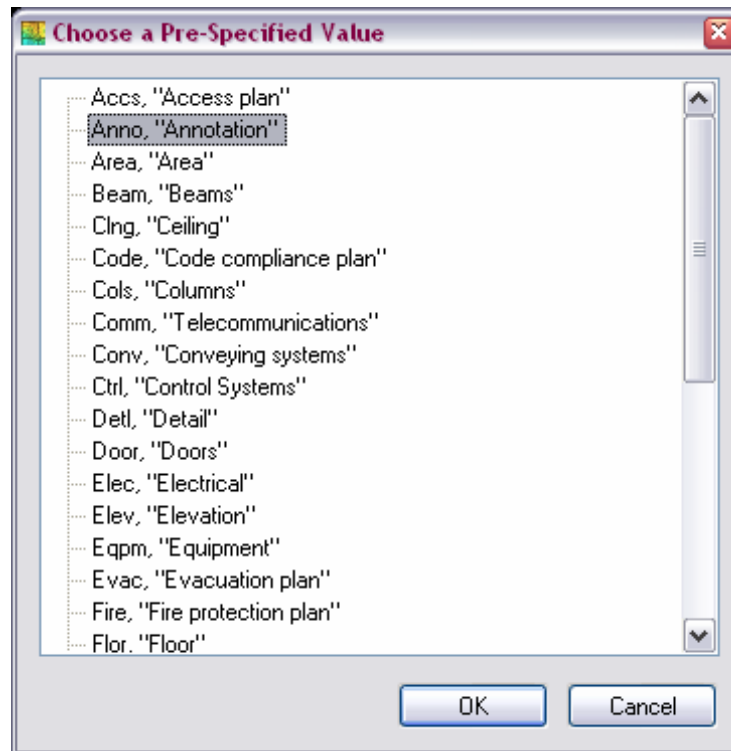


Figure 4-7, Layers - Major Category Dialog Box

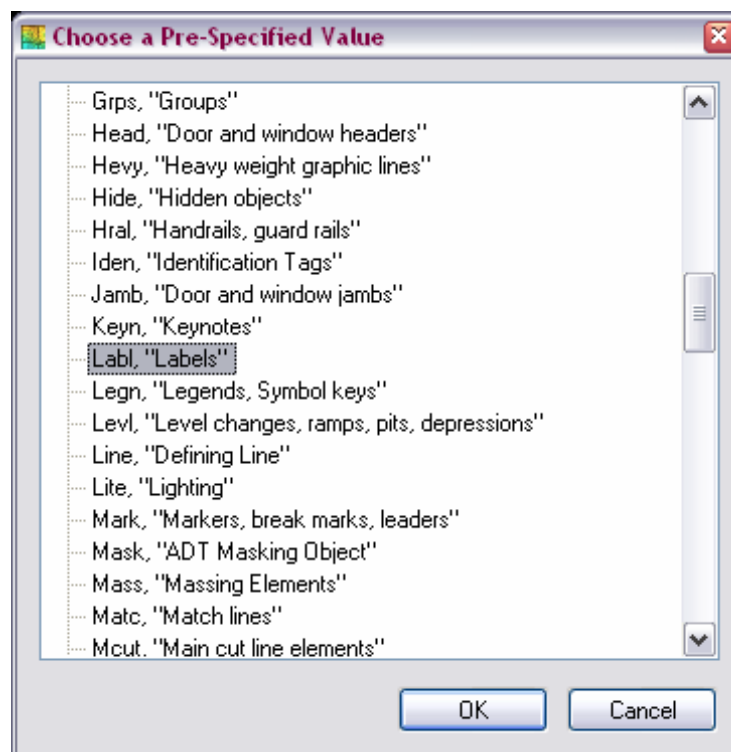


Figure 4-8, Layers - Minor Category Dialog Box

Once the discipline designator, major and minor categories have been chosen, the final portion of the layer name is the status. This describes to the user what the disposition is of the entities on that layer, and helps to determine if that layer should or should not be shown on a particular drawing sheet. Note that AutoCAD uses a single letter abbreviation for its status categories. MAA prefers to use a four-letter abbreviation to stay consistent with the Major and Minor group names, and provide a more intuitive description for the status. Below is a list of common status categories:

PHS#	Phase of project (#=1-9)
DEMO	Existing item to be demolished
EXST	Existing item to remain
FUTR	Future work
MOVE	Existing item to be moved
NEWW	New work
TEMP	Temporary work
NICN	Not in contract (not included in AutoCAD layer naming routine)
RELO	Existing item to be relocated (not included in AutoCAD layer naming routine)
ABND	Abandoned item (not included in AutoCAD layer naming routine)

#### 4.1.10 Text Styles/Fonts

The MAA standard fonts include only “out of the box” *fonts*; these are fonts that ship with every installment of *AutoCAD*. Any font not meeting this criterion must be submitted to the MAA Project Engineer for approval and inclusion in the project specific standard *Font Library* (.shx) file.

All **Text Styles** shall use the naming convention, (font name) ( ) (text height in decimal equivalent of inches) e.g. *ROMANS.120*

#### 4.1.11 Text Justification

All annotation text shall be left justified.

#### 4.1.12 Text Heights and Colors

The following text heights and colors must be used on all drawings to ensure uniformity in the contract documents.

ENTITY	PLOTTED TEXT HEIGHT (IN INCHES)	COLOR
Titles	0.25	3
Subtitles	0.175	3
Normal Text	0.125 or 0.1	2
Notes, callouts etc.	0.125 or 0.1	2






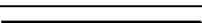

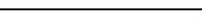

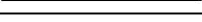

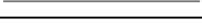
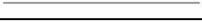

Table 4-8, Text Heights and Colors

#### 4.1.13 Line Widths and Colors

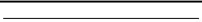



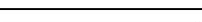









In AutoCAD, each color represents a different line width when plotted. It is preferable to control the line widths in a drawing by assigning a specific color to the layer, instead of assigning a specific color to a single element/entity (line, polyline, arc, etc.). The color of a single element/entity should be set to “BYLAYER”, so the layer’s color setting can be used to globally change all elements/entities on that layer, both in the model files and sheet files.

Each “sheet file” submitted to the MAA, must be able to create a monochrome plot, matching the appearance of the submitted corresponding hard copy contract document, by using the MAA Standard Pen Settings in [Table 4-9, MAA Standard Pen Settings](#). Pen widths are specified for only the AutoCAD index colors. Colors 1-9 plot as solid lines, and colors 250-254 plot as screened lines. There is a pen table for both full size drawings (B) and half-size drawings (D):

**MAA Full Size.ctb**

AutoCAD Color No.	Plotted Pen Width in Inches	Plotted Color	Plotted Line Width	
1	0.010	Black		Solid Lineweights
2	0.012	Black		
3	0.014	Black		
4	0.020	Black		
5	0.024	Black		
6	0.031	Black		
7	0.007	Black		
8	0.005	Black		
9	0.047	Black		
250	0.010	Dark Grey		Screened Lineweights
251	0.010	Dark Grey		
252	0.010	Medium Grey		
253	0.010	Light Grey		
254	0.010	Light Grey		

**MAA Half Size.ctb**

AutoCAD Color No.	Plotted Pen Width in Inches	Plotted Color	Plotted Line Width	
1	0.005	Black		Solid Lineweights
2	0.006	Black		
3	0.007	Black		
4	0.010	Black		
5	0.012	Black		
6	0.015	Black		
7	0.004	Black		
8	0.003	Black		
9	0.024	Black		
250	0.010	Dark Grey		Screened Lineweights
251	0.010	Dark Grey		
252	0.010	Medium Grey		
253	0.010	Light Grey		
254	0.010	Light Grey		

**Table 4-9, MAA Standard Pen Settings**

As an alternative to using the MAA Standard Pen Settings, the consultant may include one color-dependent plot style table (*CTB*) File called *PLOT.CTB*. This *CTB* File must define the pen number and pen width for all color numbers and be capable of producing monochrome plots for all submitted *Sheet Files*.

If the consultant does not submit a file named *PLOT.CTB*, along with the *Sheet Files*, it will be assumed that the files use the MAA standard plot settings.

#### 4.1.14 Line Types

The MAA standard linetypes include “out of the box” linetypes (these are linetypes that ship with every installment of *AutoCAD*) and linetypes available from *The CADD/GIS Technology Center*. Linetypes from *The CADD/GIS Technology Center* have been included on the CD accompanying the MAA CADD Standards manual. Follow the instructions carefully in the README file to install the files and load the linetypes correctly. Any new linetypes created by a consultant must be submitted to the MAA Project Engineer for approval and inclusion in the project specific standard linetype (.lin) file.

It is preferable to control the linetypes in a drawing by assigning a specific linetype to the layer, instead of assigning a specific linetype to a single element/entity (line, polyline, arc, etc.). The linetype of a single element/entity should be set to “BYLAYER”, so the layer’s linetype settings can be used to globally change all elements/entities on that layer, both in the model files and sheet files.

#### 4.1.15 Units

The units for all A/E/C drawings shall be U.S. Survey Foot, inches and fractions of an inch, with the smallest fraction normally being 1/8" or as decimals. Dimensions of less than a foot must be shown in inches or fractions of inches, or as decimals.

#### 4.1.16 Working Units, Coordinate Systems and Drawing Origins

Units should be selected according to the discipline of the drawing, architectural (feet and inches), engineering (feet and tenths), or decimal. References to feet in this document are specifically to the U.S. Survey Foot (1200/3937 meters).

All topography and topography related design including structural and architectural building footprints shall be submitted to, maintained by, and provided by MAA in the Maryland Coordinate System of 1987, also referred to as Maryland State Plane. Following are the parameters of the Maryland Coordinate System of 1987:

Map Projection:	Lambert conic conformal projection of the geodetic reference system of 1980
Horizontal Datum:	NAD83 (2001)
Latitude of Origin*:	37°40' North latitude
Central Meridian:	77°00' West longitude
Standard Parallel 1:	38°18' North latitude
Standard Parallel 2:	39°27' North latitude
False Easting*:	400,000 meters
False Northing*:	0 meters
Latitude**:	37°34' 38.14264" N
Longitude**:	81°31' 45.07877" W

\* at the 77th meridian

\*\* at artificial origin (0,0)

Vertical spatial data shall be submitted to, maintained by, and provided by MAA based on the National Geodetic Vertical Datum of 1988 (NGVD88).

The lower left corner of all other drawings should be positioned at the Cartesian coordinate point of 0, 0, 0.

#### 4.1.17 Externally Referenced Files

[Figure 4-9, Externally Referenced Files Example](#), illustrates the concept of how a sheet file drawing is composed using model/design and informational xref files.

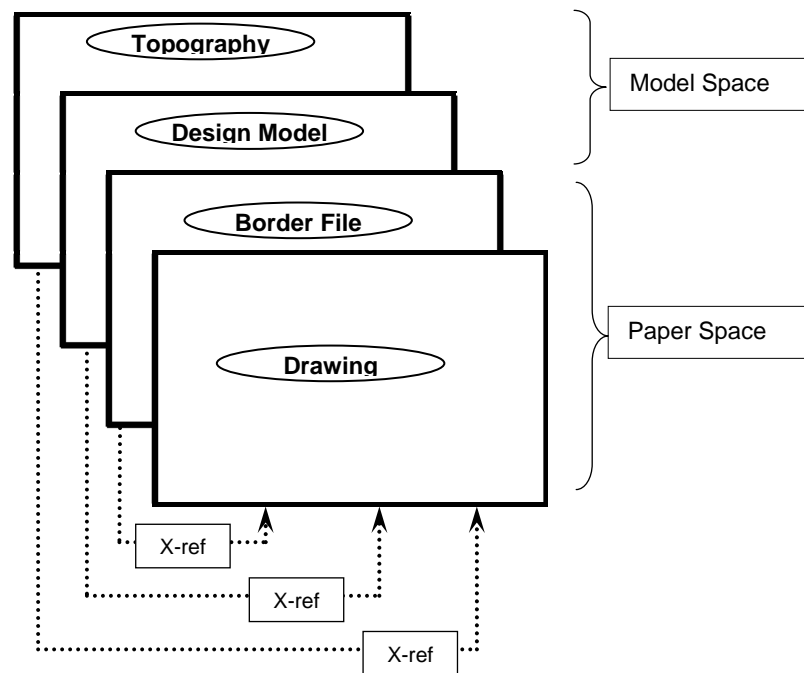


Figure 4-9, Externally Referenced Files Example

#### 4.1.17.1 Specific Use of AutoCAD Reference Files

All files referenced in the host file shall use the “Attach” option within the XREF command, when reference files are merged into the final drawing package, AutoCAD users shall use the “Bind” option. Nested or circular xref files are not allowed.

Reference files shall be added to all drawings using no saved paths. These paths do not include the drive letter and reflect the location of the reference file as it relates to the active file (the reference file is in the same folder/directory as the active file).

Reference files shall be added on a specific layer and the prefix for that layer shall be "G-ANNO-REFR-" followed by the reference file name.

#### 4.1.18 Patterning

The patterns (hatching) to be used on MAA drawings include only “out of the box” hatch patterns; customized patterns must not be used.

#### 4.1.19 Dimensioning

Refer to the ANSI Y14.5M for additional dimensioning information not provided in this standard.

The distance from the object for the first dimension is 1/2" and each additional dimension is 3/8" further apart. See [Figure 4-10, Dimension Directions and Spacing Example](#), and [Figure 4-11, Dimension and Extension Line Spacing Example](#) for dimension examples.

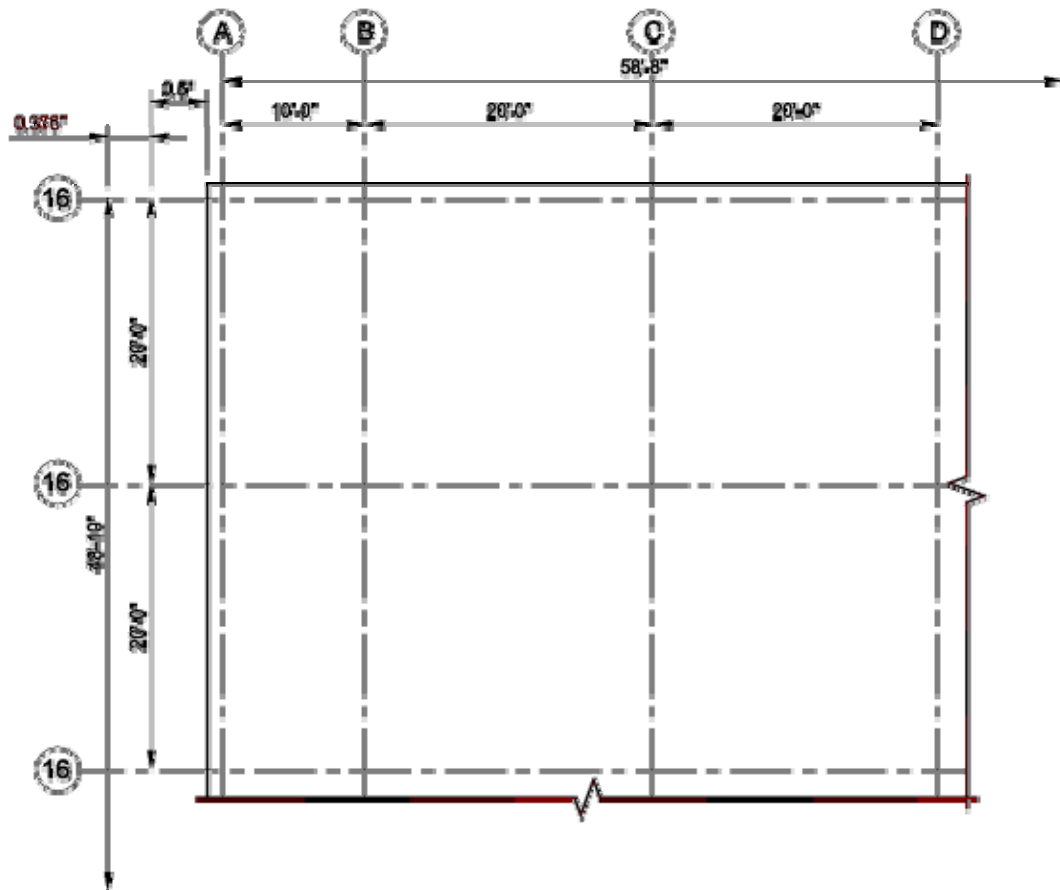


Figure 4-10, Dimension Directions and Spacing Example

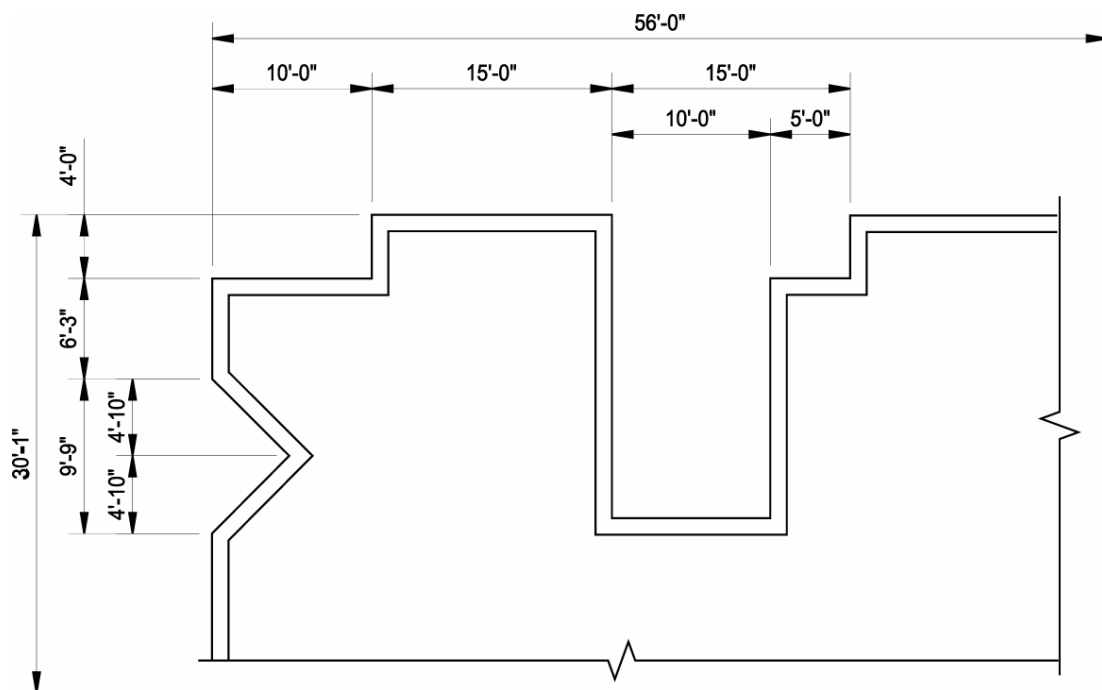


Figure 4-11, Dimension and Extension Line Spacing Example

#### 4.1.19.1 Dimension Text Size

All dimensioning text must be placed into the dimension layer. The size of dimension text is the same as the drawing field text (no smaller than 1/10" height, with 1/8" being preferable).

Refer to [Table 4-1, Scale Factor and Text Height Conversion Chart](#) for scaling factors and text height.

#### 4.1.19.2 Positioning Dimensions

Figure 4-10, Dimension Directions and Spacing Example and Figure 4-11, Dimension and Extension Line Spacing Example. Refer to these figures for examples.

The following guidelines shall apply:

- Avoid crossing dimension lines.
- Centerlines may be extended and used as extension lines.
- Place longer dimensions outside of shorter ones.
- Do not cover dimensions with patterns in sectioned areas.
- Whenever possible, arrange dimensions so they can be read easily on one continuous line.
- Dimensions are always placed on the drawing so that the text may be read from the bottom or the right.
- Locate dimension lines so that they do not cross extension lines. If it is necessary to dimension at an angle, that angle should be in quadrant between the horizontal and vertical so text may be read between 0 and 90 degrees.
- All text must be located above or centered on the dimension lines.
- The location of text on the dimension line shall be consistent throughout the drawing set.
- Fractions must be located on one line with a space between the whole inch and fraction.
- Make fractions with a slant bar with numbers the same height as text, for example, 1/4".
- All dimension and extension lines shall be created using the "Color 1" line weight.
- Arrowheads and dimension text shall be created using the "Color 1" line weight.
- All text shall be left justified per standard drafting standards.

#### 4.1.19.3 Leaders

When a note or dimension cannot be placed close to an object, a leader may be used. A leader consists of a short horizontal line, an angled line and a terminator. When placing a leader to the left side of a note the horizontal line must be placed in line with the top of the note. If the leader is on the right side, the horizontal line is placed at the bottom of the note, see [Figure 4-12, Placement of Leaders Example](#). When a leader points to an object, the angled line must terminate with an arrowhead at its first object line. When the information refers to (applies to, or points to) a surface of an object, use a small filled dot or tilde. When the information refers to a bundle or grouping of wires or cables, use a lasso. An example is shown in [Figure 4-13, Typical Leaders Example](#).

All leader lines and arrowheads shall be created using the "Color 1" line weight.

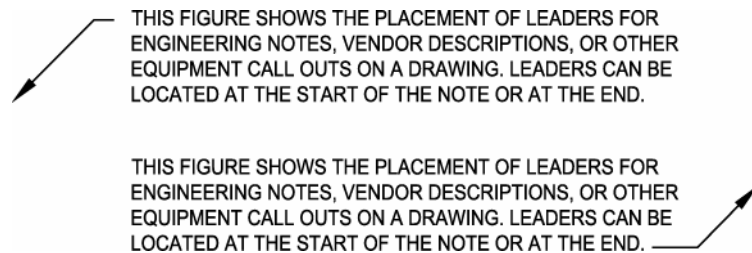


Figure 4-12, Placement of Leaders Example

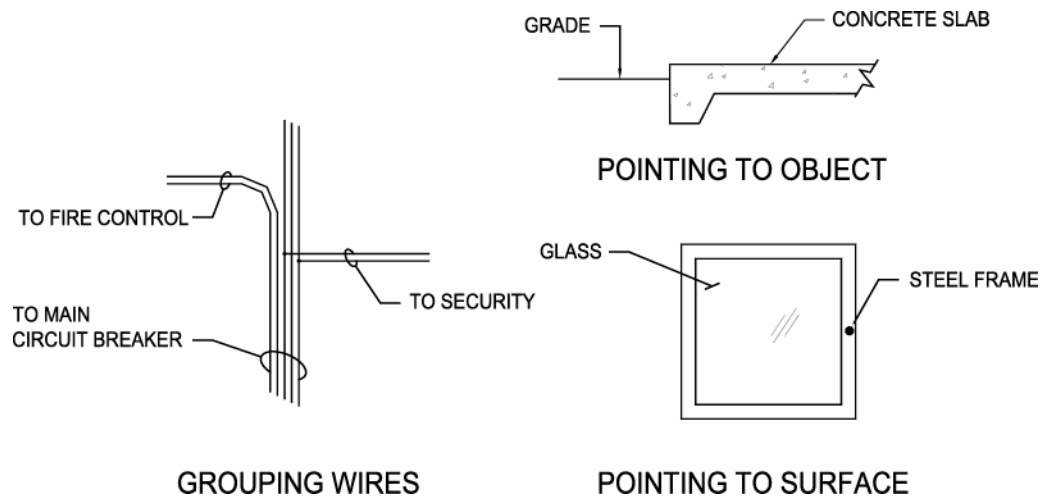


Figure 4-13, Typical Leaders Example

#### 4.1.19.4 Arrowheads

Arrowheads denote termination of dimensions and leader lines and show direction. They must be filled, and must be the same size and style as the arrowheads used in other dimensions. Arrowhead size should be a 3:1 ratio for length to width, and in proportion to any associated text.

#### 4.1.20 Symbols

Symbols used in drawings should comply with the U.S. National CADD Standard or ANSI and all symbols used in a drawing must be indicated in a legend. Symbols available from *The CADD/GIS Technology Center*, and miscellaneous signage symbols and topographic symbols that are commonly used in preparing construction drawings for MAA projects are included on the MAA CADD Standards CD.

#### 4.1.21 Drawing Subtitles

Subtitles must be used on drawings with more than one view or when sections or details are required for clarity and must also be used on drawings with a single view when title block information is inadequate and additional identification is required. Subtitles are always located below and centered on the view to which they apply, except for detail drawings where the title shall be located to the lower left.

Subtitles for plans, standard details, typical details, etc., which are not referenced in other views, consist of two lines. The first line shows the exact title of the view or detail and the second line indicates the scale of the view or detail, along with bar scale, see [Figure 4-14, Standard Subtitle Annotation Example](#).

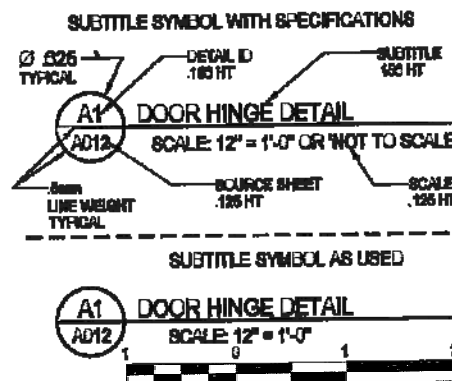


Figure 4-14, Standard Subtitle Annotation Example



## 4.1.22 Sections and Details

Sections must be drawn when additional clarification is warranted and details must be created whenever additional clarification is required and a section cannot readily be cut.

### 4.1.22.1 Sections

Sections must be drawn using the drafting standards shown in [Figure 4-15, Standard Section Annotation Example](#). The three types of section indicators to be used are short sections, extended sections, and offset sections as shown in [Figure 4-16, Section Types Example](#). All sections must be cut toward the top or left side of the drawing, except in unusual situations. In some cases, it may be necessary to cut a short section reading from the left, but this should be avoided if possible.

Sections must appear on the same drawing on which they are cut, if possible. If the section cannot be drawn on the same drawing, it must appear on a separate drawing reserved for sections. Under no circumstances are sections to be scattered indiscriminately throughout the set of drawings.

Section cuts shall be lettered in alphabetical order on each drawing. The letter in the top half of the circle marker must indicate the section letter. The alphanumeric number in the lower half of the circle marker must indicate the drawing on which the section is shown. Heavy dark lines located in the position where the section is cut must indicate the location of the cutting plane.

Offset sections may be used only when section clarity requires adjustment of a portion of the cutting plane. On all section cuts, the circle markers must be placed so they can be read from the direction of cut.

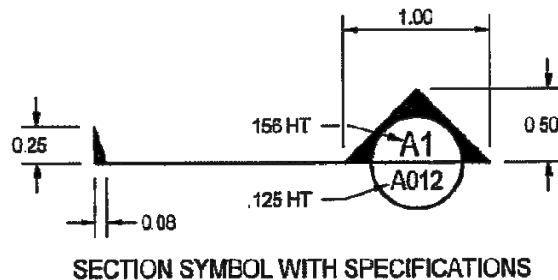


Figure 4-15, Standard Section Annotation Example

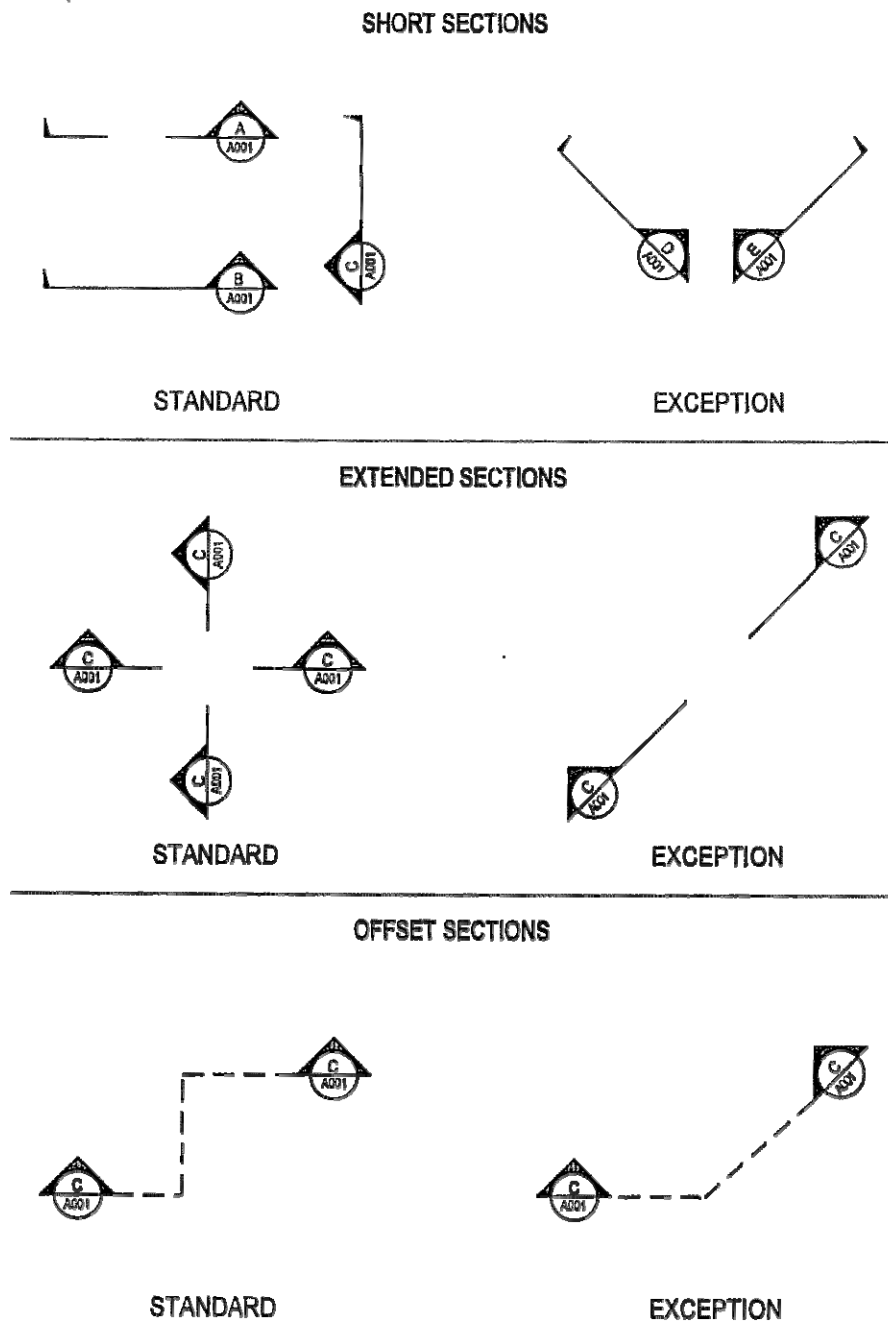


Figure 4-16, Section Types Example

#### 4.1.22.2 Detail Drawings

The detail must be a section, a plan view, an elevation, or an enlargement. Details must have an alphanumeric (e.g. A1) designation in the upper half of the circle marker. When details are intermixed with sections and it would be difficult to locate a lettered detail on a drawing, the details must be numbered consecutively with the sections. The alphanumeric number in the lower half of the circle marker must indicate the sheet number on which the details reside (see [Figure 4-17, Standard Detail Symbol Example](#)).

When a detail appears more than once on the same drawing, extend a line off the detail, abbreviate the word typical (TYP), and indicate the quantity in parentheses.

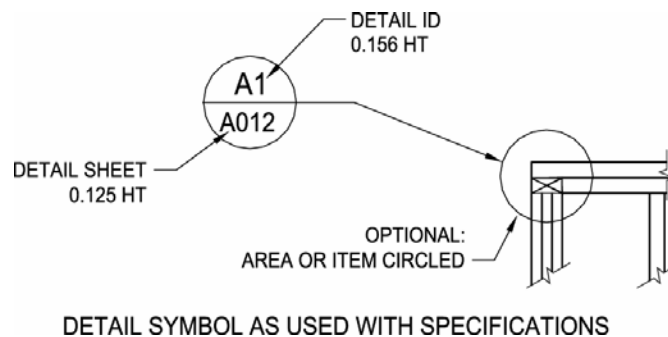


Figure 4-17, Standard Detail Symbol Example

#### 4.1.23 Revision of Drawings

Changes to contract drawings must be clearly identified and tracked. The following sections outline the required methodologies for incorporating changes to the drawing set.

##### 4.1.23.1 Required Revisions

Once a drawing has been approved and submitted as final, all subsequent changes shall be recorded as a revision.

##### 4.1.23.2 Revision Methods

Revisions shall be made by the addition or deletion of information and the changes annotated on drawings.

##### 4.1.23.3 Drawing Practices

When revising an existing drawing the most recently approved graphic symbols, abbreviations, and drawing practices shall be used to incorporate changes or revisions.

##### 4.1.23.4 Identifying Revisions on Drawings

All revisions shall be identified with a revision cloud and revision number within a triangle for addenda and a square for redline revisions. The revision number in the title block must correspond to the revision number in the drawing area where the change was made.

##### 4.1.23.5 Revision Locations

The revision location is identified by the revision cloud and only additions or modifications are to be included within the revision cloud.

##### 4.1.23.6 Revision Numbers

Revisions are to be identified by a sequential number starting at 1. Letters are not to be used for revision identification.

#### **4.1.23.7 Multiple Changes**

The same revision number shall identify all changes made to a drawing regardless of number of locations modified that are incorporated at the same time.

#### **4.1.23.8 Revision Block**

The revision block size and format shall conform to that in the standard border sheet provided. Only the five most current revisions shall be shown in the revision block and each revision shall be recorded in accordance with the following:

- a) The identifying number pertaining to the revision shall be entered in the "REV" column.
- b) The date the CADD file changes revision shall be entered in the "DATE" column.
- c) A brief description of the change shall be entered in the "DESCRIPTION" column.

#### **4.1.23.9 Redrawn or Replaced Drawings**

Drawings are redrawn when manual drawings are converted to CADD, when there are extensive changes to a CADD file. The new drawing shall contain a note referencing the superseded drawing. The note shall be located above the revision block on the new drawing stating: "THIS DRAWING SUPERSEDES DRAWING \_\_\_\_\_, REVISION\_\_\_\_, DATED\_\_\_\_\_." Subsequent revisions to the new drawing shall start with the number 1, regardless of the revision number of the drawing being superseded. A note shall also be located above the revision block on the superseded drawing stating: "THIS DRAWING SUPERSEDED BY DRAWING \_\_\_\_\_, DATED \_\_\_\_\_." The statements shall be in letters not less than .125 inches high.

## **4.2 File Naming**

CADD file names should start with the MAA project number (i.e. MAA-tt-yy-nnn where tt is the type of contract, yy are the last two digits of the year the contract was issued and nnn is a sequential number). Next, should be an underscore (i.e. "\_") followed by the drawing discipline letter and three digit sheet sequence number (as defined in Section 4.1.5). Following this set of characters, the consultant or sub consultant can add an underscore (i.e. "\_") followed by optional alphanumeric characters as desired.

## 5.0 Space Allocation Data

### 5.1 Introduction

Space allocation data describes how interior and exterior space is used and by whom. This information is important for property management, emergency response, planning and many other critical airport functions. Space allocation data is often created and maintained using CADD software. Due to its unique nature and purpose there are certain CADD requirements that pertain specifically to this important type of data. These requirements are defined in this section.

### 5.2 Layer Naming

Space allocation data should be drawn on specific layers in CADD drawings. Specifically, the polygons which form space allocation boundaries should be drawn on the C-PROP-LEAS layer for exterior data and the A-PROP-LEAS layer for interior data. Following this standard sequence of discipline, major and minor codes, should be a dash (i.e. “-”) followed by TOOOUU where:

- T represents a one-letter code indicating whether the space is leasable or not. It has one of two values:

L = Leasable Space

N = Non-leasable Space

- OOO represents a three-character code identifying the occupant of the space. For airline tenants, the code is based on the International Air Transport Association (IATA) listing of airline codes. For non-airline tenants, an attempt has been made to create three letter codes that are an intuitive extrapolation of the tenants' names. A complete list of occupant codes for tenants can be found in [Appendix B \(Occupant Codes for Airline Tenants\)](#) and [Occupant Codes for Other Tenants](#). These codes represent tenant, vacant space, or common (public) space. The \$ sign should be used as a placeholder when airline identifier codes consist of only two characters. Following are some examples:
  - \$US = US Airways (tenant)      VAC = vacant  
COM = common
- UU represent a two-letter code that describes the specific use of the occupant. A complete list of designation codes can be found in Appendix B.

To illustrate the use of this convention, the layer name for a US Airways hold room would be A-PROP-LEAS-L\$USHR, where the L designates leasable space, the \$US indicates US Airways as the occupant, and the HR indicates the use as a hold room. Similarly, the layer name for an electrical room would be A-PROP-LEAS-NCOMUE.

### 5.3 Identification via Hatch Patterns

Space allocation CADD drawings shall utilize two hatch layers per tenant to segregate occupants according to space designation and specific use. The first hatch layer contains a solid hatch distinguishing the major types of space designations. The color of the solid hatch is controlled by-layer using the color number identified in Table 5-10. The second hatch layer contains the patterned hatch overlay subdividing the tenant's space according to the various uses. The patterned hatch is always color 251 and is on a separate layer from the solid hatch. The layer naming convention for the patterned hatches is to create a new layer for each tenant by appending ‘-H’ to the end of the layer name containing the solid hatch.

For example, layer A-PROP-LEAS-L\$UATC contains United Airlines solid hatching for ticket counters. Layer A-PROP-LEAS-L\$UATC-H contains the patterned hatch for the same space.

LEGEND					
	AIRLINES OCCUPIED		BAA MARYLAND		PUBLIC RESTROOMS
	PUBLIC SPACE		CUTE JOINT USE		MAA OCCUPIED SPACE
	UTILITIES		MISC. TENANTS		MAA VACANT
	AIR CONDITIONED		ELECTRICAL		PUBLIC OFFICE
	BAA FOOD & BEVERAGE		HOLDROOM		PUBLIC RESTROOMS
	BAA OFFICE/STORAGE		MECHANICAL		PUBLIC STAIRS
	BAA RETAIL		NON-AIR CONDITIONED		REMOVED JETWAYS
	BAGGAGE CLAIM		PRIVATE OFFICE		RESTRICTED
	BAGGAGE MAKEUP		PUBLIC ELEVATOR		SECURITY AREA
	BAGGAGE SERVICE OFFICES		PUBLIC ESCALATOR		TICKET COUNTER
	COMMUNICATION		PUBLIC LOUNGE MEETING ROOMS		UNFINISHED
	DOOR NUMBER		LIGHTED ADVERTISING SIGNS		
	VISUAL PAGING		TERMINAL DIRECTORY		
	FLIGHT INFORMATION DISPLAYS		TELEPHONE		

Table 5-10, Space Allocation Hatching Guidelines

## 5.4 Viewing Hatched Lease Areas

In some instances, the patterned hatch may be hidden beneath the solid hatch. In order to view the patterned hatches in both the AutoCAD drawings and in subsequent plots, use the *Bring to Front* or *Send to Back* commands found under *Tools → Display Order* in AutoCAD's pull-down menu on the patterned hatch or solid hatch, respectively. If you still cannot view the patterned hatch on top of the solid hatch, invoking the *Regen* command should solve the problem. If these steps do not give the correct view, use the *Send under Object* command found under the *Tools → Display Order* pull down menu command, and send the solid hatching under the layer A-wall-full.

## 5.5 Occupant Identification via Polygons

Every occupant area, public area, and all other miscellaneous spaces in the Terminal Building are enclosed by an AutoCAD polygon. This *Occupant Polygon* is used for multiple purposes:

- 1.) To facilitate the hatching of the area.
- 2.) To permit listing the square footage via the AutoCAD *Area → Entity* command.

These *Occupant Polygons* do not surround individual rooms within the leased space, but rather they surround the entire tenant space as long as that tenant space is for the same use and at the same lease rate. For example, an airline's office space behind ticketing counters will be enclosed by one *Occupant Polygon* but will be separate from the *Occupant Polygon* surrounding the same airline's ticketing counters. The *Occupant Polygon* is generally not intended to be visible, but at times is turned on to enable visual differentiation between adjacent occupants. When plotting in color, the polygon appears as a thick, fuchsia border. When plotting in black and white, the polygon appears as a thick, phantom linestyle, gray line.

The lines that form occupant polygons should be placed on the outside face of exterior walls. For interior walls, the lines should be placed in the center of each interior wall where tenants occupy the space on either side. If MAA is using the adjacent space or it is unoccupied, the lines should be placed on the edge of the wall that is closest to the side occupied by the tenant. These guidelines establish the square footage quantities that will be calculated based on space allocation drawings (square footages in the lease agreement may vary).

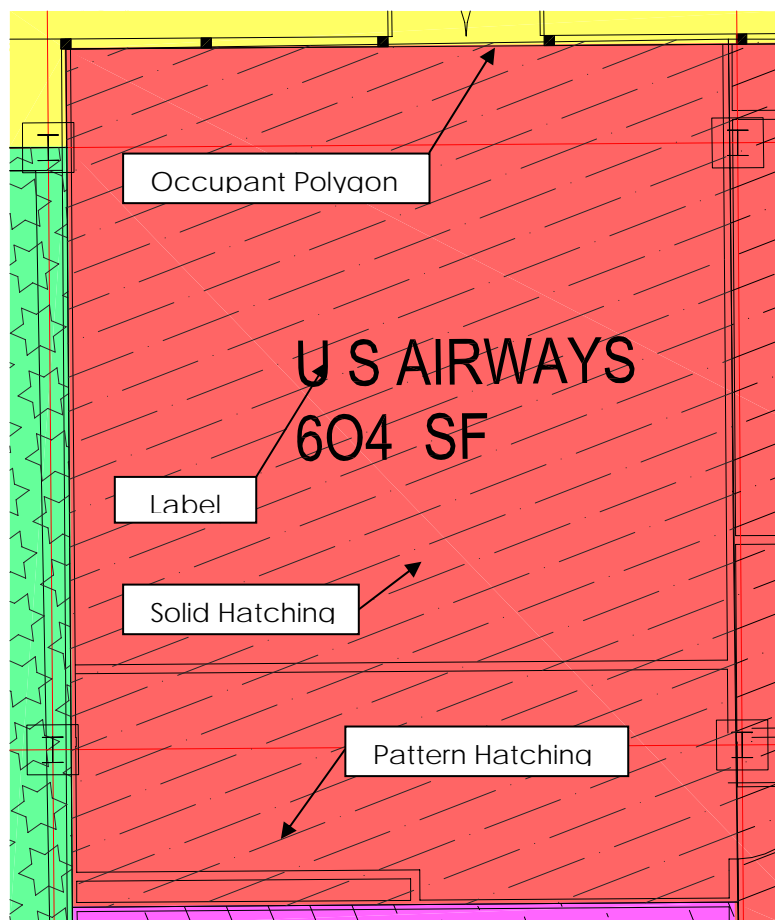


Figure 5-18, Example of Hatching, Polygons and Labels

## 5.6 Labeling Terminal Spaces

Within each *Occupant Polygon* mentioned in the previous section, an identifying label is provided. That label is defined as an AutoCAD attributed block. The information contained within this attribute block is the tenant name or type of space and the area in square feet, which that polygon encloses. Each label may be edited using the AutoCAD *DDATTE* or *ATE* command. A dialog box will appear with the various items of information, which can be edited for that label. Figure 1 illustrates the use of polylines, solid hatching, and pattern hatching to identify a lease space.

## 5.7 Attribute Blocks

The architectural model also contains lease information that is not contained within the *Occupant Polygon*. This includes public telephones by AT&T and Verizon also lighted advertising signs by Sky Sites. For these tenants the layer naming convention defined in Section 4.1 holds, however, their representation in the AutoCAD drawing model is done through the use of editable attribute blocks. Editable attribute blocks are also used for a variety of non-leasable spaces and objects such as flight information displays, terminal directories, visual paging monitors, as well as for the representation of door identification numbers. Table 5-2 summarizes the additional information blocks considered critical to the space allocation drawings.

Block File Name	Usage
Litesign.dwg	lighted advertising signs (Sky Sites) and terminal directories
Pubphone.dwg	public telephones and courtesy phones
VP.dwg	visual paging terminals
FIDS.dwg	flight information displays
Doornum.dwg	door and elevator numbers
Info2.dwg	occupant labels

**Table 5-111, Summary of Critical Information Blocks**

## 5.8 Drawing Origins and Units for Space Allocation Drawings

To facilitate the interoperability and re-use of information, the guidelines in the following sections must be adhered to.

### 5.8.1 Drawing Coordinate System and Origin

All space allocation drawings shall be submitted to, maintained by, and provided by MAA in the Maryland Coordinate System of 1987, also referred to as Maryland State Plane. Following are the parameters of the Maryland Coordinate System of 1987:

Map Projection:	Lambert conic conformal projection of the geodetic reference system of 1980
Horizontal Datum:	NAD83 (2011)
Latitude of Origin*:	37°40' North latitude
Central Meridian:	77°00' West longitude
Standard Parallel 1:	38°18' North latitude
Standard Parallel 2:	39°27' North latitude
False Easting*:	400,000 meters
False Northing*:	0 meters
Latitude**:	37°34' 38.14264" N
Longitude**:	81°31' 45.07877" W

\* at the 77th meridian

\*\* at artificial origin (0,0)

The lower left corner of all other drawings should be positioned at the Cartesian coordinate point of 0, 0, 0.

### 5.8.2 Units

The units for all space allocation drawings shall be units of feet (U.S. Survey Foot = 1200/3937 meters) and inches and fractions of an inch, with the smallest fraction normally being 1/8". Dimensions of less than a foot must be shown in inches or fractions of inches.

## 5.9 Externally Referenced Files

Space Allocation Drawings require that xref's be handled in a slightly different manner than normal engineering drawings by nature of their content, content manipulation and intended use. The following section outlines the requirements.

Each of the drawings in the Space Allocation series, covers a portion of the Terminal Building floor space with some overlap between adjacent sheets. Every square foot of space has been documented. Each drawing contains an easy to follow key plan, which identifies the extent of coverage within the Terminal Building for that particular drawing. Each individual space allocation drawing sheet consists of a common border sheet (border-U.dwg or borderL.dwg) with specific title block information. The architectural information shown in each individual drawing is merely a graphical representation of the floor plan and is not editable within that drawing file. The architectural model is contained in a separate drawing file (bldg-up.dwg or bldg-lo.dwg) which is brought into each individual space allocation drawing as an Xref (external reference). Each individual drawing incorporates a group of Xrefs including the border file, a legend appropriate to that drawings orientation, and an architectural model



(see Section 4.1.17). Therefore, all updates, corrections, or additions to the architectural features must be made in the appropriate Xref model.

## 5.10 Plotting

### 5.10.1 Layer Manager (Express Tools)

To simplify the process of plotting drawings, it is time-efficient to use the layer manager option under *Express → Layers → Layer Manager...* pull-down menu to create a *snapshot* of the information contained in the *Layer Properties Manager* dialog box. This resulting *Layer State* is to be restored in the architectural models bldg-up.dwg or bldg-lo.dwg, and not in the individual space allocation drawing sheet to be plotted. When plotting is desired, the appropriate *Layer State* is restored prior to saving and exiting the architectural model. No particular convention is used in naming *Layer States*. However, the names are intended to be intuitive. NOTE: Be sure to re-save all *Layer States* if any layers are added or changes are made to existing layers to ensure that plots set up through the Layer Manager reflect the correct information.

### 5.10.2 Default Layer Settings

Certain information within the space allocation drawings is typically not intended to be visible. Additional information may be added to the architectural model that, except in certain instances, is not displayed on the space allocation drawings. Table 5-3 lists the 13 layers that contain default settings. All layers are assumed to be on.

Layer	Default Setting
A-COLS-DIM	Frozen
A-COLS-OLD	Frozen
A-FURN-OBSV	Frozen
A-FURN-PLNT	Frozen
A-ROOM-DIMS	Frozen
A-ROOM-DIMS-MISC	Frozen
A-WALL-OBSV	Frozen
L-COM-PT-N	Frozen
N-COM-RR-H	Frozen
N-MAA-FD	Thawed
N-MAA-VP	Thawed
N-MAA-DR	Thawed
N-MAA-CP	Thawed

Table 5-122, Layers with Default Setting

These 13 individual layer settings are considered constant in any layer state defined via the Layer Manager, including those listed in Section 5.14.3.

### 5.10.3 Existing Layer States

Existing *Layer States* include the following:

*NO\_HATCH*: Used for editing *Occupant Polygons* and floor plans, this configuration does not contain hatching.

*PRINTABLE-COLOR*: Used for plotting full color copies.

*PRINTABLE-B/W*: Used for plotting black-and-white copies.

*SQUARE\_FOOTAGE*: Used for determining and verifying square footage of lease space.

There has been no attempt to create *Layer States* that allow a multitude of management options.

It would be very cumbersome to attempt to cover all potential options a user may utilize.

A standard *Layer State* naming convention makes it easy to globally set the desired view. One example would be to save a *Layer State* configured to isolate an individual occupant. The layer naming convention is intended to allow the use of wildcards (\* and ?) to easily isolate tenants in the AutoCAD *Layer*

command. The user is encouraged to create or delete *Layer States* deemed necessary to facilitate the viewing and editing of occupant information.

#### 5.10.4 Plotting Individual Space Allocation Drawings

Each individual space allocation drawing can be plotted in a variety of ways, depending on the intended use.

There are four primary uses anticipated:

- 1) Full Color, hatch patterns displayed, excluding *Occupant Polygons*.
- 2) Full Color, hatch patterns displayed, including *Occupant Polygons*.
- 3) Black-and-white, hatch patterns displayed, excluding *Occupant Polygons*.
- 4) Black-and-white, hatch patterns displayed, including *Occupant Polygons*.

The color plots will offer the clearest presentation in regards to differentiating tenant occupancy and are best plotted on bond paper. However, color plots can be expensive in large quantity. Therefore, black-and-white plots shall be plotted on reproducible paper when large quantities of prints are required for distribution.

Prior to opening and printing an individual space allocation drawing sheet, the user must restore the appropriate Layer and linetype property settings in the architectural model either manually or via the layer states defined in the [5.10.1 Layer Manager \(Express Tools\)](#)

As previously mentioned, prior to opening and printing an individual sheet of a space allocation drawing, the user must restore the appropriate Layer and Line type property settings in the *Architectural Model Xref*, either manually or via the *Layer States* defined in [5.2.1 Layer Manager \(Express Tools\)](#).

This is necessary because the AutoCAD variable *VisRetain* (see note below) for the space allocation drawings is set to 0. Therefore, the *Xref* files' *Layer States* will control the appearance of the final plots and not the individual sheets. Once settings are completed in the Architectural Model, save the drawing and:

- 1) Open the appropriate space allocation drawing.
- 2) Invoke the PLOT command.
- 3) Load the bwi-cl.ctb file (for color plots) or bwi.ctb (for black and white plots).
- 4) Choose the plot window using the circles in the bottom left and top right hand corner of the border sheet. Create a user-defined sheet size of 24" x 36" if necessary.
- 5) Choose OK.

**Note:**

The System Variable *VisRetain*: Controls the visibility, color, linetype, lineweight, and plot styles (if PSTYLEPOLICY is set to 0) of *Xref*-dependent layers; specifies whether nested xref path changes are saved.

When set to 0, the layer table as stored in the reference drawing (*Xref*) takes precedence. Changes made to *Xref*-dependent layers in the current drawing are valid in the current session only and are not saved with the drawing. When the current drawing is reopened, the layer table is reloaded from the reference drawing and the current drawing reflects those settings. The layer settings affected are On, Off, Freeze, Thaw, Color, Ltype, LWeight, and PStyle (if PSTYLEPOLICY is set to 0). This setting also specifies that changes made to the paths of nested *Xrefs* are for the current session only and are not saved with the drawing.

When set to 1 *Xref*-dependent layer changes made in the current drawing take precedence. Layer settings are saved with the current drawing's layer table and persist from session to session. Nested *Xref* path changes are saved with the current drawing and persist from session to session.

## 6.0 ELECTRONIC DELIVERABLES

### 6.1 General

The need to exchange electronic drawing or data files, between the MAA and the A/E/C community, necessitates the requirements stated in this section. All CADD drawing files shall be delivered in AutoCAD DWG and PDF and TIFF format, the version to be specified by the MAA Project Engineer and selected from the list of approved software provided in Section 2.0 of this manual.

#### 6.1.1 Delivery Media

All drawings produced for a Conformed Set or Record Drawings shall be submitted to MAA in accordance with the requirements set forth in the MAA Design Standards.

#### 6.1.2 Compression Software

As general practice MAA prefers not to receive any compressed or zip files.

#### 6.1.3 Media Labeling

The submitted CD will include a CD cover and label with the following information:

•	Contract No	MAA-XX-XX-XXX
•	Contract/Task Title:	_____
•	Consultant:	XXXXXXXXXXXXXXXX
•	Airport:	BWI and/or MTN AIRPORT
•	Submittal Date:	MONTH, DAY, YEAR
•	No. of Documents/Sheets:	XX
•	CD # / Total in Set:	X or XX

Media that contains Sensitive Security Information (SSI) as defined in the Code of Federal Regulations (49 CFR 1520) must include the following statement on the label:

*Warning: This media contains Sensitive Security Information that is controlled under 49 CFR parts 15 and 1520. No part of this record may be disclosed to persons without a "need to know", as defined in 49 CFR parts 15 and 1520, except with the written permission of the Administrator of the Transportation Security Administration or the Secretary of Transportation. Unauthorized release may result in civil penalty or other action. For U.S. government agencies, public disclosure is governed by 5 U.S.C. 552 and 49 CFR parts 15 and 1520.*

This requirement shall apply to CADD and Non-CADD deliverables.

#### 6.1.4 Directory Structure

The root directory of the delivered CD should contain a text file named ReadMe.txt that repeats the information contained on the label as well as the following:

- Contact information for the individual responsible for submitting the document(s);
- Brief explanation of CD directory structure if subdirectories are used;
- Any other comments necessary to convey the contents of the CD.

Subdirectories should be provided for each project for which deliverables are being provided (even if deliverables are only being provided for a single project). Project subdirectories should be named using just the MAA contract number (i.e. MAA-XX-XX-XXX). If no contract number has been assigned a task number and name can be used, preceded by 'Task :'. The task number can be omitted if no task number has been assigned.

Project subdirectories should contain all drawings, as well as any externally referenced drawings. Related documents, information, detail drawings and other electronic files related to these drawings should be placed in a subdirectory called 'Details'.

### 6.1.4 Electronic File Preparation

All electronic files shall be delivered in a format that is directly readable and compatible with the MAA's software and hardware platforms without conversion.

Before a file is placed on the electronic delivery media, the following procedures shall be performed:

- a) All CADD drawing files shall be *purged, audited* and all extraneous objects in the file removed prior to delivery.
- b) Drawing files shall be in their native format, not DXF, or other neutral format.
- c) Remove all extraneous graphics outside the drawing border area.

For Record Contract Documents, one sheet file representing each contract drawing shall be submitted in accordance with the MAA Design Standards. The consultant shall *bind* all reference files residential to each *sheet file*, each *sheet file* shall be ready to plot at full-size (1:1) in paper space, and layers controlled properly to reflect document's intended appearance.

### 6.1.5 Documentation

All drawing packages submitted to the MAA shall include, but not limited to, a transmittal containing the same information as on the external media label, and instructions for the restoring/transferring of files from the media.

- a)

### 6.1.6 Ownership

A statement similar to the following should be included in each contract with electronic drawing deliverables:

*MAA shall have unlimited rights under this contract to all information and materials developed under this contract and furnished to the MAA and documentation thereof, reports and listings, and all other items pertaining to the work and services pursuant to this agreement including any copyright. Unlimited rights under this contract are rights to use, duplicate, or disclose data and information, in whole or part in any manner and for any purpose whatsoever without compensation to or approval from Contractor. The MAA will at all reasonable times have the right to inspect the work and will have access to and the rights to make copies of the above-mentioned items. All digital files and data, and other products generated under this contract shall become the property of the MAA.*

## 6.2 Quality Assurance

This section lists the requirements for the inspection of drawings before they are submitted to MAA, and the engineering data quality assurance system for consultants and contractors must have in place

### 6.2.1 Responsibility for Quality

The consultant is responsible for seeing that the electronic files are in compliance with MAA standards.

### 6.2.2 Quality Assurance Testing

Quality assurance testing carried out by consultants and contractors should include examining files for entities placed in the proper layer or level, proper drawing and plot parameters, title block is filled out and set correctly, and the drawing is free of unwanted entities. Where specific spatial accuracy is required, additional checking to ensure the accuracy of the data being submitted is required. Procedures that MAA will use for acceptance testing and a recommended for consultant and contractor quality assurance are detailed in the AEIS Data Quality Standard.

### 6.2.3 Engineering Data Quality Assurance Process

Unless otherwise specified in the contract or order, the contractor/supplier must have an effective quality assurance process for the detailed quality assurance and technical accuracy of all engineering drawings and associated lists to be supplied under the terms of the contract. The procedures of the quality

assurance system shall assure the conformance of the engineering drawings and associated lists to the applicable contract provisions. The quality assurance system shall be documented, and subject to the approval of MAA's Contracting Officer.

# APPENDIX A

## LAYER NAMING

A2.....Discipline Layer Naming

A3.....Common Major and Minor Groups

A6.....Common Status Categories

## COMMON LAYER NAMES

A7.....Architectural (A)

A11....Borings (B)

A12....Civil (C)

A23....Electrical (E)

A27....Fire Protection (F)

A29....Geotechnical (G)

A30....Hazardous Materials (H)

A32....Interiors (I)

A34....Landscaping (L)

A36....Mechanical (M)

A40....Plumbing (P)

A42....Structural (S)

A45....Telecommunications (T)

A47....Survey (V)

## Appendix A

### Discipline Layer Naming

The layer name format is organized as a hierarchy. This arrangement allows users to select from a number of options for naming layers according to the level of detailed information desired. Layer names consist of distinct data fields separated from one another by dashes. A detailed list of abbreviations, or field codes, is prescribed to define the content of layers. Most field codes are mnemonic English abbreviations of construction terminology that are easy to remember.

Layer naming generally follows the *CADD LAYER GUIDELINES*, NCS Edition, published by the American Institute of Architects (AIA). There are five defined layer name data fields: Discipline Designator, Major Group, two Minor Groups, and Status. Each data field is separated from adjacent fields by a dash ("-") for clarity. Below are guidelines for compiling a layer name, followed by a table of common layer names.

Free software is available from *The CADD/GIS Technology Center* website that works with AutoCAD, which allows users to choose the proper standard layer names from a list. The layer names are easily found by defining the discipline, the type of drawing you are creating, and the types of entities that will be placed on the layer. Software can be downloaded at <https://tsc.wes.army.mil/products/>. Note that the colors that are automatically assigned to the layers may not meet the MAA standard pen table, and may have to be adjusted.

### Common Discipline Designators

Discipline Designator	Discipline	Discipline Designator	Discipline
A	Architectural	I	Interiors
B	Geotechnical	L	Landscaping
C	Civil	M	Mechanical
E	Electrical	P	Plumbing
F	Fire Protection	S	Structural
G	General	T	Telecommunications
H	Hazardous Materials	V	Surveying/Mapping

## Common Major and Minor Groups

A four-letter major group and either one or two four-letter minor groups follow the discipline designator in a layer name. Common major and minor groups are listed below:

<b>A</b>	
ACID	Industrial waste piping
AERI	Aerial
AFFF	Aqueous film forming foam
AFRZ	Anti-freeze
AIRF	Airfield
AIRS	Airspace, approach surface
ALGN	Alignment
ALRM	Alarm
ANNO	Annotation
APRN	Apron
AREA	Area
<b>B</b>	
BAGS	Baggage system information
BCNS	Beacons
BEAM	Beam
BELL	Bell systems
BLDG	Building
BORE	Bore
BORW	Borrow
BRAC	Brace
BRIN	Brine
<b>C</b>	
CABL	Cable
CATH	Cathode
CATV	Cable TV
CCTV	Closed Circuit TV
CHAN	Channel
CHEM	Chemical
CIRC	Circuit
CLNG	Ceiling
CLOK	Clock systems
CPMA	Compressed air
CNDW	Condenser water
CO2S	Carbon Dioxide system
COLS	Columns
COMM	Communications
COND	Condensate piping
CONT	Controls
CTRL	Control panels
CWTR	Chilled water
<b>D</b>	
DECK	Deck
DECN	Decontamination
DETL	Details
DIAG	Diagram
DICT	Central dictation
DISC	Discipline
DISP	Displaced
DOOR	Door
DOMW	Domestic Water
DRED	Dredge



DUAL	Dual
DUCT	Duct
DUST	Dust and fume collection
<b>E</b>	
ELEC	Electrical
ELEV	Elevation
EMER	Emergency Systems
EMCS	Emergency Monitoring Control System
EQPM	Equipment
EXHS	Exhaust
<b>F</b>	
FEAT	Feature
FIXT	Fixture
FLOR	Floor
FNDN	Foundation
FUEL	Fuel lines
FURN	Furnishing
<b>G</b>	
GLAZ	Glazed
GRAD	Grade
GRAT	Grating
GRDL	Ground/grade level
GRID	Grid
GRND	Ground
GTHP	Geothermal heat pump
<b>H</b>	
HALN	Halon
HELI	Heliport
HTCW	High temperature/chilled water
HVAC	Heating, ventilation and air conditioning
HWTR	Hot water
HYDR	Hydraulics
<b>I</b>	
IGAS	Inert gas
INDW	Industrial waste
INSL	Insulation
INTC	Intercom/PA systems
IRRG	Irrigation
<b>J</b>	
JOIN	Joints
JOIS	Joists
JACK	Jacks
<b>K</b>	
<b>L</b>	
LGAS	Liquid gas
LITE	Lighting
LSFT	Life safety / egress requirements
LTNG	Lightning protection
LUBE	Lubrication
<b>M</b>	
MACH	Machinery
MATL	Materials

METL	Metal
MDGS	Medical/Dental gas
MNST	Monitoring stations
<b>N</b>	
NGAS	Natural gas
NURS	Nurse call/paging systems
<b>O</b>	
OPEN	Opening
OVRR	Overrun
<b>P</b>	
PADS	Pads
PATT	Pattern (hatching)
PENE	Penetrations
PIPE	Piping
PKNG	Parking
PLAN	Plan, blueprint
PLNT	Plants/vegetation
POLE	Utility pole
POLL	Pollution
POWR	Power
PRIM	Primary electrical cable
PROC	Process piping
PROF	Profile
PROP	Property
PROT	Protection
PVMT	Pavement
<b>Q</b>	
<b>R</b>	
RAIL	Railroad
RATE	Rating
RCOV	Recovery
REFG	Refrigeration
REIN	Reinforcement
ROAD	Roadway
ROOF	Roof
RUNW	Runway
RWTR	Raw water
<b>S</b>	
SAFE	Safety
SAMP	Sample
SANR	Sanitary
SEAP	Seaplane
SECD	Secondary electrical cable
SECT	Section
SERT	Security systems
SITE	Sitework
SLAB	Slab
SOUN	Sound systems
SPCL	Special
SPPT	Support
<b>S</b>	
SPRN	Sprinkler
SSWR	Sanitary sewer
STAT	Status

STEM	Steam
STOR	Storage
STRC	Structures
STRM	Storm sewers/drain
STRS	Stairways
SURV	Survey
SYST	System
<b>T</b>	
TAXI	Taxiway
TOPO	Topography
TRAF	Traffic
TRUS	Trusses
TVAN	TV antenna systems
<b>U</b>	
UTIL	Utilities
<b>V</b>	
<b>W</b>	
WALL	Wall
WATR	Water
<b>X</b>	
<b>Y</b>	
<b>Z</b>	

### Common Status Categories

Once the discipline designator, major and minor categories have been chosen, the final portion of the layer name is the status. This describes to the user what the disposition is of the entities on that layer, and helps to determine if that layer should or should not be shown on a particular drawing sheet. Note that AutoCAD uses a single letter abbreviation for its status categories. MAA prefers to use a four-letter abbreviation to stay consistent with the Major and Minor group names, and provide a more intuitive description for the status. Below is a list of common status categories:

PHS#	Phase of project (#=1-9)
DEMO	Existing item to be demolished
EXST	Existing item to remain
FUTR	Future work
MOVE	Existing item to be moved
NEWW	New work
TEMP	Temporary work
NICN	Not in contract (not included in AutoCAD layer naming routine)
RELO	Existing item to be relocated (not included in AutoCAD layer naming routine)
ABND	Abandoned item (not included in AutoCAD layer naming routine)

### Common Layer Names – Architectural (A)

Discipline	Major	Minor1	Minor2	Status	Layer Description
<b>GENERAL INFORMATION</b>					
A	ANNO	DIMS			Witness/extension lines, dimension terminators, dimension text
A	ANNO	KEYN			Reference keynotes with associated leaders
A	ANNO	NOTE			General notes and general remarks
A	ANNO	NPLT			Non-plotting graphic information
A	ANNO	PATT			Miscellaneous patterning and hatching
A	ANNO	REFR			Reference files
A	ANNO	SYMB			Miscellaneous symbols
A	ANNO	TEXT			Miscellaneous text and callouts with associated leaders
<b>AREA INFORMATION</b>					
A	AREA	IDEN			Room numbers, tenant identifications, area calculations
A	AREA	LINE			Architectural area calculation boundary lines
A	AREA	OCCP			Occupant or employee names
A	AREA	PATT			Area cross hatching
<b>BAGGAGE SYSTEM INFORMATION</b>					
A	BAGS	CART			Cart/Tug
A	BAGS	CATW			Catwalk
A	BAGS	CLMD			Claim Device
A	BAGS	CONV			Baggage Conveyor
A	BAGS	CRBS			Curbside Baggage Conveyor
A	BAGS	CTRL			Control
A	BAGS	DIMM			Dimension
A	BAGS	DOOR			Doors
A	BAGS	ELEV			Elevation
A	BAGS	EQPM			Equipment
A	BAGS	ICNV			Inbound Baggage Conveyor
A	BAGS	IOSZ			Inbound Oversized Baggage Conveyor
A	BAGS	MKUP			Make-Up Device
A	BAGS	MTCH			Match Lines
A	BAGS	NOTE			Notes
A	BAGS	OCNV			Outbound Baggage Conveyor
A	BAGS	OOSZ			Outbound Oversized Baggage Conveyor
A	BAGS	RAIL			Guardrail
A	BAGS	ROWY			Right-of-Way
A	BAGS	SCDR			Security Door
A	BAGS	SCNU			Screening Unit
A	BAGS	TBLK			Title Block
A	BAGS	TCBC			Ticket Counter Baggage Conveyor
A	BAGS	TEMP			Temporary
A	BAGS	TTRY			Tilt-Tray Baggage System
A	BAGS	VPRT			View Port Layer for Paper Space
A	BAGS	XFER			Transfer Baggage Conveyor
A	BAGS	XRAY			X-Ray Unit
<b>CEILING INFORMATION</b>					
A	CLNG	ACCS			Access panels
A	CLNG	CTLJ			Ceiling control joints

Discipline	Major	Minor1	Minor2	Status	Layer Description
A	CLNG	GRID			Ceiling grid
A	CLNG	LEVL			Level Changes
A	CLNG	OPEN			Openings, ceiling/roof penetrations (see also A-FLOR-OVHD in Model File Type: Floor Plan)
A	CLNG	PATT			Ceiling patterns
A	CLNG	REFL			Reflective Ceiling
A	CLNG	SUSP			Suspended elements, ceiling mounted specialties (e.g., clocks, fans, etc.)
A	CLNG	TEES			Main tees
A	COLS	ENCL			Column enclosures/fire protection
<b>DETAIL INFORMATION</b>					
A	DETL	GRPH			Graphics, gridlines, non-text items
A	DETL	INPD			Inch-pound-specific dimensions and notes
A	DETL	METR			Metric-specific dimensions and notes
<b>DOORS</b>					
A	DOOR	FULL			Full height (to ceiling) door: swing and leaf
A	DOOR	IDEN			Door number and symbol, hardware group, etc.
A	DOOR	PRHT			Partial height door: swing and leaf
A	DOOR	SECR			Security Door
A	DOOR	SYMB			Miscellaneous door symbols (e.g., overhead, bifold, pocket, etc.)
<b>ELEVATIONS</b>					
A	ELEV	CASE			Wall-mounted casework
A	ELEV	FIXT			Miscellaneous fixtures
A	ELEV	FNSH			Finishes, woodwork, trim
A	ELEV	IDEN			Component identification numbers
A	ELEV	OTLN			Building outlines
A	ELEV	PATT			Textures and hatch patterns
A	ELEV	PFIX			Plumbing fixtures
A	ELEV	SIGN			Signage
<b>EQUIPMENT</b>					
A	EQPM	ACCS			Equipment access
A	EQPM	BELW			Equipment below Floor
A	EQPM	CLRN			Equipment clearance
A	EQPM	FIXD			Fixed equipment
A	EQPM	IDEN			Equipment identification numbers
A	EQPM	JETB			Aircraft Jet bridge
A	EQPM	MOVE			Moveable equipment
A	EQPM	NICN			Not in contract equipment
A	EQPM	OVHD			Overhead, ceiling mounted, or suspended equipment
<b>FLOOR INFORMATION</b>					
A	FLOR	CASE			Casework (manufactured cabinets)
A	FLOR	ESCL			Escalators
A	FLOR	EVTR			Elevator cars and equipment
A	FLOR	EXPJ			Expansion and Seismic Joints
A	FLOR	FIXT			Floor mounted/Free standing miscellaneous fixtures
A	FLOR	FURN			Furniture Layers
A	FLOR	HRAL			Stair and balcony handrails, guard rails
A	FLOR	IDEN			Room name, space identification text
A	FLOR	LADR			Ladders

Discipline	Major	Minor1	Minor2	Status	Layer Description
A	FLOR	LEVL			Level changes, shafts, ramps, pits, breaks in construction, and depressions
A	FLOR	MOVS			Moving sidewalks
A	FLOR	NUMB			Room/space identification number and symbol
A	FLOR	OTLN			Floor outline/perimeter/building footprint
A	FLOR	OTLN	RPRM		Room perimeter shape (Interior walls)
A	FLOR	OVHD			Overhead items (skylights, overhangs etc.)
A	FLOR	PATT			Paving, tile, carpet patterns
A	FLOR	RAIS			Access (raised) flooring
A	FLOR	SIGN			Signage
A	FLOR	SPCE			Interior space not delineated by walls
A	FLOR	SPCL			Architectural specialties (e.g., toilet room accessories, display cases)
A	FLOR	STRS			Stair risers/treads
A	FLOR	TPTN			Toilet partitions
A	FLOR	WDWK			Architectural woodwork (field built cabinets and counters)
<b>WINDOWS</b>					
A	GLAZ	FULL			Full height glazed walls and partitions (see A-WALL-CWMG for curtain walls)
A	GLAZ	IDEN			Window number and symbol
A	GLAZ	PRHT			Windows and partial height glazed partitions
A	GLAZ	SILL			Window sills
<b>LIGHTING</b>					
A	LITE	CLNG			Specialty ceiling lights not shown on Electrical Lighting Plan
<b>PROPERTY INFORMATION</b>					
A	PROP	LEAS			Lease line (interior)
<b>ROOFING INFORMATION</b>					
A	ROOF	CRTS			Crickets flow arrows flow info
A	ROOF	EXPJ			Expansion joints
A	ROOF	GUTR			Roof internal gutters
A	ROOF	HRAL			Stair handrails, nosings, guard rails
A	ROOF	LEVL			Level changes
A	ROOF	OPEN			Roof Open Below ('X' line symbol)
A	ROOF	OTLN			Roof perimeter/edge, roof geometry
A	ROOF	PATT			Roof surface patterns, hatching
A	ROOF	RFDR			Roof drains
A	ROOF	SPCL			Roof specialties, accessories, access hatches, dormers
A	ROOF	STRS			Stair risers/treads, ladders
A	ROOF	WALK			Roof walkways
A	ROOF	WALL			Parapet walls and wall caps
<b>SECTIONS</b>					
A	SECT	IDEN			Component identification numbers
A	SECT	MBND			Material beyond section cut
A	SECT	MCUT			Material cut by section
A	SECT	PATT			Textures and hatch patterns
<b>WALLS</b>					
A	WALL	CAVI			Cavity wall lines
A	WALL	CNTR			Wall centerlines
A	WALL	CWMG			Curtain wall mullions and glass

Discipline	Major	Minor1	Minor2	Status	Layer Description
A	WALL	FIRE			Fire wall designators (patterning)
A	WALL	FULL	EXTR		Exterior full height walls
A	WALL	FULL	INTR		Interior full height walls
A	WALL	HEAD			Door and window headers (appear on Reflected Ceiling Plan)
A	WALL	IDEN			Wall identification/type text or tags
A	WALL	JAMB			Door and window jambs (do not appear on Reflected Ceiling Plan)
A	WALL	MOVE			Moveable walls/partitions
A	WALL	PATT			Wall insulation, hatching, and fill
A	WALL	PRHT			Partial height walls (do not appear on Reflected Ceiling Plan)
A	WALL	SPCL			Wall-hung/attached specialties (e.g., fixtures, grab bars (incl. handicap), telephone booths)

### Common Layer Names – Borings (B)

Discipline	Major	Minor1	Minor2	Status	Description
<b>GENERAL INFORMATION</b>					
B	ANNO	DIMS			Witness/extension lines, dimension terminators, dimension text
B	ANNO	KEYN			Reference keynotes with associated leaders
B	ANNO	NOTE			General notes and general remarks
B	ANNO	NPLT			Non-plotting graphic information
B	ANNO	PATT			Miscellaneous patterning and hatching
B	ANNO	REFR			Reference files (AutoCAD users only, see Chapter 4)
B	ANNO	SYMB			Miscellaneous symbols
B	ANNO	TEXT			Miscellaneous text and callouts with associated leaders
<b>GEOPHYSICAL BORINGS</b>					
B	BORE	ELEV			Boring elevations
B	BORE	FDTA			Field data
B	BORE	HOLE			Bore/perc hole number
B	BORE	IDEN			Component identification numbers
B	BORE	LDTA			Laboratory data
B	BORE	PATT			Soil/rock patterns



### Common Layer Names – Civil (C)

Discipline	Major	Minor1	Minor2	Status	Description
<b>GENERAL INFORMATION</b>					
C	ANNO	DIMS			Witness/extension lines, dimension terminators, dimension text
C	ANNO	KEYN			Reference keynotes with associated leaders
C	ANNO	NOTE			General notes and general remarks
C	ANNO	NPLT			Non-plotting graphic information
C	ANNO	PATT			Miscellaneous patterning and hatching
C	ANNO	REFR			Reference files (AutoCAD users only, see Chapter 4)
C	ANNO	SYMB			Miscellaneous symbols
C	ANNO	TEXT			Miscellaneous text and callouts with associated leaders
<b>AIRFIELD</b>					
C	AIRF	AHOA			Air Operations Area
C	AIRF	AIDS	CRIT		Airfield Navigational Aid - Critical Area
C	AIRF	AIDS	OTHR		Other airfield navigational aides
C	AIRF	AIDS	SITE		Airfield Navigational Aid - Site
C	AIRF	AIDS	RADI		Radio airfield navigational aides
C	AIRF	AIDS	ILS_		Airfield Instrument Landing System
C	AIRF	AIDS	RADR		Radar airfield navigational aides
C	AIRF	AIDS	COMM		Communications airfield navigational aides
C	AIRF	AIDS	GPS_		GPS airfield navigational aides
C	AIRF	AIDS	MCWV		Microwave airfield navigational aides
C	AIRF	AIDS	WTHR		Weather airfield navigational aides
C	AIRF	AIDS	RMTE		Remote airfield navigational aides
C	AIRF	AIDS	SYST		NAVAID system
C	AIRF	ARWY			Airway
C	AIRF	DSRF	BLDR		Building Restriction Line
C	AIRF	DSRF	RSA_		Runway Safety Area
C	AIRF	DSRF	RPZ_		Runway Protection Zone
C	AIRF	DSRF	OFA_		Object Free Area
C	AIRF	DSRF	OFZ_		Object Free Zone
C	AIRF	DSRF	POFA		Precision Object Free Area
C	AIRF	DSRF	KEYH		Key holes
C	AIRF	DSRF	NMOV		Aircraft Non-Movement Area
C	AIRF	FAAR			FAA Region
C	AIRF	FREQ			Frequency Area
C	AIRF	GLCL	PIPE		Glycol pipes
C	AIRF	GLCL	MHOL		Glycol manholes
C	AIRF	GLCL	BUBL		Glycol bubble callout
C	AIRF	PAVE			Airfield pavement section
C	AIRF	PROP			Airport property
C	AIRF	SECR	SIDA		Security Identification Display Area
C	AIRF	SECR	SECA		Airfield security area
C	AIRF	SECR	STER		Airfield sterile area
C	AIRF	SECR	RSTR		Military restricted access boundary
C	AIRF	TRKL			Flight Track Line
C	AIRF	TRKP			Flight Track Point

Discipline	Major	Minor1	Minor2	Status	Description
<b>AIRFIELD TRAFFIC AREAS</b>					
C	TRAF	IDEN			Airfield traffic area annotation
C	TRAF	TYPA			Type A traffic area
C	TRAF	TYPB			Type B traffic area
C	TRAF	TYPC			Type C traffic area
<b>AIRSPACE</b>					
C	AIRS	ISOC			Approach surface isoclines
C	AIRS	LNDM			Landmark segment
C	AIRS	OBSC			Airfield obstruction
C	AIRS	OBST	LINE		Airspace obstructions - Line
C	AIRS	OBST	PPNT		Airspace obstructions - Point
C	AIRS	OBST	POLY		Airspace obstructions - Polygon
C	AIRS	OTHR			Other airspace surfaces
C	AIRS	PART	PRIM		FAR Part 77 Primary Surface
C	AIRS	PART	HORZ		FAR Part 77 Horizontal Surface
C	AIRS	PART	CONL		FAR Part 77 Conical Surface
C	AIRS	PART	TRNS		FAR Part 77 Transitional Surface
C	AIRS	PART	APRC		FAR Part 77 Approach Surface
C	AIRS	TERP			TERPS surfaces
<b>ALIGNMENTS</b>					
C	ALGN	DATA			Alignment coordinates and curve data
C	ALGN	LINE			Alignments
C	ALGN	STAT			Stationing and tick marks
<b>APRONS</b>					
C	APRN	ACPK			Aircraft gate/stand parking area
C	APRN	ANOM			Aircraft non-movement area
C	APRN	CNTR			Centerlines
C	APRN	CNTR	IDEN		Centerline annotation
C	APRN	DEIC			Aircraft Deicing Area
C	APRN	GRND			Grounding points
C	APRN	HOLD			Holding position markings
C	APRN	IDEN			Annotation
C	APRN	JOIN			Apron joints
C	APRN	MOOR			Mooring points
C	APRN	MRKG			Apron markings
C	APRN	OTLN			Airfield apron
C	APRN	SECU			Security zone markings
C	APRN	SHLD	MRKG		Shoulder markings
C	APRN	SIGN			Airfield signs on the apron
<b>BUILDINGS AND PRIMARY STRUCTURES</b>					
C	BLDG	IDEN			Building and other structure annotation
C	BLDG	OTLN			Buildings and other structures
C	BLDG	OVHD			Building overhang
C	BLDG	PATT			Building hatching and patterns
<b>BORROW AREAS</b>					
C	BORW	IDEN			Borrow/Spoil area annotation
C	BORW	LINE			Borrow/Spoil area

Discipline	Major	Minor1	Minor2	Status	Description
<b>CHANNELS</b>					
C	CHAN	AIDS			Navigation aids and text
C	CHAN	CNTR			Channel centerline and survey report lines
C	CHAN	CNTR	IDEN		Channel centerline and survey report lines - annotation
C	CHAN	DACL			De-authorized channel limits, anchorages, etc.
C	CHAN	DACL	IDEN		De-authorized channel limits, anchorages, etc. - annotation
C	CHAN	IDEN			Channel limits, anchorages, turning basins, disposal areas, etc. - annotation
C	CHAN	LIMT			Channel limits, anchorages, turning basins, disposal areas, etc.
C	CHAN	TURN			Turning points
<b>DETAIL INFORMATION</b>					
C	DETL	CONC			Concrete
C	DETL	COVR			Covers and fittings
C	DETL	ERTH			Earth
C	DETL	FAST			Fasteners
C	DETL	FENC			Fencing
C	DETL	FENC	SECU		Security Fencing
C	DETL	FILL			Fill
C	DETL	GENF			General features (miscellaneous items)
C	DETL	GRPH			Graphics, gridlines, non-text items
C	DETL	INPD			Inch-pound-specific dimensions and notes
C	DETL	METR			Metric-specific dimensions and notes
C	DETL	PAVE			Pavements
C	DETL	PIPE			Piping
C	DETL	SPCF			Special features
C	DETL	STRC			Structural metal
C	DETL	TANK			Tanks
C	DETL	VLVE			Valves and fittings
<b>DITCHES</b>					
C	DTCH	BOTD			Bottom of ditch
C	DTCH	CNTR			Centerline of ditch
C	DTCH	EWAT			Edge of water
C	DTCH	IDEN			Ditch annotator
C	DTCH	TOPD			Top of ditch
<b>DOMESTIC WATER</b>					
C	DOMW	PIPE		ABND	Abandoned piping
C	DOMW	DEVC			Connectors, faucets, reducers, regulators, vents, intake points, tanks, taps, backflow presenters, and valves
C	DOMW	FIRE			Fire lines
C	DOMW	FTTG			Caps, cleanouts, crosses, and tees
C	DOMW	HYDR			Hydrants
C	DOMW	IDEN			Identifier tags, symbol modifier, and text
C	DOMW	MAIN			Main domestic water piping
C	DOMW	METR			Meters
C	DOMW	NHYD			Non-potable hydrants/flushing hydrants
C	DOMW	NPOT			Non-potable water piping
C	DOMW	PITS	IDEN		Identifier tags, symbol modifier, and text
C	DOMW	PUMP			Booster pump stations
C	DOMW	REDC			Pressure reducing stations

Discipline	Major	Minor1	Minor2	Status	Description
C	DOMW	RSVR			Reservoirs
C	DOMW	RSVR	IDEN		Identifier tags, symbol modifier, and text
C	DOMW	SERV			Domestic water service piping
C	DOMW	SIGN			Surface markers/signs
C	DOMW	STNS	IDEN		Identifier tags, symbol modifier, and text
C	DOMW	TANK			Water storage tanks
C	DOMW	VENT			Vent pits
C	DOMW	VLVE			Valve pits/vaults
C	DOMW	WELL			Water well houses
<b>DREDGING</b>					
C	DRED	LIMIT			Dredge limit lines
C	DRED	OHWM			Ordinary high water marks
<b>ELEVATIONS</b>					
C	ELEV	FIXT			Miscellaneous fixtures
C	ELEV	IDEN			Component identification numbers
C	ELEV	OTLN			Building outlines
C	ELEV	PATT			Textures and hatch patterns
C	ELEV	SIGN			Signage
<b>EROSION AND SEDIMENTATION CONTROL</b>					
C	EROS	CIPR			Culvert inlet protection
C	EROS	CNST	ENTR		Construction entrance
C	EROS	DDIV			Drainage divides
C	EROS	DVDK			Diversion dike
C	EROS	IDEN			Erosion and sediment control annotation
C	EROS	INLT	PROT		Inlet protection
C	EROS	LOD			Limit of Division
C	EROS	SILT	FENC		Silt fence
C	EROS	SILT	TRAP		Silt trap
C	EROS	SSLT	FENC		Super silt fence
<b>LIQUID FUEL</b>					
C	FUEL	PIPE		ABND	Abandoned piping
C	FUEL	DEFL			Defueling piping
C	FUEL	DEVC			Air eliminators, filter strainers, hydrant fill points, line vents, markers, oil/water separators, reducers, regulators, and valves
C	FUEL	FLOW			Flow direction arrows
C	FUEL	FTTG			Caps, crosses, and tees
C	FUEL	HYDR			Hydrant control pits
C	FUEL	IDEN			Identifier tags, symbol modifier, and text
C	FUEL	JBOX			Junction boxes, manholes, handholes, test boxes
C	FUEL	MAIN			Main fuel piping
C	FUEL	METR			Meters
C	FUEL	PITS	IDEN		Identifier tags, symbol modifier, and text
C	FUEL	PUMP			Booster pump stations
C	FUEL	SERV			Service piping
C	FUEL	STNS	IDEN		Identifier tags, symbol modifier, and text
C	FUEL	TANK			Fuel tanks
C	FUEL	TRCH			Fuel line trench
C	FUEL	VENT			Vent pits

Discipline	Major	Minor1	Minor2	Status	Description
C	FUEL	VLVE			Valve pits
<b>GRADE LINEWORK</b>					
C	GRAD	EXST			Existing grade, ground line
C	GRAD	FNSH			Finished grade
<b>GRID LINES</b>					
C	GRID	FRAM			Frame (bounding frame of an area referenced by a grid)
C	GRID	MAJR			Major grid lines
C	GRID	MINR			Minor grid lines
C	GRID	TEXT			Border text, annotation
<b>HELIPORTS</b>					
C	HELI	BLST			Helipad blast pad and stopway markings
C	HELI	CNTR			Centerline
C	HELI	CNTR	MRKG		Centerline markings
C	HELI	DISP			Displaced threshold markings
C	HELI	DIST			Fixed distance markings
C	HELI	DSRF			Helipad design surface
C	HELI	FATO			Helipad FATO
C	HELI	IDEN			Heliport numbers and letters
C	HELI	SHLD			Shoulder
C	HELI	SIDE			Side stripes
C	HELI	TDZM			Touchdown zone markers
C	HELI	THRS			Threshold markers
C	HELI	TLOF			Helipad take off and landing area
<b>INDUSTRIAL WASTE WATER</b>					
C	INDW	PIPE		ABND	Abandoned piping
C	INDW	DEVC			Grit chambers, meters, flumes, neutralizers, oil/water separators, ejectors, tanks, and valves
C	INDW	FLOW			Flow direction arrows
C	INDW	FTTG			Caps and cleanouts
C	INDW	IDEN			Identifier tags, symbol modifier, and text
C	INDW	JBOX			Junction boxes and manholes
C	INDW	LAGN			Lagoons
C	INDW	LIFT			Lift stations
C	INDW	MAIN			Main industrial waste water piping
C	INDW	PLNT			Treatment plants
C	INDW	RSVR	IDEN		Identifier tags, symbol modifier, and text
C	INDW	SERV			Industrial waste water service piping
C	INDW	SIGN			Surface markers/signs
C	INDW	STNS	IDEN		Identifier tags, symbol modifier, and text
<b>JOINTS</b>					
C	JOIN	CNSL			Construction joints - longitudinal
C	JOIN	CNST			Construction joints - transverse
C	JOIN	CNTL			Contraction joints - longitudinal
C	JOIN	CNTT			Contraction joints - transverse
C	JOIN	EDGE			Thickened edges
C	JOIN	EXPN			Expansion joints
C	JOIN	IDEN			Joint annotation

Discipline	Major	Minor1	Minor2	Status	Description
<b>NATURAL GAS</b>					
C	NGAS	PIPE		ABND	Abandoned piping
C	NGAS	DEVC			Hydrant fill points, lights, vents, markers, rectifiers, reducers, regulators, sources, tanks, drip pots, taps, and valves
C	NGAS	DEVC	IDEN		Identifier tags, symbol modifier, and text
C	NGAS	FLOW			Flow direction arrows
C	NGAS	FTTG			Caps, crosses, and tees
C	NGAS	IDEN			Identifier tags, symbol modifier, and text
C	NGAS	MAIN			Main natural gas piping
C	NGAS	METR			Meters
C	NGAS	PITS	IDEN		Identifier tags, symbol modifier, and text
C	NGAS	PUMP			Compressor stations
C	NGAS	REDC			Reducing stations
C	NGAS	SERV			Service piping
C	NGAS	SIGN			Surface markers/signs
C	NGAS	STNS	IDEN		Identifier tags, symbol modifier, and text
C	NGAS	VENT			Vent pits
C	NGAS	VLVE			Valve pits/boxes
<b>OVERRUN AREAS</b>					
C	OVRN	CNTR			Centerlines
C	OVRN	CNTR	IDEN		Centerline annotation
C	OVRN	IDEN			Airfield overrun area - annotation
C	OVRN	JOIN			Airfield overrun joints
C	OVRN	OTLN			Airfield overrun area - outlines
C	OVRN	SHLD			Shoulder markings
<b>PADS (arm / disarm / calibration, etc.)</b>					
C	PADS	CNTR			Centerlines
C	PADS	CNTR	IDEN		Centerline annotation
C	PADS	IDEN			Pads - annotation
C	PADS	OTLN			Pad - outlines
C	PADS	SHLD			Shoulders with annotation
<b>PARKING LOTS</b>					
C	PKNG	CARS			Graphic illustration of cars
C	PKNG	CNTR			Centerlines
C	PKNG	CNTR	IDEN		Centerline annotation
C	PKNG	CURB			Curbs and gutters
C	PKNG	DRAN			Parking lot drainage slope indications
C	PKNG	EQPM			Parking Equipment (I.e. booths, gates, etc.)
C	PKNG	FIXT			Parking lot fixtures (e.g., wheel stops, parking meters)
C	PKNG	IDEN			Parking lot, minor road, and curb annotation
C	PKNG	ISLD			Parking islands
C	PKNG	MRKG			Parking lot striping, handicapped symbols, pavement markings
C	PKNG	OTLN			Parking lot outline
C	PKNG	SIGN			Parking lot signage
C	PKNG	SBMP			Speed bumps in parking areas
<b>PROFILES</b>					
C	PROF	CUID			Existing grade and grading cuts - annotation

Discipline	Major	Minor1	Minor2	Status	Description
C	PROF	FILL			New work, grading fills
C	PROF	INLT			Curb and surface inlets, catch basins
C	PROF	MHOL			Manholes
C	PROF	PIPE			Piping
C	PROF	ROAD			Roads
<b>PROPERTY</b>					
C	PROP	CONS			Construction limits/controls, staging area
C	PROP	ESMT			Easements
C	PROP	IDEN			Property annotation
C	PROP	LEAS			Lease line (exterior / ground lease)
C	PROP	RWAY			Right of ways
<b>PAVEMENTS</b>					
C	PVMT	ASPH			Pavement pattern - asphalt
C	PVMT	CONC			Pavement pattern - concrete
C	PVMT	GROV			Pavement Grooving
C	PVMT	GRVL			Pavement pattern - gravel
C	PVMT	IDEN			Road, parking lot, railroad, airfield pavement annotation
C	PVMT	MRKG			Pavement markings
C	PVMT	MRKG	WHIT		Roadway markings (white)
C	PVMT	MRKG	YELO		Roadway markings (yellow)
C	PVMT	PATT			Joint patterns, text and dimensions
C	PVMT	ROAD			Roads, parking lots, railroads, airfield pavements
C	PVMT	SBMP			Speed bumps on roadways
C	PVMT	SIGN			Other signs
<b>RAILROADS</b>					
C	RAIL	BRDG			Railroad bridge area
C	RAIL	BRDG	CNTR		Railroad bridge centerline
C	RAIL	CNTR			Centerlines
C	RAIL	CNTR	IDEN		Centerline annotation
C	RAIL	EQPM			Railroad equipment (e.g., gates, signals)
C	RAIL	IDEN			Railroad - annotation
C	RAIL	TRAK			Railroads
C	RAIL	YARD			Railroad Yard
<b>ROADS, STREETS, HIGHWAYS</b>					
C	ROAD	ASPH			Road outlines-asphalt surface
C	ROAD	CNTR			Centerlines
C	ROAD	CNTR	IDEN		Centerline annotation
C	ROAD	CONC			Road outlines-concrete surface
C	ROAD	CURB			Curbs
C	ROAD	DRIV			Driveway edge of pavement
C	ROAD	DRIV	CNTR		Driveway centerline
C	ROAD	GRAL			Guardrails
C	ROAD	GRVL			Road outlines-gravel surface
C	ROAD	IDEN			Road, curb, and guardrail annotation
C	ROAD	MRKG			Pavement markings
C	ROAD	SHLD			Roadway shoulder
C	ROAD	SIGN			Roadway signs
C	ROAD	UPVD			Road outlines-unpaved

Discipline	Major	Minor1	Minor2	Status	Description
<b>RUNWAYS</b>					
C	RUNW	ARST			Runway Arresting Gear Location
C	RUNW	ARST			Runway arresting area
C	RUNW	BLST			Runway blast pad
C	RUNW	CLRW			Runway clearway
C	RUNW	CNTR			Runway Centerline
C	RUNW	CNTR	MRKG		Centerline markings
C	RUNW	DISP			Displaced threshold
C	RUNW	DIST			Fixed distance markings
C	RUNW	EDGE			Airfield runway edges
C	RUNW	ENDP			Runway endpoint
C	RUNW	ENDP	MRKG		Runway label marking point
C	RUNW	IDEN			Runway numbers and letters
C	RUNW	INTS			Runway intersection
C	RUNW	LAHS			Runway land and hold short area
C	RUNW	SAFT			Runway Safety Area
C	RUNW	SEGM			Runway segment
C	RUNW	SHLD			Shoulder markings
C	RUNW	SHLD			Runway Shoulder
C	RUNW	SIDE			Side stripes
C	RUNW	SIGN			Airfield signs on the runway such as distance remaining signs
C	RUNW	STWY			Runway stopway markings
C	RUNW	TDZM			Touchdown zone markers
C	RUNW	THRS			Threshold markers
<b>SEAPLANES</b>					
C	SEAP	BUOY			Seaplane navigation buoy
C	SEAP	DOCK			Seaplane dock
C	SEAP	LNDA			Seaplane landing area
C	SEAP	RAMP	CNTR		Seaplane ramp centerline
C	SEAP	RAMP			Seaplane ramp site
<b>SECTIONS</b>					
C	SECT	IDEN			Component identification numbers
C	SECT	MBND			Material beyond section cut
C	SECT	MCUT			Material cut by section
C	SECT	PATT			Textures and hatch patterns
<b>SITE FEATURES</b>					
C	SITE	EROS			Riprap, revetments/stone protection, breakwaters, dikes, jetties, and drains
C	SITE	EROS	IDEN		Riprap, revetment/stone protection, breakwater, dike, jetty, and drain annotation
C	SITE	FENC			Fences and handrails
C	SITE	FENC	IDEN		Fence, handrail, ramp, sign, and trail annotation
C	SITE	FENP			Fence Posts
C	SITE	GATE			Gates along fences or other barriers intended to restrict access
C	SITE	IDEN			Site improvement annotation
C	SITE	IMPR			Site improvements (channel or levee features)
C	SITE	SECU	CMRA		Security camera locations outside of buildings
C	SITE	STRC			Structures (bridges, sheds, foundation pads, footings, etc.)



Discipline	Major	Minor1	Minor2	Status	Description
C	SITE	STRS			Stairs and ramps
C	SITE	WALK			Walks, trails and bicycle paths
<b>SANITARY SEWER</b>					
C	SSWR	PIPE		ABND	Abandoned piping
C	SSWR	DEVC			Grease traps, grit chambers, flumes, neutralizers, oil/water separators, ejectors, and valves
C	SSWR	DEVC	IDEN		Identifier tags, symbol modifier, and text
C	SSWR	FILT			Filtration beds
C	SSWR	FILT	IDEN		Identifier tags, symbol modifier, and text
C	SSWR	FLOW			Flow direction arrows
C	SSWR	FTTG			Caps and cleanouts
C	SSWR	IDEN			Identifier tags, symbol modifier, and text
C	SSWR	JBOX			Junction boxes and manholes
C	SSWR	JBOX	IDEN		Identifier tags, symbol modifier, and text
C	SSWR	LAGN			Lagoons
C	SSWR	LEAC			Leach field
C	SSWR	MAIN			Sanitary sewer piping
C	SSWR	MHOL			Sanitary sewer manholes
C	SSWR	NITF			Nitrification drain fields
C	SSWR	PLNT			Treatment plants
C	SSWR	PUMP			Booster pump stations
C	SSWR	RSVR	IDEN		Identifier tags, symbol modifier, and text
C	SSWR	SERV			Sanitary sewer service piping
C	SSWR	SIGN			Surface markers/signs
C	SSWR	STNS	IDEN		Identifier tags, symbol modifier, and text
C	SSWR	TANK			Septic tanks
<b>STRUCTURES</b>					
C	STRC	IDEN			Bridges, piers, breakwaters, docks, floats, etc. - annotation
C	STRC	OTLN			Bridges, piers, breakwaters, docks, floats, etc. - outlines
C	STRC	TOWR			Tower
<b>STORM SEWER</b>					
C	STRM	PIPE		ABND	Abandoned piping
C	STRM	AFFF			AFFF lagoon/detention pond
C	STRM	CHUT			Chutes and concrete erosion control structures
C	STRM	CULV			Culverts
C	STRM	DEVC			Downspouts, flumes, oil/water separators, and flap gates
C	STRM	DRAN	IDEN		Identifier tags, symbol modifier, and text
C	STRM	EROS			Erosion control (riprap)
C	STRM	FLOW			Flow direction arrows
C	STRM	FMON			Flow monitoring station
C	STRM	FTTG			Caps and cleanouts
C	STRM	HDWL			Headwalls and endwalls
C	STRM	IDEN			Identifier tags, symbol modifier, and text
C	STRM	INLT			Inlets (curb, surface, and catch basins)
C	STRM	LAGN			Lagoons, ponds, watersheds, and basins
C	STRM	MAIN			Storm sewer piping
C	STRM	MHOL			Manholes
C	STRM	PUMP			Pump stations

Discipline	Major	Minor1	Minor2	Status	Description
C	STRM	ROOF			Roof drain line
C	STRM	RSVR	IDEN		Identifier tags, symbol modifier, and text
C	STRM	SERV			Storm sewer service piping
C	STRM	SIGN			Surface markers/signs
C	STRM	STNS	IDEN		Identifier tags, symbol modifier, and text
C	STRM	STRC			Storm drainage, headwalls, inlets, manholes, culverts, and drainage structures
C	STRM	SUBS			Subsurface drain piping
<b>SURVEY</b>					
C	SURV	DATA			Survey data (benchmarks and horizontal control points or monuments)
C	SURV	IDEN			Survey, baseline, and control line annotation
C	SURV	LINE			Survey, baseline, and control lines
<b>TAXIWAYS</b>					
C	TAXI	CNTR			Taxiway centerline
C	TAXI	CNTR	IDEN		Centerline annotation
C	TAXI	CNTR	MRKG		Centerline markings
C	TAXI	EDGE			Edge markings
C	TAXI	HOLD			Holding lines
C	TAXI	IDEN			Annotation
C	TAXI	INTS			Taxiway intersection
C	TAXI	JOIN			Taxiway joints
C	TAXI	OTLN			Taxiway - outlines
C	TAXI	SHLD			Shoulder transverse stripes
C	TAXI	SIGN			Airfield signs on the taxiway such as taxiway designator, hold short and directional signs
<b>TOPOGRAPHY</b>					
C	TOPO	AUCO			Noise Complaint
C	TOPO	AUST			Noise Monitoring Station
C	TOPO	AUZN			Noise Contour/Zone
C	TOPO	BKLN			Breaklines
C	TOPO	BORE			Boring locations
C	TOPO	COOR			Coordinate grid ticks and text
C	TOPO	DTMP			DTM points
C	TOPO	DTMT			DTM triangles
C	TOPO	FLZN			Flood Zone
C	TOPO	MAJR			Major contours
C	TOPO	MAJR	IDEN		Major contours - annotation
C	TOPO	MINR			Minor contours
C	TOPO	MINR	IDEN		Minor contours - annotation
C	TOPO	MINR	ONEF		Minor contours - One Foot Intervals
C	TOPO	MINR	TWOF		Minor contours - Two Foot Intervals
C	TOPO	RNYE			Runway centerline elevation point
C	TOPO	RTWL			Retaining wall
C	TOPO	SHOR			Shorelines, land features, and references
C	TOPO	SHOR			Shoreline
C	TOPO	SLOP			Cut/fill slopes
C	TOPO	SLOP	FILL		Cut/fill slopes
C	TOPO	SLOP	IDEN		Cut/fill slope, top/toe slope annotation
C	TOPO	SLOP	TOPT		Top/toe slopes

Discipline	Major	Minor1	Minor2	Status	Description
C	TOPO	SLTP			Top/toe slopes
C	TOPO	SOUN			Soundings
C	TOPO	SPOT			Spot elevations
C	TOPO	SPOT	IDEN		Spot elevations - annotation
C	TOPO	WATR			Water area

### Common Layer Names – Electrical (E)

Discipline	Major	Minor1	Minor2	Status	Description
<b>GENERAL INFORMATION</b>					
E	ANNO	DIMS			Witness/extension lines, dimension terminators, dimension text
E	ANNO	KEYN			Reference keynotes with associated leaders
E	ANNO	NOTE			General notes and general remarks
E	ANNO	NPLT			Non-plotting graphic information
E	ANNO	PATT			Miscellaneous patterning and hatching
E	ANNO	REFR			Reference files (AutoCAD users only, see Chapter 4)
E	ANNO	SYMB			Miscellaneous symbols
E	ANNO	TEXT			Miscellaneous text and callouts with associated leaders
<b>ALARM SYSTEMS</b>					
E	ALRM	IDEN			Identifier tags, symbol modifier, and text
E	ALRM	SYMB			Miscellaneous alarm system symbols
<b>BEACONS</b>					
E	BCNS	IDEN			Identifier tags, symbol modifier, and text
E	BCNS	MISC			Miscellaneous nav aids - windcones and beacons
E	BCNS	STRB			Strobe beacons
<b>BELL SYSTEMS</b>					
E	BELL	IDEN			Identifier tags, symbol modifier, and text
E	BELL	SYMB			Bell system symbols
<b>CABLE SYSTEMS</b>					
E	CABL	COAX			Coax cable
E	CABL	FIBR			Fiber optics cable
E	CABL	IDEN			Cable identifiers
E	CABL	MULT			Multi-conductor cable
E	CABL	TRAY			Cable trays and wireways
<b>CATHODIC PROTECTION SYSTEM</b>					
E	CATH	ANOD			Sacrificial anode system
E	CATH	CURR			Impress current system
E	CATH	IDEN			Identifier tags, symbol modifier, and text
E	CATH	TEST			Test stations
E	CATV	IDEN			Identifier tags, symbol modifier, and text
E	CATV	SYMB			Cable television system symbols
<b>CLOSED-CIRCUIT TELEVISION SYSTEM</b>					
E	CCTV	IDEN			Identifier tags, symbol modifier, and text
E	CCTV	SYMB			Closed-circuit television system symbols
<b>CIRCUITS</b>					
E	CIRC	CTRL			Control and monitoring circuits
E	CIRC	IDEN			Identifier tags, symbol modifier, and text
E	CIRC	MULT			Multiple circuits
E	CIRC	SERS			Series circuits
<b>CLOCK SYSTEMS</b>					
E	CLOK	IDEN			Identifier tags, symbol modifier, and text
E	CLOK	SYMB			Clock system symbols
<b>COMMUNICATIONS</b>					
E	COMM	EQPM			Other communications distribution equipment
E	COMM	JBOX			Communication junction or pull boxes, man/handholes, pedestals, splices

Discipline	Major	Minor1	Minor2	Status	Description
E	COMM	OVHD			Overhead communications/telephone lines
E	COMM	OVHD	IDEN		Identifier tags, symbol modifier and text
E	COMM	UNDR			Underground communications/telephone lines
E	COMM	UNDR	IDEN		Identifier tags, symbol modifier and text
E	COMM	VALT			Communications vault
<b>DETAIL INFORMATION</b>					
E	DETL	GRPH			Graphics, gridlines, non-text items
E	DETL	INPD			Inch-pound-specific dimensions and notes
E	DETL	METR			Metric-specific dimensions and notes
<b>DIAGRAM INFORMATION</b>					
E	DIAG	GRPH			Graphics, gridlines, non-text items
E	DIAG	IDEN			Identifier tags, symbol modifier and text
E	DIAG	INPD			Inch-pound-specific dimensions and notes
E	DIAG	METR			Metric-specific dimensions and notes
<b>CENTRAL DICTATION SYSTEMS</b>					
E	DICT	IDEN			Identifier tags, symbol modifier, and text
E	DICT	SYMB			Central dictation system symbols
E	DISC	INFO			Clearances and working space information (NEC code, etc.)
<b>UNDERGROUND DUCTBANKS (to be used when multiple systems are in one ductbank system)</b>					
E	DUCT	MULT			Ductbank
E	DUCT	MULT	IDEN		Identifier tags, symbol modifier and text
<b>ELECTRIC</b>					
E	ELEC	DEVC			Capacitors, voltage regulators, motors, buses, generators, meters, grounds, and markers
E	ELEC	JBOX			Junction boxes, pull boxes, manholes, handholes, pedestals, splices
E	ELEC	SUBS			Other substation equipment
E	ELEC	SWCH			Fuse cutouts, pole mounted switches, circuit breakers, gang operated disconnects, reclosers, cubicle switches
E	ELEC	VALT			Vaults
<b>ENERGY MONITORING CONTROL SYSTEMS</b>					
E	EMCS	IDEN			Identifier tags, symbol modifier, and text
E	EMCS	SYMB			Energy monitoring control system symbols
E	EMER	EMER			Emergency systems equipment
<b>FLOOR INFORMATION</b>					
E	FLOR	IDEN			Room name, space identification text (copied from Architectural - Floor Plan model file)
E	FLOR	NUMB			Room/space identification number and symbol (copied from Architectural - Floor Plan model file)
<b>GROUND SYSTEM</b>					
E	GRND	CIRC			Circuits
E	GRND	DIAG			Ground system diagram
E	GRND	EQUI			Equipotential ground system
E	GRND	REFR			Reference ground system
<b>INTERCOM SYSTEM</b>					
E	INTC	IDEN			Identifier tags, symbol modifier, and text
E	INTC	SYMB			Intercom/PA system symbols
<b>LIGHTING</b>					
E	LITE	APPR			Approach lights
E	LITE	APRN			Apron Lighting

Discipline	Major	Minor1	Minor2	Status	Description
E	LITE	CIRC			Lighting circuits (including crosslines and homeruns)
E	LITE	CIRC	NUMB		Lighting circuit numbers (e.g., panel/circuit number, wire/conduit size)
E	LITE	CLNG			Ceiling mounted (surface/pendant) fixtures
E	LITE	CONS			Constant Current Regulators
E	LITE	DIST			Distance and arresting gear markers and lights
E	LITE	EMER			Emergency fixtures (outline of light (if ceiling mounted) should go on E-LITE-CLNG)
E	LITE	EXIT			Exit fixtures (outline of light (if ceiling mounted) should go on E-LITE-CLNG)
E	LITE	EXTR			Exterior lights
E	LITE	EXTR	IDEN		Identifier tags, symbol modifier, and text
E	LITE	FLOR			Floor mounted fixtures (e.g., stage)
E	LITE	IDEN			Light fixture identifier tags
E	LITE	JBOX			Junction boxes
E	LITE	LANE			Hoverlane, taxilane, and helipad lights
E	LITE	OBST			Obstruction lights
E	LITE	PANL			Main distribution panels, switchboards, lighting panels
E	LITE	RNWX	GARD		Runway guard lights
E	LITE	ROOF			Roof lighting
E	LITE	RUNW	EDGE		Runway edge lights
E	LITE	RUNW	TDZN		Runway Touchdown Zone lights
E	LITE	RUNW	CNTR		Runway Centerline lights
E	LITE	RUNW	DTGS		Runway Distance to go lights
E	LITE	SIGN			Taxiway guidance signs
E	LITE	SPCL			Special fixtures
E	LITE	SWCH			Lighting contactors, photoelectric controls, low-voltage lighting controls, etc.
E	LITE	TAXI	CNTL		Taxiway centerline lights
E	LITE	TAXI	EDGE		Taxiway edge lights
E	LITE	THRS			Threshold lights
E	LITE	WALL			Wall mounted fixtures
<b>LIGHTNING PROTECTION SYSTEM</b>					
E	LTNG	COND			Lightning protection conductors
E	LTNG	TERM			Lightning protection terminals
<b>NURSE CALL / PAGING SYSTEMS</b>					
E	NURS	IDEN			Identifier tags, symbol modifier, and text
E	NURS	SYMB			Nurse call/paging system symbols
<b>POLES</b>					
E	POLE	GUY			Guying equipment
E	POLE	GUY	IDEN		Guying equipment identifier tags, symbol modifiers, and text
E	POLE	IDEN			Utility pole identifier tags, symbol modifier, and text
E	POLE	UTIL			Utility poles
<b>POWER</b>					
E	POWR	BUSW			Busways and wireways
E	POWR	CABL			Cable trays
E	POWR	CIRC			Power circuits (including crosslines and homeruns)
E	POWR	CIRC	NUMB		Power circuit numbers (e.g., panel/circuit number, wire/conduit size)
E	POWR	CLNG			Ceiling outlets (receptacles and switches)
E	POWR	FEED			Feeders

Discipline	Major	Minor1	Minor2	Status	Description
E	POWR	GENR			Generators and auxiliary equipment
E	POWR	JBOX			Junction boxes
E	POWR	MOTR			Motors and utilization equipment
E	POWR	PANL			Panelboards, switchboards, MCC, unit substations
E	POWR	SWCH			Disconnect switches, motor starters, contactors, etc.
E	POWR	URAC			Underfloor raceways
E	POWR	XFMR	PADM		Pad mounted transformers
E	POWR	XFMR	POLE		Pole mounted transformers
E	POWR	WALL			Wall/floor outlets (receptacles and switches)
<b>PRIMARY ELECTRICAL CABLES</b>					
E	PRIM	OVHD			Overhead electrical utility lines
E	PRIM	OVHD	IDEN		Identifier tags, symbol modifier, and text
E	PRIM	UNDR			Underground electrical utility lines
E	PRIM	UNDR	IDEN		Identifier tags, symbol modifier, and text
<b>SECONDARY ELECTRICAL CABLES</b>					
E	SECD	OVHD			Overhead electrical utility lines
E	SECD	OVHD	IDEN		Identifier tags, symbol modifier, and text
E	SECD	UNDR			Underground electrical utility lines
E	SECD	UNDR	IDEN		Identifier tags, symbol modifier, and text
<b>SECURITY SYSTEMS</b>					
E	SERT	ACCS			Access control system symbols
E	SERT	BURD			Buried sensors
E	SERT	CLNG			Ceiling mounted sensors
E	SERT	FLOR			Floor mounted sensors
E	SERT	IDEN			Identifier tags, symbol modifier, and text
E	SERT	UNDR			Buried sensors
E	SERT	WALL			Wall mounted sensors
<b>SOUND / PA SYSTEMS</b>					
E	SOUN	IDEN			Identifier tags, symbol modifier, and text
E	SOUN	SYMB			Sound system symbols
<b>SPECIAL SYSTEMS</b>					
E	SPCL	IDEN			Special systems (UMCS, EMCS, CATV, etc.) identifier tags, symbol modifier, and text
E	SPCL	JBOX			Junction boxes
E	SPCL	PANL			Panelboards, backing boards, patch panel racks
E	SPCL	SRFS			Surface Sensor System
E	SPCL	SYST			Special systems (UMCS, EMCS, CATV, etc.)
E	SPCL	TRAF			Traffic signal system
E	SPCL	TRAF	IDEN		Traffic signal identifier tags, symbol modifier, and text
<b>TV ANTENNA SYSTEMS</b>					
E	TVAN	IDEN			Identifier tags, symbol modifier, and text
E	TVAN	SYMB			TV antenna system symbols

### Common Layer Names – Fire Protection (F)

Discipline	Major	Minor1	Minor2	Status	Description
<b>AQUEOUS FILM FORMING FOAM SYSTEM</b>					
F	AFFF	EQPM			Equipment
F	AFFF	PIPE			Piping
<b>ALARM SYSTEM</b>					
F	ALRM	DTCT			Smoke/heat/other detectors
F	ALRM	INDC			Indicating appliances
F	ALRM	MANL			Manual fire alarm pull stations
F	ALRM	PHON			Fire service or emergency telephone stations
<b>GENERAL INFORMATION</b>					
F	ANNO	DIMS			Witness/extension lines, dimension terminators, dimension text
F	ANNO	KEYN			Reference keynotes with associated leaders
F	ANNO	NOTE			General notes and general remarks
F	ANNO	NPLT			Non-plotting graphic information
F	ANNO	PATT			Miscellaneous patterning and hatching
F	ANNO	REFR			Reference files (AutoCAD users only, see Chapter 4)
F	ANNO	SYMB			Miscellaneous symbols
F	ANNO	TEXT			Miscellaneous text and callouts with associated leaders
<b>CO2 SPRINKLER SYSTEM</b>					
F	CO2S	EQPM			Equipment
F	CO2S	PIPE			CO2 piping or CO2 discharge nozzle piping
<b>CONTROL PANELS</b>					
F	CTRL	PANL			Control panels
<b>DETAIL INFORMATION</b>					
F	DETL	GRPH			Graphics, gridlines, non-text items
F	DETL	INPD			Inch-pound-specific dimensions and notes
F	DETL	METR			Metric-specific dimensions and notes
<b>FLOOR INFORMATION</b>					
F	FLOR	IDEN			Room name, space identification text (copied from Architectural - Floor Plan model file)
F	FLOR	NUMB			Room/space identification number and symbol (copied from Architectural - Floor Plan model file)
<b>HALON SYSTEM</b>					
F	HALN	EQPM			Halon equipment
F	HALN	PIPE			Halon piping
<b>INERT GAS</b>					
F	IGAS	EQPM			Inert gas equipment
F	IGAS	PIPE			Inert gas piping
<b>LIGHTING</b>					
F	LITE	EMER			Emergency fixtures
F	LITE	EXIT			Exit fixtures
<b>EGRESS REQUIREMENTS</b>					
F	LSFT	EGRE			Egress requirements designator
F	LSFT	OCCP			Occupant load for egress capacity
F	LSFT	TRVL			Maximum travel distances
<b>FIRE PROTECTION / SUPPRESSION / ALARM / DETECTION EQUIPMENT</b>					
F	PROT	CABN			Fire hose cabinets
F	PROT	EXTN			Fire extinguishers and fire extinguisher cabinets



Discipline	Major	Minor1	Minor2	Status	Description
F	PROT	HOSE			Fire hoses
<b>FIRE RATINGS</b>					
F	RATE	DOOR			Door fire ratings
F	RATE	WALL			Wall fire ratings
<b>SMOKE / PRESSURIZATION CONTROL</b>					
F	SMOK	DAMP			Dampers
<b>SPRINKLER SYSTEM</b>					
F	SPRN	CLHD			Sprinkler - ceiling heads
F	SPRN	COMB			Combination system
F	SPRN	OTHD			Sprinkler - other heads
F	SPRN	OTHR			Sprinkler - other
F	SPRN	PEND			Sprinkler - pendant
F	SPRN	PIPE			Sprinkler piping
F	SPRN	STAN			Standpipe system
<b>WATER SUPPLY AND DISTRIBUTION</b>					
F	WATR	CONN			Fire department connections
F	WATR	HYDR			Hydrants
F	WATR	PIPE			Piping
F	WATR	PUMP			Fire pumps

### Common Layer Names – Geotechnical (G)

Discipline	Major	Minor1	Minor2	Status	Description
<b>GENERAL INFORMATION</b>					
G	ANNO	NPLT			Non-plotting graphic information
G	ANNO	PATT			Miscellaneous patterning and hatching
G	ANNO	REFR			Reference files (AutoCAD users only, see Chapter 4)
G	ANNO	SYMB			Miscellaneous symbols
G	ANNO	TEXT			Miscellaneous text and callouts with associated leaders
G	ANNO	TTLB			Border and title block linework
<b>GRIDS</b>					
G	GRID	EXTR			Column grid outside building
G	GRID	IDEN			Column grid tags
<b>PLAN / OUTLINE</b>					
G	PLAN	OTLN			Floor outline/perimeter/building footprint
<b>SITE INFORMATION</b>					
G	SITE	OTLN			Site plan - key map

### Common Layer Names – Hazardous Materials (H)

Discipline	Major	Minor1	Minor2	Status	Description
<b>GENERAL INFORMATION</b>					
H	ANNO	DIMS			Witness/extension lines, dimension terminators, dimension text
H	ANNO	KEYN			Reference keynotes with associated leaders
H	ANNO	NPLT			Non-plotting graphic information
H	ANNO	PATT			Miscellaneous patterning
H	ANNO	SYMB			Reference bubbles, matchlines and breaklines
H	ANNO	TEXT			Detail title text, text and associated leaders, notes
<b>BUILDINGS</b>					
H	BLDG	IDEN			Annotation
H	BLDG	OTLN			Command posts, information centers
<b>DECONTAMINATION</b>					
H	DECN	EQPM			Decontamination equipment
H	DECN	IDEN			Annotation
<b>DETAIL INFORMATION</b>					
H	DETL	GRPH			Graphics, gridlines, non-text items
H	DETL	INPD			Inch-pound-specific dimensions and notes
H	DETL	METR			Metric-specific dimensions and notes
<b>DISPOSAL AREAS</b>					
H	DISP	HAZW			Hazardous waste
H	DISP	IDEN			Annotation
H	DISP	MUNT			Munitions
H	DISP	TANK			Spill containment tanks
<b>FIXTURES</b>					
H	FIXT	EYEW			Emergency eyewashes
H	FIXT	SHOW			Emergency showers
<b>MONITORING SYSTEMS</b>					
H	MNST	AIRQ			Air quality
H	MNST	GWTR			Ground water
H	MNST	IDEN			Annotation
H	MNST	LAND			Landfill gas
H	MNST	SOIL			Soil gas
H	MNST	SWTR			Surface water
<b>POLLUTION AREAS</b>					
H	POLL	CONC			Polluted area of concern
H	POLL	IDEN			Annotation
H	POLL	ORIG			Point of pollution origin
H	POLL	POTN			Potential spill, emission, or release source
<b>SAMPLE POINTS</b>					
H	SAMP	AIRS			Air samples
H	SAMP	BIOL			Biological samples
H	SAMP	GWTR			Ground water samples
H	SAMP	IDEN			Annotation
H	SAMP	MAGN			Magnetometer location points
H	SAMP	SEDI			Sediment samples
H	SAMP	SOIL			Soil samples
H	SAMP	SOLI			Solid material samples

Discipline	Major	Minor1	Minor2	Status	Description
H	SAMP	SWTR			Surface water samples
H	SAMP	WAST			Waste samples
<b>SECTIONS</b>					
H	SECT	IDEN			Component identification numbers
H	SECT	MBND			Material beyond section cut
H	SECT	MCUT			Material cut by section
H	SECT	PATT			Textures and hatch patterns
<b>STORAGE FACILITIES</b>					
H	STOR	HAZM			Hazardous materials
H	STOR	HAZW			Hazardous waste
H	STOR	IDEN			Annotation

### Common Layer Names – Interiors (I)

Discipline	Major	Minor1	Minor2	Status	Description
<b>GENERAL INFORMATION</b>					
I	ANNO	DIMS			Witness/extension lines, dimension terminators, dimension text
I	ANNO	KEYN			Reference keynotes with associated leaders
I	ANNO	NOTE			General notes and general remarks
I	ANNO	NPLT			Non-plotting graphic information
I	ANNO	PATT			Miscellaneous patterning
I	ANNO	SYMB			Reference bubbles, matchlines and breaklines
I	ANNO	TEXT			Detail title text, text and associated leaders, notes
<b>DETAIL INFORMATION</b>					
I	DETL	GRPH			Graphics, gridlines, non-text items
I	DETL	INPD			Inch-pound-specific dimensions and notes
I	DETL	METR			Metric-specific dimensions and notes
<b>ELEVATIONS</b>					
I	ELEV	CASE			Wall mounted casework
I	ELEV	FIXT			Miscellaneous fixtures
I	ELEV	FNSH			Finishes, woodwork and trim
I	ELEV	IDEN			Component identification numbers
I	ELEV	PATT			Textures and hatch patterns
I	ELEV	PFIX			Plumbing fixtures in elevation
I	ELEV	SIGN			Signage
<b>EQUIPMENT</b>					
I	EQPM	ACCS			Equipment access
I	EQPM	CHLD			Child development (play toys, teaching rugs, play forms)
I	EQPM	COPY			Copiers, fax machines, office equipment
I	EQPM	FIXD			Fixed equipment
I	EQPM	IDEN			Equipment identification numbers
I	EQPM	MEDI			Medical (exam beds, dental chairs, etc.)
I	EQPM	MOVE			Moveable equipment
I	EQPM	NICN			Not in contract equipment
I	EQPM	OVHD			Overhead, ceiling mounted, and suspended equipment
I	EQPM	STOR			Storage equipment
<b>FLOORING ITEMS AND MATERIALS</b>					
I	FLOR	SIGN			Signage
<b>FURNISHINGS</b>					
I	FURN	ACCS			Accessories (vestibule matts, partitions, draperies, clocks, trashcans, lecturns, lamps, etc.)
I	FURN	ADPC			Automated Data Processing Components
I	FURN	ARTW			Artwork
I	FURN	CASE			Case goods (desks, credenzas, beds, dressers, nightstands, wardrobes, etc.)
I	FURN	FLOR			Flooring (carpet, rugs, etc.)
I	FURN	FREE			Free-standing furnishings (desks, beds, tables, dressers, credenzas, case goods)
I	FURN	GRID			Planning grid/modular outline
I	FURN	IDEN			Furniture code identification
I	FURN	MISC			Miscellaneous furniture
I	FURN	PLNT			Plants

Discipline	Major	Minor1	Minor2	Status	Description
I	FURN	SEAT			Chairs, sofas, etc.
I	FURN	STOR			File cabinets, high density storage, shelving, storage cabinets
<b>SYSTEM FURNITURE</b>					
I	SYST	BIDS			Baggage information display system equipment used in an airport terminal
I	SYST	CUTE			Common use terminal equipment in an airport terminal
I	SYST	FIDS			Flight information display system equipment used in an airport terminal
I	SYST	FURN			Furniture
I	SYST	IDEN			Code identification
I	SYST	LITE			Lighting components
I	SYST	PATT			Patterns
I	SYST	PNLS			Panels
I	SYST	POWR			Power, communication components
I	SYST	SECU	CMRA		Security camera locations inside buildings
I	SYST	STOR			Storage components
I	SYST	WALL			Systems furniture partition walls
I	SYST	WKSF			Work surface components

### Common Layer Names – Landscaping (L)

Discipline	Major	Minor1	Minor2	Status	Description
<b>GENERAL INFORMATION</b>					
L	ANNO	DIMS			Witness/extension lines, dimension terminators, dimension text
L	ANNO	KEYN			Reference keynotes with associated leaders
L	ANNO	NOTE			General notes and general remarks
L	ANNO	NPLT			Non-plotting graphic information
L	ANNO	PATT			Miscellaneous patterning
L	ANNO	SYMB			Reference bubbles, matchlines and breaklines
L	ANNO	TEXT			Detail title text, text and associated leaders, notes
<b>DETAIL INFORMATION</b>					
L	DETL	CABS			Cabinets, enclosures
L	DETL	CONC			Concrete
L	DETL	ERTH			Earth
L	DETL	FENC			Fencing
L	DETL	FILL			Fill/cover material
L	DETL	FURN			Furniture, furnishings
L	DETL	GATE			Gate
L	DETL	GENF			General features (miscellaneous items)
L	DETL	GRAS			Grass, sod
L	DETL	GRPH			Graphics, gridlines, non-text items
L	DETL	INPD			Inch-pound-specific dimensions and notes
L	DETL	METR			Metric-specific dimensions and notes
L	DETL	STRC			Structural metal, supports
L	DETL	TKST			Tank Site
L	DETL	VEGI			Planting details
L	DETL	VLVE			Valves, fittings
L	DETL	WIRE			Wiring
<b>IRRIGATION SYSTEM</b>					
L	IRRG	COVR			Irrigation coverage, spray distribution patterns
L	IRRG	EQPM			Equipment (e.g., controllers, valves, RPBPs, etc.)
L	IRRG	HEAD			Irrigation heads, bubblers, and drip irrigation emitters
L	IRRG	IDEN			Annotation
L	IRRG	PIPE			Piping
L	IRRG	SPKL			Sprinklers
<b>PLANT AND LANDSCAPING MATERIAL</b>					
L	PLNT	BEDS			Planting beds
L	PLNT	BUSH			Bushes and shrubs (e.g., evergreen, deciduous)
L	PLNT	BUSH	LINE		Bush and shrub line
L	PLNT	CTNR			Containers or planters
L	PLNT	GRND			Groundcover and vines
L	PLNT	IDEN			Annotation
L	PLNT	MLCH			Mulches - organic and inorganic
L	PLNT	PLTS			Planting plants (e.g., ornamental annuals and perennials)
L	PLNT	SHAD			Shadow areas
L	PLNT	SPRG			Sprigs
L	PLNT	TREE			Trees (e.g., evergreen, deciduous, etc.)
L	PLNT	TREE	LINE		Tree line

Discipline	Major	Minor1	Minor2	Status	Description
L	PLNT	TURF			Lawn areas (turfing limits)
<b>SITE IMPROVEMENTS</b>					
L	SITE	BRDG			Bridges
L	SITE	DECK			Decks
L	SITE	FENC			Fencing
L	SITE	FURN			Furnishings
L	SITE	GATE			Gate
L	SITE	IDEN			Annotation
L	SITE	PLAY			Play structures
L	SITE	POOL			Pools and spas
L	SITE	ROCK			Boulders and cobble
L	SITE	RTWL			Retaining walls
L	SITE	SPRT			Sports fields
L	SITE	TUNL			Tunnels
L	SITE	WALK			Walks and steps



**Common Layer Names – Mechanical (M)**

Discipline	Major	Minor1	Minor2	Status	Description
<b>INDUSTRIAL WASTE PIPING</b>					
M	ACID	EQPM			Acid, alkaline, and oil waste equipment
M	ACID	PIPE			Acid, alkaline, and oil waste piping
M	ACID	VENT			Acid, alkaline, and oil waste vent piping
<b>ANTI-FREEZE</b>					
M	AFRZ	PIPE			Anti-freeze piping
M	AFRZ	WAST			Waste anti-freeze piping
<b>ALIGNMENTS</b>					
M	ALGN	DATA			Alignment coordinates and curve data
M	ALGN	LINE			Alignments
M	ALGN	STAT			Alignment stationing and tick marks
<b>GENERAL INFORMATION</b>					
M	ANNO	DIMS			Witness/extension lines, dimension terminators, dimension text
M	ANNO	KEYN			Reference keynotes with associated leaders
M	ANNO	NOTE			General notes and general remarks
M	ANNO	NPLT			Non-plotting graphic information
M	ANNO	PATT			Miscellaneous patterning and hatching
M	ANNO	REFR			Reference files (AutoCAD users only, see Chapter 4)
M	ANNO	SYMB			Miscellaneous symbols
M	ANNO	TEXT			Miscellaneous text and callouts with associated leaders
<b>BRINE SYSTEM</b>					
M	BRIN	EQPM			Brine system equipment
M	BRIN	PIPE			Brine system piping
<b>CHEMICAL TREATMENT SYSTEM</b>					
M	CHEM	EQPM			Equipment
M	CHEM	PIPE			Piping (includes fittings, valves)
<b>CONDENSER WATER SYSTEM</b>					
M	CNDW	EQPM			Condenser water equipment
M	CNDW	PIPE			Condenser water piping
M	COND	PIPE			Condensate piping (includes fittings, valves)
M	CONT	THER			Thermostats, controls, instrumentation, and sensors
M	CONT	WIRE			Low voltage wiring
<b>CHILLED WATER SYSTEM</b>					
M	CWTR	EQPM			Equipment
M	CWTR	PIPE			Piping (includes fittings, valves)
<b>DETAIL INFORMATION</b>					
M	DETL	ACCS			Accessories
M	DETL	BOIL			Boilers
M	DETL	CABS			Cabinets
M	DETL	COIL			Coils and fin tubes
M	DETL	DUCT			Ducts
M	DETL	EQPT			Equipment and fixtures
M	DETL	FANS			Fans
M	DETL	GENF			General features (miscellaneous items)
M	DETL	GRLS			Grilles and louvers
M	DETL	GRPH			Graphics, gridlines, non-text items

Discipline	Major	Minor1	Minor2	Status	Description
M	DETL	INPD			Inch-pound-specific dimensions and notes
M	DETL	INSL			Insulation and coverings
M	DETL	METR			Metric-specific dimensions and notes
M	DETL	MOTR			Motors
M	DETL	PIPE			Piping
M	DETL	PUMP			Pumps and compressors
M	DETL	STRC			Structural support features
M	DETL	TANK			Tanks
M	DETL	TRAP			Traps and drains
M	DETL	VENT			Vents
M	DETL	VLVE			Valves and fittings
M	DETL	WIRE			Electrical wiring
<b>DIAGRAM INFORMATION</b>					
M	DIAG	GRPH			Graphics, gridlines, non-text items
M	DIAG	INPD			Inch-pound-specific dimensions and notes
M	DIAG	METR			Metric-specific dimensions and notes
<b>OTHER DISCIPLINE</b>					
M	DISC	INFO			Clearances and working space information
<b>DUAL TEMPERATURE SYSTEM</b>					
M	DUAL	EQPM			Equipment
M	DUAL	PIPE			Piping (includes fittings, valves)
<b>DUST AND FUME COLLECTION SYSTEMS</b>					
M	DUST	DUCT			Dust and fume ductwork
M	DUST	EQPM			Dust and fume collection equipment
<b>ELEVATIONS</b>					
M	ELEV	FIXT			Miscellaneous fixtures
M	ELEV	IDEN			Component identification numbers
M	ELEV	OTLN			Building outlines
M	ELEV	PATT			Textures and hatch patterns
M	ELEV	PFIX			Plumbing fixtures
<b>EXHAUST AIR SYSTEM</b>					
M	EXHS	CDFE			Exhaust air ceiling registers and grilles
M	EXHS	DUCT			Exhaust ductwork
M	EXHS	EQPM			Equipment
<b>FLOOR INFORMATION</b>					
M	FLOR	IDEN			Room name, space identification text (copied from Architectural - Floor Plan model file)
M	FLOR	NUMB			Room/space identification number and symbol (copied from Architectural - Floor Plan model file)
<b>GEOHERMAL HEAT PUMP SYSTEM</b>					
M	GTHP	EQPM			Equipment
M	GTHP	PIPE			Piping (includes fittings, valves)
<b>HIGH TEMPERATURE / CHILLED WATER SYSTEM</b>					
M	HTCW	PIPE		ABND	Abandoned piping
M	HTCW	CHLL			Main chilled water piping
M	HTCW	CHLP			Chilled water plant
M	HTCW	CHLS			Chilled water service piping
M	HTCW	DEVC			Rigid anchors, anchor guides, rectifiers, reducers, markers, meters, pumps, regulators, tanks, and valves

Discipline	Major	Minor1	Minor2	Status	Description
M	HTCW	FLOW			Flow direction arrows
M	HTCW	FTTG			Caps and flanges
M	HTCW	HTPL			Main high temperature piping
M	HTCW	HTPP			High temperature water plant
M	HTCW	HTPS			High temperature service piping
M	HTCW	IDEN			Identifier tags, symbol modifier, and text
M	HTCW	JBOX			Junction boxes, manholes, handholes, test boxes
M	HTCW	LTPL			Main low temperature piping
M	HTCW	LTPS			Low temperature service piping
M	HTCW	PITS			Valve pits/vaults, steam pits
M	HTCW	PLNT	IDEN		Identifier tags, symbol modifier, and text
M	HTCW	PUMP			Pump stations
M	HTCW	RTRN			Return for all HTCW lines
M	HTCW	STML			Main steam piping
M	HTCW	STMS			Steam service piping
M	HTCW	STNS	IDEN		Identifier tags, symbol modifier, and text
<b>HVAC SYSTEM</b>					
M	HVAC	ACCS			Equipment access doors
M	HVAC	CDFD			Ceiling diffusers, registers, and grilles
M	HVAC	DAMP			Fire and smoke dampers
M	HVAC	EQPM			Air system equipment
M	HVAC	FDFF			Floor diffusers, registers, and grilles
M	HVAC	IDEN			Duct sizes
M	HVAC	RETN			Return ductwork
M	HVAC	ROOF			Roof mounted HVAC equipment
M	HVAC	SUPP			Supply ductwork
M	HVAC	TAGS			Diffuser/register/grille tags and air flow arrows
M	HVAC	WDFF			Wall diffusers, registers, and grilles
<b>HOT WATER HEATING SYSTEM</b>					
M	HWTR	EQPM			Equipment
M	HWTR	PIPE			Piping (includes fittings, valves)
<b>HYDRAULIC SYSTEMS</b>					
M	HYDR	EQPM			Hydraulic system equipment
M	HYDR	PIPE			Hydraulic system piping
<b>INSULATING (TRANSFORMER) OIL SYSTEM</b>					
M	INSL	EQPM			Insulating oil equipment
M	INSL	PIPE			Insulating oil piping
<b>LUBRICATION OIL</b>					
M	LUBE	EQPM			Lubrication oil equipment
M	LUBE	PIPE			Lubrication oil piping
<b>MACHINE DESIGN</b>					
M	MACH	BASE			Machinery bases
M	MACH	COMP			Miscellaneous machinery parts and components
M	MACH	EXST			Existing machinery
M	MACH	FAST			Fasteners, nuts, and bolts
M	MACH	LROT			Large rotating machinery (turbine and pump outlines)
M	MACH	MOTR			Machinery motors
M	MATL	CRAN			Bridge cranes, jib cranes, and monorails

Discipline	Major	Minor1	Minor2	Status	Description
M	MATL	HOIS			Hoists and hooks
M	MATL	LIFT			Miscellaneous lifting equipment
<b>PENETRATIONS</b>					
M	PENE	FLOR			Floor penetrations
M	PENE	ROOF			Roof penetrations
<b>PROCESS PIPING</b>					
M	PROC	EQPM			Equipment
M	PROC	PIPE			Process piping
<b>ENERGY RECOVERY SYSTEM</b>					
M	RCOV	EQPM			Equipment
M	RCOV	PIPE			Piping (includes fittings, valves)
<b>REFRIDGERATION SYSTEM</b>					
M	REFG	EQPM			Equipment
M	REFG	PIPE			Piping (includes fittings, valves)
<b>RAW WATER PIPING</b>					
M	RWTR	EQPM			Raw water equipment
M	RWTR	PIPE			Raw water piping
<b>SECTIONS</b>					
M	SECT	IDEN			Component identification numbers
M	SECT	MBND			Material beyond section cut
M	SECT	MCUT			Material cut by section
M	SECT	PATT			Textures and hatch patterns
<b>STEAM SYSTEM</b>					
M	STEM	EQPM			Equipment
M	STEM	PIPE			Steam piping

### Common Layer Names – Plumbing (P)

Discipline	Major	Minor1	Minor2	Status	Description
<b>GENERAL INFORMATION</b>					
P	ANNO	DIMS			Witness/extension lines, dimension terminators, dimension text
P	ANNO	KEYN			Reference keynotes with associated leaders
P	ANNO	NOTE			General notes and general remarks
P	ANNO	NPLT			Non-plotting graphic information
P	ANNO	PATT			Miscellaneous patterning and hatching
P	ANNO	REFR			Reference files (AutoCAD users only, see Chapter 4)
P	ANNO	SYMB			Reference bubbles, matchlines and breaklines
P	ANNO	TEXT			Detail title text, text and associated leaders, notes
<b>COMPRESSED AIR</b>					
P	CMPA	EQPM			Equipment
P	CMPA	PIPE			Piping
<b>DETAIL INFORMATION</b>					
P	DETL	GRPH			Graphics, gridlines, non-text items
P	DETL	INPD			Inch-pound-specific dimensions and notes
P	DETL	METR			Metric-specific dimensions and notes
<b>DIAGRAM INFORMATION</b>					
P	DIAG	GRPH			Graphics, gridlines, non-text items
P	DIAG	INPD			Inch-pound-specific dimensions and notes
P	DIAG	METR			Metric-specific dimensions and notes
<b>OTHER DISCIPLINE</b>					
P	DISC	INFO			Information and notes for other disciplines
<b>DOMESTIC WATER</b>					
P	DOMW	ACCS			Equipment access doors
P	DOMW	CPIP			Domestic cold water piping
P	DOMW	EQPM			Hot and cold water equipment
P	DOMW	FPIP			Domestic filtered water piping
P	DOMW	HPIP			Domestic hot water piping
P	DOMW	RISR			Domestic hot and cold water risers
P	DOMW	RPIP			Domestic hot water recirculation piping
<b>FLOOR INFORMATION</b>					
P	FLOR	IDEN			Room name, space identification text (copied from Architectural - Floor Plan model file)
P	FLOR	NUMB			Room/space identification number and symbol (copied from Architectural - Floor Plan model file)
<b>LIQUID FUEL</b>					
P	FUEL	EQPM			Equipment
P	FUEL	FGAS			Fuel gas piping
P	FUEL	FOIL			Fuel oil piping
P	FUEL	NGAS			Natural gas piping
<b>LIQUID GAS</b>					
P	LGAS	EQPM			Equipment
P	LGAS	PIPE			Piping
<b>MEDICAL / DENTAL GAS</b>					
P	MDGS	EQPM			Medical/Dental Gas Equipment
P	MDGS	PIPE			Medical/Dental Gas Piping

Discipline	Major	Minor1	Minor2	Status	Description
<b>PENETRATIONS</b>					
P	PENE	FLOR			Floor penetrations
P	PENE	ROOF			Roof penetrations
<b>SANITARY DRAINAGE</b>					
P	SANR	COND			Sanitary Condensate piping
P	SANR	EQPM			Sanitary Equipment (e.g., sand/oil/water separators)
P	SANR	FIXT			Sanitary Plumbing fixtures
P	SANR	FLDR			Sanitary Floor drains, sinks, and cleanouts
P	SANR	PIPE			Sanitary Piping
P	SANR	RISR			Sanitary risers
P	SANR	VENT			Sanitary Vent piping
<b>STORM DRAINAGE SYSTEM</b>					
P	STRM	PIPE			Storm drain piping
P	STRM	RFDR			Roof drains
P	STRM	RISR			Storm drain risers

### Common Layer Names – Structural (S)

Discipline	Major	Minor1	Minor2	Status	Description
<b>GENERAL INFORMATION</b>					
S	ANNO	DIMS			Witness/extension lines, dimension terminators, dimension text, welding symbols
S	ANNO	KEYN			Reference keynotes with associated leaders
S	ANNO	NOTE			General notes and general remarks
S	ANNO	NPLT			Non-plotting graphic information
S	ANNO	PATT			Miscellaneous patterning and hatching
S	ANNO	REFR			Reference files (AutoCAD users only, see Chapter 4)
S	ANNO	SYMB			Reference bubbles, matchlines and breaklines
S	ANNO	TEXT			Miscellaneous text and callouts with associated leaders
<b>BEAMS</b>					
S	BEAM	CNTR			Beam centerlines
S	BEAM	PRIM			Primary beams, girders
S	BEAM	SECD			Secondary beams, girders
<b>BRACING</b>					
S	BRAC	LATL			Lateral bracing
S	BRAC	SHEA			Shear walls
S	BRAC	VERT			Vertical bracing
<b>COLUMNS</b>					
S	COLS	CNTR			Column centerlines/working lines
S	COLS	MSC1			Miscellaneous columns (Type 1)
S	COLS	MSC2			Miscellaneous columns (Type 2)
S	COLS	MSC3			Miscellaneous columns (Type 3)
S	COLS	MSC4			Miscellaneous columns (Type 4)
S	COLS	PRIM			Primary columns
S	COLS	SCND			Secondary columns
<b>DECKING</b>					
S	DECK	FLOR			Floor deck
S	DECK	OPEN			Openings and penetrations
S	DECK	RBAR			Deck/slab reinforcing
S	DECK	ROOF			Roof deck
<b>DETAIL INFORMATION</b>					
S	DETL	GRPH			Graphics, gridlines, non-text items
S	DETL	INPD			Inch-pound-specific dimensions and notes
S	DETL	METR			Metric-specific dimensions and notes
<b>FEATURES</b>					
S	FEAT	CMUW			CMU outline (no patterning)
S	FEAT	CNTR			Feature centerlines
S	FEAT	CONC			Concrete outline (no patterning)
S	FEAT	GENL			General features (miscellaneous items)
S	FEAT	WOOD			Wood outline (no patterning)
<b>FOUNDATIONS</b>					
S	FNDN	CNTR			Beam centerlines
S	FNDN	FTNG			Footings
S	FNDN	GRBM			Grade beams
S	FNDN	PEDS			Column pedestals

Discipline	Major	Minor1	Minor2	Status	Description
S	FNDN	PILE			Piles (steel sheet, concrete, wood), piers, caisson piers, drilled piers
S	FNDN	RBAR			Foundation reinforcing
<b>GRATING</b>					
S	GRAT	ELEV			Elevated grating (catwalks)
S	GRAT	FLOR			Floor grating
S	GRAT	SUBS			Subsurface grating
<b>GRADE LINES</b>					
S	GRDL	EXGL			Existing ground
S	GRDL	FNGR			Finished grade
S	GRDL	WATR			Water surface
<b>GRIDS</b>					
S	GRID	HORZ			Primary grid lines (horizontal)
S	GRID	IDEN			Column I.D. tags
S	GRID	MSC			Miscellaneous grid lines (Type 1)
S	GRID	MSC2			Miscellaneous grid lines (Type 2)
S	GRID	MSC3			Miscellaneous grid lines (Type 3)
S	GRID	MSC4			Miscellaneous grid lines (Type 4)
S	GRID	VERT			Primary grid lines (vertical)
<b>JOINTS</b>					
S	JOIN	CNST			Construction joints
S	JOIN	CTRL			Control/expansion joints
<b>JOISTS</b>					
S	JOIS	BRDG			Bridging
S	JOIS	PRIM			Primary joists
S	JOIS	SECD			Secondary joists
<b>METAL</b>					
S	METL	MISC			Miscellaneous metal
<b>OPENINGS</b>					
S	OPEN	MISC			Openings and penetrations
<b>PADS</b>					
S	PADS	EQPM			Equipment pads
<b>PIPING</b>					
S	PIPE	GATE			Gates (flap gates, sluice gates, other)
S	PIPE	MISC			Miscellaneous piping/culverts
S	PIPE	TRSH			Trash racks
<b>REINFORCEMENT</b>					
S	REIN	RBAR			Rebar, welded wire mesh
<b>SAFETY FEATURES</b>					
S	SAFE	FENC			Fencing
S	SAFE	HRAL			Handrails
<b>SECTIONS</b>					
S	SECT	CMUW			CMU outline (no patterning)
S	SECT	CNTR			Centerlines
S	SECT	CONC			Concrete outline (no patterning)
S	SECT	FNGR			Finished grade
S	SECT	GENF			General features (miscellaneous items)
S	SECT	JOIN			Joint materials (e.g., felt), vapor barrier, other
S	SECT	MISC			Miscellaneous fasteners, anchor bolts, supports



Discipline	Major	Minor1	Minor2	Status	Description
S	SECT	PRIM			Primary beams/girders outlines
S	SECT	RBAR			Rebar, welded wire mesh
S	SECT	SHPS			Miscellaneous shapes, plates
S	SECT	STLS			Wide flange shapes, plates, open web joists, decking
S	SECT	WOOD			Wood outline (no patterning)
<b>SLABS</b>					
S	SLAB	EDGE			Edge of slab
S	SLAB	OPEN			Openings and penetrations
S	SLAB	RBAR			Slab reinforcing
<b>SUPPORTS</b>					
S	SPPT	MISC			Miscellaneous fasteners, anchor bolts, supports
S	SPPT	SHPS			Miscellaneous shapes, plates
<b>STAIRWAYS</b>					
S	STRS	FRAM			Stair/elevator framing
S	STRS	LADD			Ladders, ladder handrails, safety guard, grab bars
S	STRS	RBAR			Stair reinforcing
<b>TRUSSES</b>					
S	TRUS	PRIM			Primary trusses
S	TRUS	SECD			Secondary trusses
<b>WALLS</b>					
S	WALL	CONC			Concrete walls
S	WALL	HBAR			Horizontal/secondary reinforcement
S	WALL	LOAD			Load bearing CMU walls
S	WALL	NONL			Non-load bearing CMU walls
S	WALL	OPEN			Openings and penetrations
S	WALL	OTLN			Wall outline
S	WALL	PCST			Precast walls
S	WALL	RBAR			Wall reinforcing
S	WALL	STUD			Stud walls
S	WALL	VBAR			Vertical/primary reinforcement

### Common Layer Names - Telecommunications (T)

Discipline	Major	Minor1	Minor2	Status	Description
<b>ALARM SYSTEMS</b>					
T	ALRM	EQPM	SECU		Security Alarm Equipment
T	ALRM	IDEN			Identifier tags, symbol modifier, and text
T	ALRM	SYST			Miscellaneous alarm system symbols
<b>GENERAL INFORMATION</b>					
T	ANNO	DIMS			Witness/extension lines, dimension terminators, dimension text
T	ANNO	KEYN			Reference keynotes with associated leaders
T	ANNO	NOTE			General notes and general remarks
T	ANNO	NPLT			Non-plotting graphic information
T	ANNO	PATT			Miscellaneous patterning and hatching
T	ANNO	REFR			Reference files (AutoCAD users only, see Chapter 4)
T	ANNO	SYMB			Miscellaneous symbols
T	ANNO	TEXT			Miscellaneous text and callouts with associated leaders
<b>CABLE SYSTEMS</b>					
T	CABL	COAX			Coax cable
T	CABL	FIBR			Fiber optics cable
T	CABL	IDEN			Cable identifiers
T	CABL	MULT			Multi-conductor cable
T	CABL	TRAY			Cable trays and wireways
<b>CLOCK SYSTEMS</b>					
T	CLOK	IDEN			Identifier tags, symbol modifier, and text
T	CLOK	SYST			Clock system symbols
<b>COMMUNICATIONS</b>					
T	COMM	ANTN			Telecommunications antennae
T	COMM	APSY			Audio paging system
T	COMM	ATMS			Advanced traffic management system
T	COMM	AVID			Automatic vehicle identification system
T	COMM	BIDS			Baggage information display system
T	COMM	FIDS			Flight information display system
T	COMM	GIDS			Gate information display system
T	COMM	JBOX			Junction boxes
T	COMM	PMRC			Parking management and revenue control
T	COMM	VPSY			Visual paging system
<b>DIAGRAM INFORMATION</b>					
T	DIAG	GRPH			Graphics, gridlines, non-text items
T	DIAG	IDEN			Identifier tags, symbol modifier and text
T	DIAG	INPD			Inch-pound-specific dimensions and notes
T	DIAG	METR			Metric-specific dimensions and notes
<b>OTHER DISCIPLINE INFORMATION</b>					
T	DISC	INFO			Information and notes for other disciplines
<b>EQUIPMENT</b>					
T	EQPM	COMB			Distribution equipment for both copper and fiber optics
T	EQPM	COPP			Distribution equipment for copper
T	EQPM	FIBR			Distribution equipment for fiber optic
T	EQPM	OTHR			Other telecommunications equipment
T	EQPM	RELA			Relays, resistors, capacitors, and inducers

Discipline	Major	Minor1	Minor2	Status	Description
<b>FLOOR INFORMATION</b>					
T	FLOR	IDEN			Room name, space identification text (copied from Architectural - Floor Plan model file)
T	FLOR	NUMB			Room/space identification number and symbol (copied from Architectural - Floor Plan model file)
<b>JACKS</b>					
T	JACK	COMB			Combination telephone and data/LAN jacks
T	JACK	DATA			Data/LAN jacks
T	JACK	IDEN			Identifier tags, symbol modifier, and text
T	JACK	PHON			Telephone jacks
<b>NURSE CALL SYSTEMS</b>					
T	NURS	IDEN			Identifier tags, symbol modifier, and text
T	NURS	SYST			Nurse call system symbols
<b>SOUND SYSTEMS</b>					
T	SOUN	IDEN			Identifier tags, symbol modifier, and text
T	SOUN	SYST			Sound system symbols

### Common Layer Names – Survey (V)

Discipline	Major	Minor1	Minor2	Status	Description
<b>GENERAL INFORMATION</b>					
V	ANNO	DIMS			Witness/extension lines, dimension terminators, dimension text
V	ANNO	KEYN			Reference keynotes with associated leaders
V	ANNO	NOTE			General notes and general remarks
V	ANNO	NPLT			Non-plotting graphic information
V	ANNO	PATT			Miscellaneous patterning and hatching
V	ANNO	REFR			Reference files (AutoCAD users only, see Chapter 4)
V	ANNO	SYMB			Miscellaneous symbols
V	ANNO	TEXT			Miscellaneous text and callouts with associated leaders
<b>AERIAL SURVEY</b>					
V	AERI	BNDY			Aerial photography boundaries
V	AERI	INDX			Aerial photo index
V	AERI	PATH			Aerial flight lines/paths
<b>AIFIELD</b>					
V	AIRF	BCNS	IDEN		Identifier tags, symbol modifiers, and text
V	AIRF	BCNS	MISC		Miscellaneous nav aids-windcones and beacons
V	AIRF	BCNS	STRB		Strobe beacons
V	AIRF	CIRC	CTRL		Control and monitoring circuits
V	AIRF	CIRC	IDEN		Circuit identifier tags, symbol modifier, and text
V	AIRF	CIRC	MULT		Multiple circuits
V	AIRF	CIRC	SERS		Series circuits
V	AIRF	DEVC			Capacitors, voltage regulators, motors, buses, generators, meters, grounds, and markers
V	AIRF	DUCT			Ductbanks
V	AIRF	IDEN			Airfield annotation
V	AIRF	JBOX			Junction boxes, pull boxes, manholes, handholes, pedestals, splices
V	AIRF	LITE	APPR		Approach lights
V	AIRF	LITE	DIST		Distance and arresting gear markers
V	AIRF	LITE	LANE		Hoverlane, taxilane and helipad lights
V	AIRF	LITE	OBST		Obstruction lights
V	AIRF	LITE	RUNW		Runway lights
V	AIRF	LITE	SIGN		Taxiway guidance signs
V	AIRF	LITE	TAXI		Taxiway lights
V	AIRF	LITE	THRS		Threshold lights
V	AIRF	VALT			Airfield lighting vaults
<b>ALIGNMENTS</b>					
V	ALGN	DATA			Alignment coordinates and curve data
V	ALGN	LINE			Alignments
V	ALGN	MRKG			Alignment tick marks
V	ALGN	STAT			Alignment stationing and tick marks
<b>BUILDINGS</b>					
V	BLDG	IDEN			Building and other structure annotation
V	BLDG	OTLN			Buildings and other structures outline
V	BLDG	OVHD			Building overhangs
<b>CATHODIC PROTECTION SYSTEM</b>					
V	CATH	ANOD			Sacrificial anode system

Discipline	Major	Minor1	Minor2	Status	Description
V	CATH	CURR			Impress current system
V	CATH	IDEN			Identifier tags, symbol modifier, and text
V	CATH	TEST			Test stations
<b>CHANNELS</b>					
V	CHAN	AIDS			Navigation aids and text
V	CHAN	CNTR			Channel centerline and survey report lines
V	CHAN	CNTR	IDEN		Channel centerline and survey report lines - annotation
V	CHAN	DACL			De-authorized channel limits, anchorages, etc.
V	CHAN	DACL	IDEN		De-authorized channel limits, anchorages, etc. - annotation
V	CHAN	IDEN			Channel limits, anchorages, turning basins, disposal areas, etc. - annotation
V	CHAN	LIMIT			Channel limits, anchorages, turning basins, disposal areas, etc.
<b>CIRCUITS</b>					
V	CIRC	CTRL			Control and monitoring circuits
V	CIRC	IDEN			Identifier tags, symbol modifier, and text
V	CIRC	MULT			Multiple circuits
V	CIRC	SERS			Series circuits
<b>COMMUNICATIONS</b>					
V	COMM	EQPM			Other communications distribution equipment
V	COMM	JBOX			Communication junction boxes, pull boxes, manholes, handholes, pedestals, splices
V	COMM	OVHD			Overhead communications/telephone lines
V	COMM	OVHD	IDEN		Identifier tags, symbol modifier and text
V	COMM	UNDR			Underground communications/telephone lines
V	COMM	UNDR	IDEN		Identifier tags, symbol modifier and text
V	COMM	VALT			Communications vault
<b>CONTROL</b>					
V	CTRL	BMRK			Benchmarks
V	CTRL	GRID			Grid
V	CTRL	HCPT			Horizontal control points
V	CTRL	IDEN			Control point annotator
V	CTRL	TRAV			Traverse points
V	CTRL	VCPT			Vertical control points
<b>DITCHES</b>					
V	DTCH	BOTD			Bottom of ditch
V	DTCH	CNTR			Centerline of ditch
V	DTCH	EWAT			Edge of water
V	DTCH	IDEN			Ditch annotator
V	DTCH	TOPD			Top of ditch
<b>DOMESTIC WATER</b>					
V	DOMW	PIPE		ABND	Abandoned piping
V	DOMW	DEVC			Connectors, faucets, reducers, regulators, vents, intake points, tanks, taps, backflow preventers, and valves
V	DOMW	FIRE			Fire lines
V	DOMW	FTTG			Caps, cleanouts, crosses, and tees
V	DOMW	HYDR			Hydrants
V	DOMW	IDEN			Identifier tags, symbol modifier, and text
V	DOMW	MAIN			Main domestic water piping
V	DOMW	METR			Meters

Discipline	Major	Minor1	Minor2	Status	Description
V	DOMW	NHYD			Non-potable hydrants/flushing hydrants
V	DOMW	NPOT			Non-potable water piping
V	DOMW	PITS	IDEN		Identifier tags, symbol modifier, and text
V	DOMW	PUMP			Booster pump stations
V	DOMW	REDC			Pressure reducing stations
V	DOMW	RSVR			Reservoirs
V	DOMW	RSVR	IDEN		Identifier tags, symbol modifier, and text
V	DOMW	SERV			Domestic water service piping
V	DOMW	SIGN			Surface markers/signs
V	DOMW	STNS	IDEN		Identifier tags, symbol modifier, and text
V	DOMW	TANK			Water storage tanks
V	DOMW	VENT			Vent pits
V	DOMW	VLVE			Valve pits/vaults
V	DOMW	WELL			Water well houses
<b>DUCTBANKS</b>					
V	DUCT	MULT			Ductbank
V	DUCT	MULT	IDEN		Identifier tags, symbol modifier and text
<b>ELECTRICAL</b>					
V	ELEC	DEVC			Capacitors, voltage regulators, motors, buses, generators, meters, grounds, and markers
V	ELEC	JBOX			Junction boxes, pull boxes, manholes, handholes, pedestals, splices
V	ELEC	SUBS			Other substation equipment
V	ELEC	SWCH			Fuse cutouts, pole mounted switches, circuit breakers, gang operated disconnects, reclosers, cubicle switches
V	ELEC	VALT			Vaults
<b>LIQUID FUEL</b>					
V	FUEL	PIPE		ABND	Abandoned piping
V	FUEL	DEFL			Defueling piping
V	FUEL	DEVC			Air eliminators, filter strainers, hydrant fill points, line vents, markers, oil/water separators, reducers, regulators, and valves
V	FUEL	FLOW			Flow direction arrows
V	FUEL	FTTG			Caps, crosses, and tees
V	FUEL	HYDR			Hydrant control pits
V	FUEL	IDEN			Identifier tags, symbol modifier, and text
V	FUEL	JBOX			Junction boxes, manholes, handholes, test boxes
V	FUEL	MAIN			Main fuel piping
V	FUEL	METR			Meters
V	FUEL	PITS	IDEN		Identifier tags, symbol modifier, and text
V	FUEL	PUMP			Booster pump stations
V	FUEL	SERV			Service piping
V	FUEL	STNS	IDEN		Identifier tags, symbol modifier, and text
V	FUEL	TANK			Fuel tanks
V	FUEL	TRCH			Fuel line trench
V	FUEL	VENT			Vent pits
V	FUEL	VLVE			Valve pits
<b>GRADE LINEWORK</b>					
V	GRAD	EXST			Existing grade, ground line
V	GRAD	FNSH			Finished grade
V	GRID	FRAM			Frame

Discipline	Major	Minor1	Minor2	Status	Description
V	GRID	MAJR			Major grid lines
V	GRID	MINR			Minor grid lines
V	GRID	TEXT			Border text, annotation
V	GTHP	EQPM			Equipment
V	GTHP	PIPE			Piping (includes fittings, valves)
<b>HIGH TEMPERATURE / CHILLED WATER</b>					
V	HTCW	PIPE		ABND	Abandoned piping
V	HTCW	CHLL			Main chilled water piping
V	HTCW	CHLP			Chilled water plant
V	HTCW	CHLS			Chilled water service piping
V	HTCW	DEVC			Rigid anchors, anchor guides, rectifiers, reducers, markers, meters, pumps, regulators, tanks, and valves
V	HTCW	FLOW			Flow direction arrows
V	HTCW	FTTG			Caps and flanges
V	HTCW	HTPL			Main high temperature piping
V	HTCW	HTPP			High temperature water plant
V	HTCW	HTPS			High temperature service piping
V	HTCW	IDEN			Identifier tags, symbol modifier, and text
V	HTCW	JBOX			Junction boxes, manholes, handholes, test boxes
V	HTCW	LTPL			Main low temperature piping
V	HTCW	LTPS			Low temperature service piping
V	HTCW	PITS			Valve pits/vaults, steam pits
V	HTCW	PLNT	IDEN		Identifier tags, symbol modifier, and text
V	HTCW	PUMP			Pump stations
V	HTCW	RTRN			Return for all HTCW lines
V	HTCW	STML			Main steam piping
V	HTCW	STMS			Steam service piping
V	HTCW	STNS	IDEN		Identifier tags, symbol modifier, and text
<b>INDUSTRIAL WASTE</b>					
V	INDW	PIPE		ABND	Abandoned piping
V	INDW	DEVC			Grit chambers, meters, flumes, neutralizers, oil/water separators, ejectors, tanks, and valves
V	INDW	FLOW			Flow direction arrows
V	INDW	FTTG			Caps and cleanouts
V	INDW	IDEN			Identifier tags, symbol modifier, and text
V	INDW	JBOX			Junction boxes and manholes
V	INDW	LAGN			Lagoons
V	INDW	LIFT			Lift stations
V	INDW	MAIN			Main industrial waste water piping
V	INDW	PLNT			Treatment plants
V	INDW	RSVR	IDEN		Identifier tags, symbol modifier, and text
V	INDW	SERV			Industrial waste water service piping
V	INDW	SIGN			Surface markers/signs
V	INDW	STNS	IDEN		Identifier tags, symbol modifier, and text
<b>LIGHTS</b>					
V	LITE	APPR			Approach lights
V	LITE	DIST			Distance and arresting gear markers
V	LITE	FIXT			Exterior Lights
V	LITE	FIXT	IDEN		Identifier tags, symbol modifier, and text

Discipline	Major	Minor1	Minor2	Status	Description
V	LITE	LANE			Hoverlane, taxilane, and helipad lights
V	LITE	OBST			Obstruction lights
V	LITE	RUNW			Runway lights
V	LITE	RUNW	TDZN		Runway Touchdown Zone lights
V	LITE	RUNW	CNTL		Runway Centerline lights
V	LITE	SIGN			Taxiway guidance signs
V	LITE	TAXI			Taxiway lights
V	LITE	THRS			Threshold lights
<b>NATURAL GAS</b>					
V	NGAS	PIPE		ABND	Abandoned piping
V	NGAS	DEVC			Hydrant fill points, lights, vents, markers, rectifiers, reducers, regulators, sources, tanks, drip pots, taps, and valves
V	NGAS	DEVC	IDEN		Identifier tags, symbol modifier, and text
V	NGAS	FLOW			Flow direction arrows
V	NGAS	FTTG			Caps, crosses, and tees
V	NGAS	IDEN			Identifier tags, symbol modifier, and text
V	NGAS	MAIN			Main natural gas piping
V	NGAS	METR			Meters
V	NGAS	PITS	IDEN		Identifier tags, symbol modifier, and text
V	NGAS	PUMP			Compressor stations
V	NGAS	REDC			Reducing stations
V	NGAS	SERV			Service piping
V	NGAS	SIGN			Surface markers/signs
V	NGAS	STNS	IDEN		Identifier tags, symbol modifier, and text
V	NGAS	VENT			Vent pits
V	NGAS	VLVE			Valve pits/boxes
<b>POLES</b>					
V	POLE	GUYS			Guying equipment
V	POLE	GUYS	IDEN		Guying equipment identifier tags, symbol modifiers, and text
V	POLE	IDEN			Utility pole identifier tags, symbol modifier, and text
V	POLE	UTIL			Utility poles
<b>POWER</b>					
V	POWR	XFMR	PADM		Pad mounted transformers
V	POWR	XFMR	POLM		Pole mounted transformers
<b>PRIMARY ELECTRICAL CABLES</b>					
V	PRIM	OVHD			Overhead electrical utility lines
V	PRIM	OVHD	IDEN		Identifier tags, symbol modifier, and text
V	PRIM	UNDR			Underground electrical utility lines
V	PRIM	UNDR	IDEN		Identifier tags, symbol modifier, and text
<b>PROFILES</b>					
V	PROF	CUID			Existing grade and grading cuts - annotation
V	PROF	FILL			New work, grading fills
V	PROF	INLT			Curb and surface inlets, catch basins
V	PROF	MHOL			Manholes
V	PROF	PIPE			Piping
V	PROF	ROAD			Roads
<b>PROPERTY</b>					
V	PROP	BRNG			Bearings and distance labels



Discipline	Major	Minor1	Minor2	Status	Description
V	PROP	CNTY			County Boundary
V	PROP	ESMT			Government easements/property lines
V	PROP	IDEN			Property annotation
V	PROP	LEAS			Lease line (surveyed)
V	PROP	LINE			Property lines (Existing recorded plats)
V	PROP	LUSE			Land Use Area
V	PROP	MUNI			Municipal Boundary
V	PROP	QTRS			Quarter lines
V	PROP	RWAY			Right of ways
V	PROP	SECT			Section lines
V	PROP	STAT			State Boundary
V	PROP	SXTS			Sixteenth lines (40 lines)
V	PROP	ZONG			Zoning Areas
<b>PAVEMENT</b>					
V	PVMT	IDEN			Road, parking lot, railroad, airfield pavement annotation
V	PVMT	MRKG			Pavement markings
V	PVMT	PATT			Joint patterns, text and dimensions
V	PVMT	ROAD			Roads, parking lots, railroads, airfield pavements
<b>ROADS, STREETS AND HIGHWAYS</b>					
V	ROAD	ASPH			Road outlines-asphalt surface
V	ROAD	CNTR			Road centerlines
V	ROAD	CNTR			Road centerlines annotator
V	ROAD	CONC			Road outlines-concrete surface
V	ROAD	CURB			Curbs and gutters
V	ROAD	GRAL			Guard rails
V	ROAD	GRVL			Road outlines-gravel surface
V	ROAD	IDEN			Road, street, highway annotator
V	ROAD	MRKG			Pavement markings
V	ROAD	OTLN			Road outlines
V	ROAD	PATT			Joint patterns, text and dimensions
V	ROAD	SHLD			Roadway shoulders
V	ROAD	SIGN			Signs
V	ROAD	UPVD			Road outlines-unpaved surface
<b>RUNWAYS</b>					
V	RUNW	BLST	MRKG		Blast pad markings
V	RUNW	CNTR	MRKG		Centerline markings
V	RUNW	DISP	MRKG		Displaced threshold markings
V	RUNW	DIST	MRKG		Fixed distance markings
V	RUNW	EDGE	MRKG		Edge markings
V	RUNW	IDEN	MRKG		Runway identifier markings
V	RUNW	SHLD	MRKG		Shoulder markings
V	RUNW	TDZM	MRKG		Touchdown zone markers
V	RUNW	THRS	MRKG		Threshold markers
<b>SECONDARY ELECTRICAL CABLES</b>					
V	SECD	OVHD			Overhead electrical utility lines
V	SECD	OVHD	IDEN		Identifier tags, symbol modifier, and text
V	SECD	UNDR			Underground electrical utility lines
V	SECD	UNDR	IDEN		Identifier tags, symbol modifier, and text

Discipline	Major	Minor1	Minor2	Status	Description
<b>SECTIONS</b>					
V	SECT	IDEN			Component identification numbers
V	SECT	MBND			Material beyond section cut
V	SECT	MCUT			Material cut by section
V	SECT	PATT			Textures and hatch patterns
<b>SITE FEATURES</b>					
V	SITE	EROS			Riprap, revetments/stone protection, breakwaters, dikes, jetties, and drains
V	SITE	EWAT			Water features
V	SITE	FENC			Fences and handrails
V	SITE	FENC	IDEN		Fence, handrail, ramp, and trail annotation
V	SITE	IDEN			Existing site feature/structure annotation
V	SITE	OTLN			Existing site features (play structures, bike racks, benches, recreational equipment)
V	SITE	STRC			Structures (bridges, sheds, foundation pads, footings, etc.)
V	SITE	STRS			Stairs and ramps
V	SITE	VEGE			Existing treelines and vegetation
V	SITE	WALK			Walks, trails, and bicycle paths
V	SITE	WATR			Water features
<b>SPECIAL SYSTEMS</b>					
V	SPCL	IDEN			Special systems (UMCS, EMCS, CATV, etc.) identifier tags, symbol modifier, and text
V	SPCL	SYST			Special systems (UMCS, EMCS, CATV, etc.)
V	SPCL	TRAF			Traffic signal system
V	SPCL	TRAF	IDEN		Traffic signal identifier tags, symbol modifier, and text
<b>SANITARY SEWER</b>					
V	SSWR	PIPE		ABND	Abandoned piping
V	SSWR	DEVC			Grease traps, grit chambers, flumes, neutralizers, oil/water separators, ejectors, and valves
V	SSWR	DEVC	IDEN		Identifier tags, symbol modifier, and text
V	SSWR	FILT			Filtration beds
V	SSWR	FILT	IDEN		Identifier tags, symbol modifier, and text
V	SSWR	FLOW			Flow direction arrows
V	SSWR	FTTG			Caps and cleanouts
V	SSWR	IDEN			Identifier tags, symbol modifier, and text
V	SSWR	MHOL			Manholes
V	SSWR	MHOL	IDEN		Identifier tags, symbol modifier, and text
V	SSWR	JBOX			Junction boxes
V	SSWR	JBOX	IDEN		Identifier tags, symbol modifier, and text
V	SSWR	LAGN			Lagoons
V	SSWR	LEAC			Leach field
V	SSWR	MAIN			Sanitary sewer piping
V	SSWR	NITF			Nitrification drain fields
V	SSWR	PLNT			Treatment plants
V	SSWR	PUMP			Booster pump stations
V	SSWR	RSVR	IDEN		Identifier tags, symbol modifier, and text
V	SSWR	SERV			Sanitary sewer service piping
V	SSWR	SIGN			Surface markers/signs
V	SSWR	STNS	IDEN		Identifier tags, symbol modifier, and text

Discipline	Major	Minor1	Minor2	Status	Description
V	SSWR	TANK			Septic tanks
<b>STRUCTURES</b>					
V	STRC	IDEN			Bridges, piers, breakwaters, docks, floats, etc. - annotation
V	STRC	OTLN			Bridges, piers, breakwaters, docks, floats, etc. - outlines
V	STRC	TOWR			Tower
<b>STORM SEWER</b>					
V	STRM	PIPE		ABND	Abandoned piping
V	STRM	AFFF			AFFF lagoon/detention pond
V	STRM	CHUT			Chutes and concrete erosion control structures
V	STRM	CULV			Culverts
V	STRM	DEVC			Downspouts, flumes, oil/water separators, and flap gates
V	STRM	DRAN	IDEN		Identifier tags, symbol modifier, and text
V	STRM	EROS			Erosion control (riprap)
V	STRM	FLOW			Flow direction arrows
V	STRM	FMON			Flow monitoring station
V	STRM	FTTG			Caps and cleanouts
V	STRM	HDWL			Headwalls and endwalls
V	STRM	IDEN			Identifier tags, symbol modifier, and text
V	STRM	INLT			Inlets (curb, surface, and catch basins)
V	STRM	LAGN			Lagoons, ponds, watersheds, and basins
V	STRM	MAIN			Storm sewer piping
V	STRM	MHOL			Manholes
V	STRM	PUMP			Pump stations
V	STRM	ROOF			Roof drain line
V	STRM	RSVR	IDEN		Identifier tags, symbol modifier, and text
V	STRM	SERV			Storm sewer service piping
V	STRM	SIGN			Surface markers/signs
V	STRM	STNS	IDEN		Identifier tags, symbol modifier, and text
V	STRM	SUBS			Subsurface drain piping
<b>SURVEY</b>					
V	SURV	DATA			Survey data (benchmarks and horizontal control points or monuments)
V	SURV	IDEN			Survey, baseline, and control line annotation
V	SURV	LINE			Survey, baseline, and control line
V	SURV	SYMB			Survey line symbol
<b>TAXIWAYS</b>					
V	TAXI	CNTR			Centerlines
V	TAXI	CNTR	IDEN		Centerline annotator
V	TAXI	CNTR	MRKG		Centerline markings
V	TAXI	EDGE			Edge markings
V	TAXI	HOLD			Hold lines
V	TAXI	IDEN			Taxiway-annotator
V	TAXI	OTLN			Taxiway outlines
V	TAXI	SHLD			Taxiway shoulder
<b>TOPOGRAPHY</b>					
V	TOPO	BKLN			Breaklines
V	TOPO	BORE			Boring locations
V	TOPO	COOR			Coordinate grid ticks and text

Discipline	Major	Minor1	Minor2	Status	Description
V	TOPO	DTCH			Ditches and swales
V	TOPO	DTMP			DTM points
V	TOPO	DTMT			DTM triangles
V	TOPO	MAJR			Major contours
V	TOPO	MAJR	IDEN		Major contours - annotation
V	TOPO	MINR			Minor contours
V	TOPO	MINR	IDEN		Minor contours - annotation
V	TOPO	SHOR			Shorelines, land features, and references
V	TOPO	SLOP	TOPT		Top/toe slopes
V	TOPO	SOUN			Soundings
V	TOPO	SPEC			Species Site
V	TOPO	SPOT			Spot elevations
V	TOPO	WETL			Wetland
<b>UTILITIES</b>					
V	UTIL	ELEC			Power lines, lights, telephone poles, communication lines
V	UTIL	ELEC	IDEN		Power/communication annotation
V	UTIL	IDEN			Utility annotation
V	UTIL	LINE			Utilities
V	UTIL	NGAS			Gas lines, features, and valves
V	UTIL	NGAS	IDEN		Gas annotation
V	UTIL	SSWR			Sanitary lines and manholes
V	UTIL	SSWR	IDEN		Sanitary annotation
V	UTIL	STEM			Steam lines
V	UTIL	STRM			Storm sewer lines, culverts, manholes, and headwalls
V	UTIL	STRM	IDEN		Storm sewer annotation
V	UTIL	WATR			Water lines, hydrants, tanks
V	UTIL	WATR	IDEN		Water annotation

# APPENDIX B

## AIRLINE CODES

B2.....Airline Name and Codes

B18....Occupant Codes for Airline Tenants

B18....Occupant Codes for Other Tenants

B19....Usage Codes for Layering Convention

**Airline Name and Codes**

3 Digit Code	2 Digit Code	Name	Ticketing Code
	6M	40-MILE AIR	
	VY	A.C.E.	
		A.S. NORVING	
		AARON AIRLINES PTY	
	SM	ABERDEEN AIRWAYS	731
	GB	ABX AIR (CARGO)	832
	VX	ACES	137
	XQ	ACTION AIRLINES	410
	ZY	ADALBANAIR	121
	IN	ADIRONDACK AIRLINES	
	JP	ADRIA AIRWAYS	165
REA	RE	AER ARANN	684
EIN	EI	AER LINGUS	053
		AEREOS SERVICIOS DE TRANSPORTE	278
	DU	AERIAL TRANSIT COMPANY(CARGO)	892
	JR	AERO CALIFORNIA	078
	DF	AERO COACH AVIATION INT	868
	2G	AERO DYNAMICS (CARGO)	
		AERO EJECUTIVOS	681
	YP	AERO LLOYD	633
		AERO SERVICIOS	243
		AERO TRANSPORTES PANAMENOS	155
	QA	AEROCARIBE	723
		AEROCHAGO AIRLINES	198
	3Q	AEROCHASQUI	298
		AEROCOZUMEL	686
AFL	SU	AEROFLOT	555
	FP	AEROLEASING S.A.	
ARG	AR	AEROLINEAS ARGENTINAS	044
	YU	AEROLINEAS DOMINICANAS	
	VG	AEROLINEAS EL SALVADOR (CARGO)	680
		AEROLINEAS URUGUAYAS	966
	BQ	AEROMAR (CARGO)	926
	AM	AEROMEXICO	139
		AEROMONTERREY	722
	XX	AERONAVES DEL PERU (CARGO)	624
	RL	AERONICA	127
	PO	AEROPELICAN AIR SERVICES	
	WL	AEROPERLAS	
	PL	AEROPERU	210
	6P	AEROPUMA, S.A. (CARGO)	
	AW	AEROQUETZAL	291
	XU	AEROVIAS (CARGO)	316
		AEROVIAS COLOMBIANAS (CARGO)	158
		AFFRETAIR (PRIVATE) (CARGO)	292
		AFRICAN INTERNATIONAL AIRWAYS	648
	ZI	AIGLE AZUR	
AMM	DP	AIR 2000	
	RK	AIR AFRIQUE	092
DAH	AH	AIR ALGERIE	124
	3J	AIR ALLIANCE	188
	4L	AIR ALMA	248
		AIR ALPHA	
		AIR AQUITAINE	
	FQ	AIR ARUBA	276
	9A	AIR ATLANTIC LTD.	
AAG	ES	AIR ATLANTIQUE	
	OU	AIR ATONABEE/CITY EXPRESS	253

3 Digit Code	2 Digit Code	Name	Ticketing Code
	AX	AIR AURORA (CARGO)	386
	ZX	AIR B.C.	742
	AJ	AIR BELGIUM	
	KF	AIR BOTNIA	
	BP	AIR BOTSWANA	636
		AIR BRASIL	853
		AIR BRIDGE CARRIERS (CARGO)	912
	VH	AIR BURKINA	226
	PB	AIR BURUNDI	919
	TY	AIR CALEDONIE	190
	SB	AIR CALEDONIE INTERNATIONAL	063
ACA	AC	AIR CANADA	014
	XC	AIR CARIBBEAN	918
	SF	AIR CHARTER	
		AIR CHARTER (CHARTER)	
		AIR CHARTER SYSTEMS	272
CCA	CA	AIR CHINA	999
	CE	AIR CITY S.A.	
CNB		AIR COLUMBUS	
	OR	AIR COMORES	687
	YN	AIR CREEBEC	219
	DJ	AIR DJIBOUTI	611
	EN	AIR DOLOMITI	
	RQ	AIR ENGIADINA	834
		AIR ENTERPRISE INTERNATIONAL	
AEA	AE	AIR EUROPA	803
	UX	AIR EUROPA (AIR ESPANA S.A.)	
	BS	AIR EXCHANGE (CARGO)	595
	VJ	AIR EXEL	900
	DN	AIR EXEL (BELGIQUE)	
	NE	AIR EXEL (UK) LTD.	
	GS	AIR FOYLE	
AFR	AF	AIR FRANCE	057
FUA		AIR FUTURA	
	GN	AIR GABON	185
	IV	AIR GAMBIA	
	OG	AIR GUADELOUPE	937
	GI	AIR GUINEE	093
	ID	AIR GUYANE	694
		AIR HAITI (CARGO)	623
	GG	AIR HOLLAND B.V	
AHK		AIR HONG KONG (CARGO)	152
	OX	AIR HUDIK	
AIC	AI	AIR INDIA	098
	9J	AIR INTEGRA	
	IT	AIR INTER	279
	3H	AIR INUIT	
	VU	AIR IVOIRE	084
	JM	AIR JAMAICA	
	YH	AIR JET	
	UV	AIR KANGAROO ISLAND	
	QP	AIR KENYA AVIATION	
		AIR KOREA CO. LTD.	
AIS	UE	AIR L.A.	396
ALK	UL	AIR LANKA	603
	VD	AIR LIBERTE	718
	FU	AIR LITTORAL	659
	MD	AIR MADAGASCAR	258
	QM	AIR MALAWI	167
KMC		AIR MALTA	
AMC	KM	AIR MALTA	643

3 Digit Code	2 Digit Code	Name	Ticketing Code
	7N	AIR MANITOBA	268
	NN	AIR MARTINIQUE	606
	MR	AIR MAURITANIE	174
MAU	MK	AIR MAURITIUS	239
		AIR MERCURY INT (CARGO)	
	ZV	AIR MIDWEST	471
		AIR MOLOKAI	437
	OM	AIR MONGOL	289
	QE	AIR MOOREA	067
	SW	AIR NAMIBIA	186
		AIR NATIONAL	417
	ON	AIR NAURU	123
	LW	AIR NEVADA	568
	NZ	AIR NEW ZEALAND	086
	DB	AIR NIAGARA (CARGO)	296
	EL	AIR NIPPON	
	PX	AIR NIUGINI	656
	4N	AIR NORTH	287
	HS	AIR NORTH INTERNATIONAL LTD	935
	QK	AIR NOVA	983
	GX	AIR ONTARIO	368
	QN	AIR OUTRE MER	676
	FJ	AIR PACIFIC	260
	GZ	AIR RAROTONGA	755
	UZ	AIR RESORTS AIRLINES	
	UU	AIR REUNION	760
	ZJ	AIR ROUTING	
	RY	AIR RWANDA	178
	5W	AIR SAN JUAN CHARTAIR	529
	7W	AIR SASK AVIATION	
	QR	AIR SATELLITE	
	9V	AIR SCHEFFERVILLE	
	UJ	AIR SEDONA	
	DS	AIR SENEGAL	223
SEY	HM	AIR SEYCHELLES	061
	4D	AIR SINAI	903
	WV	AIR SOUTH	399
	NY	AIR ST. VINCENT	
	OJ	AIR ST.BARTHELEMY	981
	PJ	AIR ST.PIERRE	638
		AIR STORD	
	YI	AIR SUNSHINE	806
	GK	AIR SWAZI (CARGO)	097
	VT	AIR TAHITI	135
ATC	TC	AIR TANZANIA CORPORATION	197
	HT	AIR TCHAD	095
	CS	AIR TORONTO	777
		AIR TRANSAT (CHARTER)	
	TF	AIR TRANSPORT PYRENEES	655
		AIR TRANSPORT SCHIPHOL	
	VK	AIR TUNGARU CORP	715
	QW	AIR TURKS & CAICOS	254
UKL	UK	AIR UK	130
LEI		AIR UK LEISURE	
	NF	AIR VANUATU	218
	6V	AIR VEGAS	
	VM	AIR VENDEE	982
		AIR VIA BULGARIAN AIRWAYS	699
	8K	AIR VITKOVIC	
	ZW	AIR WISCONSIN	303
AZR	QC	AIR ZAIRE	207



3 Digit Code	2 Digit Code	Name	Ticketing Code
	UM	AIR ZIMBABWE CORPORATION	168
	ZF	AIRBORNE OF SWEDEN	
	4C	AIRES	
	XL	AIR-GLACIERS	
	FL	AIRLEC	
		AIR-LIFT INTERNATIONAL (CARGO)	
	CW	AIRLINE OF THE MARSHALL ISLAND	778
	IP	AIRLINES OF TASMANIA	
		AIRPAC AIRLINES (CARGO)	856
	5S	AIRSPEED AVIATION	
AIH		AIRTOURS INTERNATIONAL	
	3N	AIRVANTAGE (CARGO)	
	HO	AIRWAYS INTERNATIONAL	372
AWD		AIRWORLD	
	6L	AKLAK AIR	709
		ALAS DE TRANSPORTES INT (CARGO)	791
	AS	ALASKA AIRLINES	027
	6D	ALASKA ISLAND AIR	
	2L	ALBERNI AIRWAYS	
		ALIADRIATICA	
	AZ	ALITALIA	055
	TO	ALKAN AIR	751
ANA	NH	ALL NIPPON AIRWAYS	205
		ALL SEASONS AIR PACIFIC	525
		ALLEGHENY COMMUTER AIRLINES	358
	3A	ALLIANCE AIRLINES	317
	QQ	ALLIED AIRLINES INC	446
	LM	ALM	119
	AQ	ALOHA AIRLINES	327
	WP	ALOHA ISLANDAIR	347
LPN		ALPENAIR (CHARTER)	
	7V	ALPHA AIR	895
	5A	ALPINE AVIATION	511
	AL	ALSAIR S.A	
	DY	ALYEMDA-DEMOCRATIC YEMEN AIR	607
AMY		AMBASSADOR	
AWA	HP	AMERICA WEST AIRLINES	401
AAL	AA	AMERICAN AIRLINES	001
AMT	TZ	AMERICAN TRANS AIR INC	366
		AMERIJET INTERNATIONAL (CARGO)	810
		AMTRAK	554
	OB	ANDALUCIA INTERNATIONAL AIRWAY	
	ED	ANDES AIRLINE (CARGO)	215
		ANGLO AIRLINES	
	VF	ANGLO ROMANIAN AIRLINE	
		ANSETT AIR FREIGHT	964
AAA	AN	ANSETT AUSTRALIA AIRLINES	090
	WX	ANSETT EXPRESS	187
	ZQ	ANSETT NEW ZEALAND	941
	MV	ANSETT W.A.	181
		ANSETT WORLDWIDE AVIATION	757
	7P	APA INTERNATIONAL AIR	917
	VZ	AQUATIC AIRWAYS	
	5F	ARCTIC CIRCLE AIR	
FGA	FG	ARIANA AFGHAN AIRLINES	255
	XA	ARINC	545
	OQ	ARIZONA PACIFIC AIRWAYS	503
	IZ	ARKIA ISRAEL AIRLINES	238
	JW	ARROW AIR (CARGO)	404
	UH	ARUBAIR N.V.	
	OZ	ASIANA AIRLINES	988

3 Digit Code	2 Digit Code	Name	Ticketing Code
	AP	ASPEN AIRWAYS	
		ASTRO AIR INTERNATIONAL	769
	9T	ATHABASKA AIRWAYS	909
	BM	ATI-AERO TRANSPORTI ITALIANI	
		ATLANTIC AIR TRANSPORT	
		ATLANTIC AIRLINES	336
	RC	ATLANTIC AIRWAYS, FAROE ISLES	767
		ATLANTIC ISLAND AIR	
	EV	ATLANTIC SOUTHEAST AIRLINES	862
	PT	ATLAS AIR SERVICE	
	BH	AUGUSTA AIRWAYS	
AUR	GR	AURIGNY AIR SERVICES	924
	NO	AUS-AIR	
	AU	AUSTRAL	143
	IM	AUSTRALIA-ASIA AIRLINES	
	TN	AUSTRALIAN AIRLINES	102
	SO	AUSTRIAN AIR SERVICES	
AVA	OS	AUSTRIAN AIRLINES	257
		AUSTRIAN AIRTRANSPORT	663
	CG	AVAIKI AIR	
	VE	AVENSA	128
	JZ	AVIA AB	752
	5T	AVIACION DEL NOROESTE	661
	AO	AVIACO	110
		AVIAEXPRESS AIRLINES	732
	5V	AVIAIR AVIATION	
	AV	AVIANCA COLOMBIA	134
	RD	AVIANOVA	
	GU	AVIATECA	240
		AVIOGENEX	
	2B	B. AIRWAYS (CARGO)	817
		B0-S-AIRE AIRLINES	871
BHS	UP	BAHAMASAIR	111
	8B	BAKER AVIATION	
		BALAIR	290
LAZ	LZ	BALKAN BULGARIAN AIRLINES	196
	BT	BALTIA AIR LINES	
	TI	BALTIC INTERNATIONAL AIRLINES	
	PG	BANGKOK AIRWAYS CO	829
		BANKAIR (CARGO)	
	QO	BAR HARBOR AIRLINES	473
	6Q	BARROW AIR	
	6B	BAXTER AVIATION	
BYU	DD	BAYU INDONESIA AIR	
	JV	BEARSKIN LAKE AIR SERVICE	632
		BELIZE AIR INT (CARGO)	986
	LL	BELL AIR	
	5B	BELLAIR	
	CH	BEMIDJI AIRLINES	872
	8E	BERING AIR	
	WZ	BERLIN EUROPEAN U.K.	758
	GQ	BIG SKY AIRLINES	387
BBC	BG	BIMAN BANGLADESH AIRLINES	997
	NT	BINTER CANARIES	
		BIRGENAIR CHARTER GROUP	
	VB	BIRMINGHAM EUROPEAN AIRWAYS	702
		BLACKHAWK (CARGO)	536
	BV	BOPAIR	928
	3B	BORINQUEN AIR (CARGO)	433
	BO	BOURAQ INDONESIA AIRLINES	666
	BU	BRAATHENS S.A.F.E	154

3 Digit Code	2 Digit Code	Name	Ticketing Code
		BRANIFF INTERNATIONAL A/L	577
	JJ	BRASIL CENTRAL LINHA AEREA REG	
DZH	DB	BRIT AIR	750
BAL	BY	BRITANNIA AIRWAYS	754
BAF		BRITISH AIR FERRIES LTD	
BAW	BA	BRITISH AIRWAYS	125
	RX	BRITISH INDEPENDENT AIRWAYS	
BIH	UR	BRITISH INT HELICOPTERS	
BMA	BD	BRITISH MIDLAND AIRWAYS	236
BWL	VF	BRITISH WORLD AIRLINES	762
		BRITT AIRWAYS	565
	BC	BRYMON AVIATION	657
	FR	BURLINGTON AIR EXPRESS	934
	II	BUSINESS AIR	
		BUSINESS AIR TRAVEL	664
	HQ	BUSINESS EXPRESS	357
	DR	BUSINESS FLIGHT OF SCANDINAVIA	244
	CT	C.A.V.E	
		CAICOS CARIBBEAN AIR. (CARGO)	
CKT	KT	CALEDONIAN AIRWAYS	
	MO	CALM AIR INT	622
	3C	CAMAI AIR	451
	UY	CAMEROON AIRLINES	604
CMM		CANADA 3000	
CDN		CANADIAN AIRLINES INT	018
	4A	CANADIAN EAGLE AIRLINES	
	KG	CANAFRICA TRANSPORTES AEREOS	
		CANAIR (CARGO)	
	9K	CAPE AIR	306
	6C	CAPE SMYTHE AIR SERVICE	879
		CARGO AIRLINES	700
	CV	CARGOLUX AIRLINES (CARGO)	172
	OW	CARGOSUR (CARGO)	
		CARIBBEAN AIR CARGO (CARGO)	749
		CARIBBEAN AIRWAYS	
	KW	CARNIVAL AIR LINES	521
	CX	CATHAY PACIFIC AIRWAYS	160
	KX	CAYMAN AIRWAYS	378
		CAYUGA AIR (CARGO)	402
		CC AIR (US AIR COMMUTER)	354
CNA		CENTENIAL AIRLINES	
	GW	CENTRAL AMERICAN AIRLINES	712
	9M	CENTRAL MOUNTAIN AIR	634
	BK	CHALK'S/PARADISE ISLAND AIRWAY	522
		CHALLENGE AIR CARGO (CARGO)	307
		CHANNEL EXPRESS(AIR SER)(CARGO)	
	NK	CHARTER ONE	487
		CHAUTAUQUA AIRLINES	363
		CHICAGO AIR TAXI	439
		CHILCOTIN-CARIBO AVIATION	116
CAL	CI	CHINA AIRLINES	297
	MU	CHINA EASTERN AIRLINES	781
		CHINA GENERAL AVIATION	
	CJ	CHINA NORTHERN AIRLINES	782
	WH	CHINA NORTHWEST AIRLINES	783
	CZ	CHINA SOUTHERN AIRLINES	784
	SZ	CHINA SOUTHWEST AIRLINES	785
	JS	CHOSONMINHANG KOREAN AIRWAYS	120
	SX	CHRISTMAN AIR SYSTEM	509
	QI	CIMBER AIR A/S	647
		CIRCLE AIR FREIGHT	

3 Digit Code	2 Digit Code	Name	Ticketing Code
	CC	CISKEI INTERNATIONAL	222
	BX	COAST AIR	970
	DQ	COASTAL AIR TRANSPORT	457
		COASTAL AIRWAYS	819
	LQ	COHLMIA AVIATION (CARGO)	
	7C	COLUMBIA PACIFIC AIRLINES	
	OH	COMAIR	886
	MN	COMMERCIAL AIRWAYS	161
	XK	COMPAGNIE CORSE MEDITERRANEE	146
CFP	CF	COMPANIA DE AVIACION FAUCETT	163
MXA	MX	COMPANIA MEXICANA	132
	YM	COMPASS AIRLINES	612
		CONNECTAIR CHARTERS	
	4S	CONNER AIR LINES	575
	5C	CONQUEST AIRLINES	355
	DD	CONTI-FLUG	
COA	CO	CONTINENTAL AIRLINES	005
	KC	COOK ISLANDS INTERNATIONAL	
	KO	COOK STRAIT SKYFERRY	
	CM	COPA-COMPANIA PANAMENA DE AVCN	230
		CORDOBA AIR CARGO	660
		CORPORATE AIR (CARGO)	
		CROATIA AIRLINES	
	LX	CROSSAIR	724
		CROWN AIRWAYS	501
	SC	CRUZEIRO DO SUL	049
CSA	OK	CSA CZECHOSLOVAK AIRLINES	064
	CU	CUBANA	136
CYP	CY	CYPRUS AIRWAYS	048
	YK	CYPRUS TURKISH AIRLINES	056
		DAIRO AIR SERVICES (CARGO)	761
	DX	DANAIR A/S	609
	DA	DAN-AIR SERVICES	062
	2D	DAWN AIR	551
	9D	DELTA AIR CHARTER	689
DAL	DL	DELTA AIR LINES	006
	DI	DELTA AIR REGIONAL FLUGVERKEHR	944
DLH	LH	DEUTSCHE LUFTHANSA AG.	220
	ER	DHL AIRWAYS	423
	UO	DIRECT AIR	418
	DH	DISCOVERY AIRWAYS	438
	DW	DLT DEUTSCHE LUFTVERK.	683
	YU	DOMINAIR	725
	DO	DOMINICANA	113
	DZ	DOUGLAS AIRWAYS	275
	KA	DRAGONAIR	043
	KB	DRUK AIR	787
	8D	DULLES EXPRESS	506
	QG	DYNAMIC AIR	
	EX	EAGLE AVIATION	
	XZ	EASTAIR (ICELAND)	
	UN	EASTERN AUSTRALIA AIRLINES	
	EW	EAST-WEST AIRLINES	088
	EU	ECUATORIANA	341
	3D	EDGARTOWN AIR	
	MS	EGYPTAIR	077
	LY	EL AL ISRAEL AIRLINES	114
	EB	EMERY WORLDWIDE (CARGO)	
	EK	EMIRATES	176
	EM	EMPIRE AIRLINES	464
	BE	ENTERPRISE AIRLINES	409

3 Digit Code	2 Digit Code	Name	Ticketing Code
		ENVIROSALES CORPORATION	959
	3P	EQUATOR AIRLINES	
	GJ	EQUATORIAL INT AIR OF SAO TOME 980	
	7H	ERA AVIATION	808
ETH	ET	ETHIOPIAN AIRLINES	071
	RN	EURALAIR INTERNATIONAL	836
	YQ	EURO AIR HELICOPTER SERVICE AB	
	EE	EURO BERLIN	770
ECA		EUROCYPRAIR	
EUC		EURO-CYPRIA (CHARTER)	
EEZ		EUROFLY	
		EUROFLY (CHARTER)	
	EY	EUROPE AERO SERVICE	546
		EUROPEAN EXPEDITE	256
		EUROWORLD	844
	BR	EVA AIR	
	OT	EVERGREEN HELICOPTERS ALASKA	
EXC	EQ	EXCALIBUR AIRWAYS	
	AD	EXEC EXPRESS	504
	NA	EXECUTIVE AIR CHARTER	
	FX	EXPRESS AIR	569
	9E	EXPRESS AIRLINES	430
		EXPRESS ONE INTERNATIONAL INC	
	IH	FALCON CARGO AB.	759
	EF	FAR EASTERN AIR TRANSPORT	265
	UD	FAST AIR CARRIER (CARGO)	726
FDX	FM	FEDERAL EXPRESS CORP. (CARGO)	023
	PC	FIJI AIR	677
FIN	AY	FINNAIR	105
	FA	FINNAVIATION	
	7F	FIRST AIR	245
	9R	FLAGSHIP EXPRESS SERV (CARGO)	359
	FK	FLAMENCO AIRWAYS	580
	IX	FLANDRE AIR	972
	VV	FLEXAIR	
	EC	FLIGHT LINE	452
	YC	FLIGHT WEST AIRLINES	060
	GM	FLITESTAR	805
		FLORIDA EXPRESS	456
	OP	FLYING BOAT	370
	FT	FLYING TIGER LINE (CARGO)	
	GE	FOSHING AIRLINES	
		FOUR STAR AIR CARGO (CARGO)	861
	ZU	FREEDOM AIR	221
	3F	FRESH AIR CORP. (CARGO)	815
	WR	FRIENDLY ISLANDS AIRWAYS	971
	SI	FRIESENFLUG	SI
	4F	FRONTIER AIR	233
	2F	FRONTIER FLYING SERVICE	517
	GO	GAMBIA AIR SHUTTLE	216
	CK	GAMBIA AIRWAYS	866
GIA	GA	GARUDA INDONESIAN AIRWAYS	126
		GAS AIR CARGO	271
		GATEWAY PACE AVIATION	807
GBL	GT	GB AIRWAYS	171
	GP	GEMINI (CARGO)	625
GHA	GH	GHANA AIRWAYS CORPORATION	237
	9C	GILL AVIATION	786
	DC	GOLDEN AIR COMMUTER	
		GOLDEN STAR AIR CARGO	
	LK	GOLDFIELDS AIR SERVICES	

3 Digit Code	2 Digit Code	Name	Ticketing Code
	8G	GP EXPRESS AIRLINES INC.	825
	QD	GRAND AIRWAYS	475
	YE	GRAND CANYON AIRLINES	374
		GREAT BARRIER AIRLINES	
		GREAT CHINA AIRLINES	
	ZK	GREAT LAKES AVIATION	846
GRN	WK	GREEN AIR (CHARTER)	
	GL	GREENLANDAIR (GRONLANDSFLY)	631
GFA	GF	GULF AIR	072
	XF	GULF FLITE CENTER	383
	3M	GULFSTREAM INTERNATIONAL A/L	449
	GY	GUYANA AIRWAYS CORPORATION	206
	7A	HAINES AIRWAYS	
		HAITI AIR FREIGHT INTERNAT.	671
		HAITI NATIONAL AIRLINES	284
	TV	HAITI TRANS AIR	362
	WD	HAITIAN AVIATION LINE	851
HAS	HX	HAMBURG AIRLINES	099
	VN	HANG KHONG VIETNAM	738
	4H	HANNA'S AIR SALTSRING	
	8H	HARBOR AIR SERVICE	458
	HG	HARBOR AIRLINES	495
	HA	HAWAIIAN AIRLINES	173
	ZL	HAZELTON AIRLINES	
		HEAVYLIFT CARGO AIRL. (CARGO)	
	YO	HELI AIR MONACO	747
	OI	HELI TRANSPORT	764
	MY	HELIFRANCE	
	IU	HELIFRANS AIR SERVICE	860
	CN	HELIJET	
	JB	HELIJET AIRWAYS	613
		HENSON AVIATION	531
	2E	HERMANS/MARKAIR EXPRESS	325
		HEX'AIR	848
	ZS	HISPANIOLA AIRWAYS (CARGO)	263
	HJ	HOLMSTROEM AIR AB	
		HONDURAS INTERCARGO AIRLINE	669
	QX	HORIZON AIRLINES	481
ABR	AK	HUNTING CARGO AIRLINES	
		HUTCHAIR	863
	HZ	HUTCHINSON AIR (CARGO)	
		I.L.P.O/ARUBA CARGO (CARGO)	564
IBE	IB	IBERIA	075
ICE	FI	ICELANDAIR FLUGLEIDIR	108
	LS	ILIAMNA AIR TAXI	
	IC	INDIAN AIRLINES	058
	ND	INTAIR	330
IEA		INTER EUROPEAN AIRWAYS	
		INTERAMERICANA DE AVIACION	601
	RS	INTERCONTINENTAL DE AVIACION	
	IF	INTERFLUG	107
		INTER-ISLAND AIR	882
		INTERNACIONAL DE AVIACION	420
	IQ	INTEROT AIR SERVICES	614
		IPEC AVIATION (CARGO)	717
IRA	IR	IRAN AIR	096
	IA	IRAQI AIRWAYS	073
	4M	ISLAND AIR	
	AK	ISLAND AIR, SA	
	IS	ISLAND AIRLINES	
	2S	ISLAND EXPRESS	

3 Digit Code	2 Digit Code	Name	Ticketing Code
	2N	ISLANDER AIR/AIR NEWARK	
	WC	ISLENA AIRLINES	282
	FW	ISLES OF SCILLY SKYBUS	
	IL	ISTANBUL AIRLINES	
ITJ		ITALJET (CHARTER)	
	LN	JAMAHIRIYA LIBYAN ARAB AIRLINE	148
		JAMAICA AIR FREIGHTERS	605
		JANAIR (CARGO)	462
	JN	JAPAN AIR COMMUTER	
JAL	JL	JAPAN AIR LINES	131
	JD	JAPAN AIR SYSTEM	234
	EG	JAPAN ASIA AIRWAYS	688
	JT	JARO INTERNATIONAL	
JAT	JU	JAT YUGOSLAV AIRLINES	115
JEA	JY	JERSEY EUROPEAN AIRWAYS	267
	JX	JES AIR	691
		JET AIRWAYS	
	9W	JET AIRWAYS (INDIA) LTD	
		JET ALSACE	716
		JET EXECUTIVE INTERNATIONAL	310
	JI	JET EXPRESS	878
	8J	JETALL	662
	DK	KAMPUCHEA AIRLINES	
	KR	KARAIR	261
	6K	KEEWATIN AIR	157
	KD	KENDELL AIRLINES	678
	5K	KENMORE AIR	
	4K	KENN BOREK AIR	652
	KQ	KENYA AIRWAYS	706
	6S	KETCHIKAN AIR SERVICE	469
	HE	KEYSTONE AIR SERVICE	921
		KING ISLAND AIRLINES	
	2K	KITTY HAWK AIRWAYS (CARGO)	352
	KL	KLM CITYHOPPER (KLM COMMUTER)	
KLM	KL	KLM ROYAL DUTCH AIRLINES	074
KAL	KE	KOREAN AIR	180
	2Y	KOYUKON AIR	
KAC	KU	KUWAIT AIRWAYS	229
	KH	KYRNAIR	
	JF	L.A.B. FLYING SERVICE	510
	7J	L.A.P.S.A	213
LAB		LAB AIRLINES	
	WJ	LABRADOR AIRWAYS	927
	LR	LACSA	133
	LD	LADE (LINEAS AER DEL ESTADO)	177
	UC	LADECO	145
		LAKE UNION AIR	461
	7L	LAKE UNION AIR SERVICE	461
	TM	LAM-LINHAS AEREAS MOCAMBIQUE	068
	LA	LAN-CHILE	045
	QV	LAO AVIATION	627
	PZ	LAP(LINEAS AEREAS PARAGUAYAS)	705
	MJ	LAPA	069
	TH	LAR TRANSREGIONAL	259
	7K	LARRY'S FLYING SERVICE	
	TQ	LAS VEGAS AIRWAYS	540
	NG	LAUDA AIR	231
	LV	LAV LINEA AERO VENEZOLANA	046
	QL	LESOTHO AIRWAYS	721
	4X	L'EXPRESS AIRLINES	534
	LI	LIAT	140

3 Digit Code	2 Digit Code	Name	Ticketing Code
	QB	LIGNES AERIENNES INTER-QUEBEC	968
	GC	LINA CONGO	246
	RT	LINCOLN AIRLINES	
	LC	LINEAS AER DEL CARIBE (CARGO)	029
	LF	LINJEFLYG	247
	JK	LINK AIRWAYS	
	LE	LINK AIRWAYS (SOUTH AFRICA)	600
		LINK AMERICA (CARGO)	474
LAL	TE	LITHUANIAN AIRLINES	
LLB	LB	LLOYD AEREO BOLIVIANO	051
LOG	LC	LOGANAIR	122
		LOKEN AVIATION INC	
	YL	LONG ISLAND AIRLINES LTD	443
LOT	LO	LOT POLISH AIRLINES	080
	L2	LOVE AIR	
	LT	LTU INTERNATIONAL AIRWAYS	266
LTE		LUFTANSA TRANS ESPANA	
	LG	LUXAIR LUXEMBOURG AIRLINES	149
	CD	M.K. AIRLINES	
	3R	MACAIR	812
	MT	MACKNIGHT AIRLINES	
DMA	DM	MAERSK AIR (DANISH AIRLINES)	349
	2J	MAJESTIC AIRLINES (CARGO)	
		MAKUNG AIRLINES	
MAS	MH	MALAYSIA AIRLINES	232
MAH	MA	MALEV HUNGARIAN AIRLINES	182
	FH	MALI AIRWAYS	
	HB	MALI-TINBOUCTOU AIR SERVICE	679
	6E	MALMO AVIATION	984
MXE	JE	MANX AIRLINES INC.	916
	BF	MARKAIR	478
	MP	MARTINAIR HOLLAND NV	
	MW	MAYA AIRWAYS	
	IG	MERIDIANA	191
	MZ	MERPATI NUSANTARA AIRLINES	621
	YV	MESA AIRLINES	533
	XJ	MESABA AIRLINES	582
		METAVIA AIRLINES	873
		METHOW AVIATION	519
	HY	METRO AIRLINES	380
		METRO AIRLINES NORTHEAST	450
		METRO EXPRESS	887
	FY	METROFLIGHT AIRLINES	
	MG	MGM GRAND AIR	558
		MICHIGAN PENINSULA AIRWAYS	574
MEA	ME	MIDDLE EAST AIRLINES	076
	ML	MIDWAY AIRLINES	557
	WV	MIDWEST AVIATION	896
	YX	MIDWEST EXPRESS AIRLINES	453
		MILLON AIR (CARGO)	034
	IW	MINERVE	646
		MISR. OVERSEAS AIRWAYS (CARGO)	931
	FS	MISSIONARY AVIATION FELLOWSHIP	
	ZO	MOHAWK AIRLINES	390
MON	ZB	MONARCH AIRLINES	974
		MONTAIR FLIGHT SERVICE	319
MNT		MONTERRAT AIRWAYS	
	NM	MOUNT COOK LINE OF NEW ZEALAND	445
	ZR	MUK AIR	796
	UB	MYANMA AIRWAYS CORPORATION	209
	JO	N.V LUCHTVAARTMAATSCHAPPIJ TWN	



3 Digit Code	2 Digit Code	Name	Ticketing Code
	NJ	NAMAKWALAND LUGDIENS	
	DV	NANTUCKET AIRLINES	
		NASA SOYUZ AVIATION (CARGO)	
	8N	NASHVILLE EAGLE	
	HC	NASKE AIR	
NXA	NX	NATIONAIR CANADA	151
	YJ	NATIONAL AIRLINES	
	9L	NATIONAL CAPITAL AIRWAYS	426
	XV	NATURE ISLAND EXPRESS	
	EJ	NEW ENGLAND AIRLINES	367
	HD	NEW YORK HELICOPTER CORP	814
	WA	NEWAIR	797
		NEWFOUNDLAND/LABRADOR AIR TRAN	645
	NS	NFD LUFTVERKEHRS	104
NGA	WT	NIGERIA AIRWAYS	087
	KZ	NIPPON CARGO AIRLINES	933
	FN	NIUE AIRLINES	
	HN	NLM DUTCH AIRLINES	195
	HK	NOBLE AIR	
		NORCANAIR	
	JH	NORDESTA LINHAS AER REG	
	EO	NORDIC & SWEDEN AIRWAYS	650
	UI	NORLANDAIR (ICELAND)	
	NR	NORONTAIR	066
	NC	NORSKAIR	665
		NORTH CROSS AIRWAYS	
	5N	NORTHCOAST EXECUTIVE AIRLINES	497
	2V	NORTHEAST EXPRESS REGIONAL	463
		NORTHERN AIR CARGO (CARGO)	345
	RU	NORTHERN COMMUTER AIRLINES	
NWA	NW	NORTHWEST AIRLINES	012
	NV	NORTHWEST TERRITORIAL AIRWAYS	668
	3E	NORTHWESTERN AIR LEASE	
	HW	NORTH-WRIGHT AIR	
	JA	NORWAY AIRLINES	
	6N	NUNASI-NORTHLAND AIRLINES	
	LP	NYGE-AERO	
AAN		OASIS INTERNATIONAL AIRLINES	
	5H	ODIN AIR	
	4B	OLSON AIR SERVICE	
	OL	OLT OSTFRIESISCHE LUFTRANSPORT	704
OAL	OA	OLYMPIC AIRWAYS	050
	WY	OMAN AVIATION SERVICES	910
	9X	ONTARIO EXPRESS	940
	VQ	OXLEY AIRLINES	
	RI	P.T MANDALA AIRLINES	
		PACIFIC AIRLINES	
	PQ	PACIFIC COAST AIRLINES	561
	8P	PACIFIC COASTAL AIRLINES	905
	2W	PACIFIC MIDLAND AIRLINES	763
PIA	PK	PAKISTAN INT AIRLINE	214
PAF		PANAF AIRWAYS (CHARTER)	
		PANAMA AIRWAYS	421
	PV	PANORAMA AIR	311
	HI	PAPILLON AIRWAYS	563
PGT		PEGASUS AIRLINES	
	9P	PELANGI AIR	
	PD	PEM AIR	329
	KS	PENINSULA AIRWAYS	339
		PENNSYLVANIA AIRLINES	395
	4P	PEOPLES AIR	906

3 Digit Code	2 Digit Code	Name	Ticketing Code
	UW	PERIMETER AIRLINES	711
PAL	PR	PHILIPPINE AIRLINES	079
	NP	PICCOLO AIRLINES	
	PU	PLUNA URUGUAYIAN AIRLINES	286
	WO	POLARWING	
	PH	POLYNESIAN AIRLINES	162
	NI	PORTUGALIA	685
	2P	PRAIRIE FLYING SERVICE	094
	RP	PRECISION AIRLINES	544
		PREMIERE AIRLINES	350
		PRIME AIR	514
	FB	PROMAIR AUSTRALIA	
	YS	PROTEUS	
	AG	PROVINCIAL AIRWAYS	967
	PE	PROVINCIAL AIR SERVICES	
	5P	PTARMIGAN AIRWAYS	697
QFA	QF	QANTAS AIRWAYS	081
		QUEBEC AVIATION	911
	QJ	QUEENSLAND PACIFIC AIRLINES	
	QH	QWESTAIR	
		RACE CARGO AIRLINES	765
	4R	RAVEN AIR	
	7R	REDWING AIRWAYS	594
	RV	REEVE ALEUTIAN AIRWAYS	338
	7S	REGION AIR	
		RENTA-JET FLUGDIENST	
		RFG-REGIONALFLUG	637
	WE	RHEINTALFLUG SEEWALD	915
	6R	RICHARDS AVIATION (CARGO)	552
	SL	RIO-SUL SERVICOS AEREO REGION	293
	IK	ROADAIR FEEDER SERVICE	
	JC	ROCKY MOUNTAIN AIRWAYS	428
	ZD	ROSS AVIATION	
	WI	ROTTNEST AIRBUS	
	5R	ROVER AIRWAYS (CARGO)	376
	RR	ROYAL AIR FORCE	
	AT	ROYAL AIR MAROC	147
	BI	ROYAL BRUNEI AIRLINES	672
RJA	RJ	ROYAL JORDANIAN AIRLINE	512
RNA	RA	ROYAL NEPAL AIRLINES	285
	ZC	ROYAL SWAZI NATIONAL AIRWAYS	141
		RWL-LUFTFAHRT GMBH & CO	801
	XY	RYAN AIR (ALASKA)	251
RYR	FR	RYANAIR	224
		S.A.R. AVIONS TAXIS	
	ZG	SABAIR AIRLINES	
SAB	SN	SABENA WORLD AIRLINES	082
		SABER AVIATION (CARGO)	854
	9S	SABOURIN LAKE AIRWAYS	
	EH	SAETA	156
	KP	SAFAIR	103
	SH	SAHSA	274
	8S	SALAIR (CARGO)	477
	YD	SALAIR AB	947
	TS	SAMOA AVIATION	
	WB	SAN	739
	BB	SANSA	907
	UF	SARO AIRLINES	
	SP	SATA AIA ACORES	737
	ZT	SATENA	
SVA	SV	SAUDI ARABIAN	065

3 Digit Code	2 Digit Code	Name	Ticketing Code
SAS	SK	SCANDINAVIAN AIRLINES	117
	SY	SCANJET	
	YR	SCENIC AIRLINES	398
	ZM	SCIBE AIRLIFT	939
	WW	SCOTTISH EUROPEAN AIRWAYS	626
		SEAGREEN AIR TRANSPORT	308
	RW	SEAIR PACIFIC	
	XT	SECTOR AIRLINES (CARGO)	987
		SERVICE AERIEN FRANCAIS	
	8L	SERVICIO AEREO LEO LOPEZ	
	2Z	SERVICIOS AEREOS LITORAL	642
		SERVICIOS DE CARGA AEREA	641
	VC	SERVIVENSA	985
	SS	SHABAIR	
	NL	SHAHEEN AIR INTERNATIONAL	740
	3S	SHUSWAP FLIGHT CENTRE	
		SIERRA PACIFIC AIRLINES	
		SIGI AIR CARGO COMPANY	714
	MI	SILKAIR	
	MQ	SIMMONS AIRLINES	
	7B	SIMPSON AIR	166
	SQ	SINGAPORE AIRLINES	618
	5U	SKAGWAY AIR SERVICE	
	OO	SKY WEST AIRLINES	302
	9F	SKYCRAFT AIR TRANSPORT	973
	8M	SKYMASTER	581
	YT	SKYWEST AIRLINES	674
	HU	SLOV-AIR	
	MM	SOCIEDAD AERONAUTICA MEDELLIN	334
	IE	SOLOMON ISLANDS AIRLINES	193
	HH	SOMALI AIRLINES	089
SAA	SA	SOUTH AFRICAN AIRWAYS	083
	XE	SOUTH CENTRAL AIR	301
	SG	SOUTHEAST AIRLINES LIMITED	
		SOUTHERN AIR	
	SJ	SOUTHERN AIR TRANSPORT (CARGO)	351
	NU	SOUTHWEST AIRLINES (JAPAN)	353
	WN	SOUTHWEST AIRLINES (U.S.A.)	526
SPP		SPAN AIR	
	YW	STATESWEST AIRLINES	454
	NB	STERLING AIRWAYS	194
SAY	CB	SUCKLING AIRWAYS	969
	SD	SUDAN AIRWAYS	200
		SULTAN AIR (CHARTER)	
		SUMO AIRLINES (CARGO)	541
	VL	SUN PACIFIC AIRLINES	
	EZ	SUN-AIR OF SCANDINAVIA	
SMB		SUNBEAM AIRLINE (CHARTER)	
	PI	SUNFLOWER AIRLINES	252
	OC	SUNSHINE AVIATION	938
	OF	SUNSTATE AIRLINES	620
	PY	SURINAM AIRWAYS	192
	JG	SWEDAIR	616
SWR	SR	SWISSAIR TRANSPORT COMPANY	085
	FD	SYDNEY AIRLINES	
	RB	SYRIAN ARAB AIRLINES	070
	EQ	T.A.M.E.	269
	DT	TAAG ANGOLA AIRLINES	118
	TA	TACA INTERNATIONAL AIRLINES	202
	CQ	TAHITI CONQUEST AIRLINES	
		TAIWAN AIRLINES COMPANY	710

3 Digit Code	2 Digit Code	Name	Ticketing Code
	GV	TALAIR	447
	KK	TAM	
	QT	TAMPA AIRLINES (CARGO)	729
	TX	TAN AIRLINES	208
	4E	TANANA AIR SERVICE	
TAP	TP	TAP AIR PORTUGAL	047
	9Q	TAQUAN AIR SERVICE	
	RO	TAROM ROMANIAN AIR TRANSPORT	281
	TJ	TAS AIRWAYS S.P.A	667
	3K	TATONDUK AIR SERVICE	
	QS	TATRA AIR	904
		TEDDY AIR	
	CL	TEMPLEHOF AIRWAYS U.S.A.	175
	KN	TEMSCO HELICOPTERS	876
	TG	THAI AIRWAYS INTERNATIONAL	217
	LU	THERON AIRWAYS	
TRS		TIA	
		TIKAL JETS (CARGO)	489
		TIME AIR SWEDEN	
		TNT SAVA S.A.	849
	AB	TORRES AIR	
TUR		TOUR EUROPE (CHARTER)	
TOW	NC	TOWER AIR	305
		TPI INTER. AIRWAYS (CARGO)	587
		TRANS AIR	499
		TRANS ARABIAN AIR TRANS(CARGO)	
	YB	TRANS CONTINENTAL A/L (CARGO)	837
	7T	TRANS COTE	
TEI		TRANS EUROPEAN AIR (CHARTER)	
		TRANS EUROPEAN AIRWAYS (CHART)	
	JQ	TRANS JAMAICAN AIRLINES	100
	TL	TRANS MEDITERRAREAN AIR(CARGO)	270
	4Q	TRANS NORTH AVIATION	
	9N	TRANS STATES AIRLINES	414
TWA	TW	TRANS WORLD AIRLINES	015
		TRANS-AIR-LINK (CARGO)	348
TRA	HV	TRANSAVIA AIRLINES	979
	TD	TRANSAVIO	
	TR	TRANSBRASIL S/A LINHAS AEREAS	653
		TRANSCARGO (CARGO)	978
	KV	TRANSKEI AIRWAYS	264
	IO	TRANSPORT AERIEN TRANS EXPORT	153
	IJ	TRANSPORT AERIEN TRANSREGIONAL	936
		TRANSPORT AIR CENTRE	203
	VR	TRANSPORTES AEREOS CABO VERDE	696
	GD	TRANSPORTES AEREOS EJECUTIVOS	838
	VW	TRANSPORTES AEROMAR	942
	YZ	TRANSPORTES DE GUINE BISSAU	241
	8T	TRAVELAIR	
	BW	TRINIDAD & TOBAGO BWIA INT	106
	PM	TROPIC AIR	
	BN	TROPICAL SEA AIRLINES	922
	TB	TRUMP SHUTTLE	857
	UG	TUNINTER	
	TU	TUNIS AIR	199
	TT	TUNISAVIA	720
		TURK HAVA TASIMACILIGI	929
	TK	TURKISH AIRLINES	235
	KT	TURTLE AIRWAYS	
	6T	TYEE AIRWAYS	
	VO	TYROLEAN AIRWAYS	734

3 Digit Code	2 Digit Code	Name	Ticketing Code
UGA	QU	UGANDA AIRLINES CORPORATION	673
	PS	UKRAINE INTERNATIONAL AIRLINES	
UAL	UA	UNITED AIRLINES	016
	5X	UNITED PARCEL SERVICE (CARGO)	406
	9U	UNIVERSAL AIRLINES (CARGO)	598
		US EXPRESS (CARGO)	
	US	USAIR	037
	UT	UTA	142
		VALLEY AIR SERVICES INC	482
	J7	Valuejet	
	5J	VALUJET	
BRG	RG	VARIG BRAZILIAN AIRLINES	042
	VP	VASP	343
	PF	VAYUDOOT	925
VIA	VA	VENEZUELAN INTL AIRWAYS	164
	VI	VIEQUES AIR LINK	381
	ZP	VIRGIN AIR	315
VIR	VS	VIRGIN ATLANTIC AIRWAYS	932
	FV	VIVA AIR	728
	4V	VOYAGEUR AIRWAYS	908
	3V	WAGLISLA AIR	
	XW	WALKERS CAY AIRLINE	360
		WALLISAIR	
	4W	WARBELOW'S AIR VENTURES	
	KY	WATERWINGS AIRWAYS (TE ANAU)	914
	KJ	WEST AIR EXECUTIVE	
	3L	WEST ISLE AIR	
	OE	WESTAIR COMMUTER AIRLINES	460
	WS	WESTATES AIRLINES	573
	MB	WESTERN AIRLINES	
	FO	WESTERN NEW SOUTH WALES AIR	
		WESTPAC AIRLINES (CARGO)	
	WF	WIDEROE'S FLYVESELSKAP	701
	8F	WILBURS FLIGHT OPERATIONS	442
	6W	WILDERNESS AIRLINE (1975)	
	WM	WINDWARD ISLANDS AIRWAYS	295
	WQ	WINGS AIRWAYS	842
	SE	WINGS OF ALASKA	397
	RM	WINGS WEST AIRLINES	
		WORLD AIRWAYS (CHARTER)	
	WG	WORLDWAYS CANADA LTD	
	8R	WRA	393
		WRANGLER AVIATION (CARGO)	490
	8V	WRIGHT AIR SERVICE	
	MF	XIAMEN AIRLINES	
	XO	XINJIANG AIRLINES	
	ST	YANDA AIRLINES	
IYE	IY	YEMEN AIRWAYS	635
	9Y	YUTANA AIRLINES	
	4Y	YUTE AIR ALASKA	476
ZAC	QZ	ZAMBIA AIRWAYS	169
		ZANTOP INT AIRLINES (CARGO)	391
	ZA	ZAS AIRLINES OF EGYPT	708
	OD	ZULIANA DE AVIACION (CARGO)	822

### Occupant Codes for Airline Tenants

The \$ symbol is used as a placeholder in order to conform to the aforementioned layering convention.

Airline	Y - designation
Air Ghana	\$GH
Air Jamaica	\$JM
Aer Lingus	\$EI
Air Mobility Command	\$MC
Air Ontario/Air Canada	\$AC
American Airlines	\$AA
America West	\$HP
British Airways	\$BA
Continental Airlines	\$CO
Delta Airlines	\$DL
Frontier Airlines	\$F9
Icelandair	\$FI
Northwest Airlines	\$NW
Pro Air	\$P9
Ryan Int'l Airlines	\$XY
Trans World Airlines	\$TW
United Airlines	\$UA
US Airways	\$US
MetroJet	USM
Southwest Airlines	L\$WN

### Occupant Codes for Other Tenants

Baltimore/Washington International Airport lessees and their corresponding layer codes.

Y - designation	Company
AEX	A-1 Express
AGR	United States Department of Agriculture
ALA	Alamo Rent-a-Car
ARC	Arinc
AVS	Avis Car Rental
BUD	Budget Car Rental
CEX	Currency Exchange
CHM	Chimes
CMD	Celebrate Maryland
CUS	U.S. Customs
DEA	Drug Enforcement Agency
DOL	Dollar Car Rental
DUT	Duty Free
MAA	Federal Aviation Administration
GLO	Globe Airport Security
HNT	Huntleigh
HTZ	Host International, Inc.
INS	Herb Car Rental
HST	Immigration and Naturalization Service

Y - designation	Company
ITS	International Total Services, Inc.
LHD	Lockheed
MAA	Maryland Aviation Administration
MAA	Millar Elevator (MAA)
MAS	Service Master
MTA	Maryland Transportation Authority Police
NAT	National Car Rental
PHS	Public Health Service
SIG	Signature Flight Support, Inc.
SKY	Sky Sites
SMT	SmarteCarte
SUS	Super Shuttle
TRX	Travelex
TRA	Travelers Aid Society
USM	U.S. Mail
USO	USO
VAC	Vacant
WAC	Wackenhut Security Services

**Usage Codes for Layering Convention**

<b>Z-Designation</b>	<b>Description</b>	<b>Patterned Hatch</b>	<b>Scale/Angle</b>
DR	Directory	-none-	-
FB	Food and beverages (retail)	CROSS	96/0°
FD	flight information directory	- none -	-
HR	holdroom	DASH	00/45°
LS	lighted sign	- none -	-
MS	Merchandising space (retail)	STARS	50/0°
ON	office, no public	ANS136	100/0°
OP	office, public access	ANS133	100/90°
PM	Public meeting/lounge	ACRD.IS014W100	3/315°
PS	public stairs	ANS134	50/90°
PL	public elevator	- none -	-
PE	public escalator	SACNCR	200/90°
PC	public corridor	- none -	-
PC	restricted corridor	ANGLE	60/45°
PT	public telephones	- none -	-
RR	restroom	AN S132	50/90°
SF	special, finished	- matches usage -	
SU	special, unfinished	ANS138	120/0°
SC	security checkpoint	ANS137	150/0°
SS	Special, storage	ANS138	120/0°
TC	ticket counter	ANS131	100/0°
UM	utility, mechanical	SQUARE	100/0°
UE	utility, electrical	ZIGZAG	100/0°
UT	utility, telecommunications	TRIANG	100/90°
VP	visual paging	- none -	

# APPENDIX C

## GLOSSARY

A2.....Glossary of Acronyms for Use in Airport Documents



### Glossary of Acronyms for Use in Airport Documents

-A-	
A/C -Aircraft	ARINC -Aeronautical Radio, Inc.
A/H -Altitude/Height	A/G -Air to Ground
AAF -Army Air Field	AAC -Mike Monroney Aeronautical Center
AAP -Advanced Automation Program	AAI -Arrival Aircraft Interval
ABDIS -Automated Data Interchange System Service B	AAR -Airport Acceptance Rate
ACAS -Aircraft Collision Avoidance System	ACAIS -Air Carrier Activity Information System
ACCT -Accounting Records	ACC -Area Control Center
ACDO -Air Carrier District Office	ACD -Automatic Call Distributor
ACFO -Aircraft Certification Field Office	ACF -Area Control Facility
ACID -Aircraft Identification	ACFT -Aircraft
ACLT -Actual Landing Time Calculated	ACLS -Automatic Carrier Landing System
ADA -Air Defense Area	ACO -Aircraft Certification Office
ADAS -AWOS Data Acquisition System	ADAP -Airport Development Aid Program
ADDA -Administrative Data	ADCCP -Advanced Data Communications Control Procedure
ADI -Automatic De-Ice and Inhibitor	ADF -Automatic Direction Finding
ADIZ -Air Defense Identification Zone	ADIN -AUTODIN Service
ADLY -Arrival Delay	ADL -Aeronautical Data-Link
ADP -Automated Data Processing	ADO -Airline Dispatch Office
ADSIM -Airfield Delay Simulation Model	ADS -Automatic Dependent Surveillance
ADTN -Administrative Data Transmission Network	ADSY -Administrative Equipment Systems
ADVO -Administrative Voice	ADTN2000 -Administrative Data Transmission Network 2000
AEIS - Airport Engineering Information System	AEG -Aircraft Evaluation Group
AERA -Automated En-Route Air Traffic Control	AEX -Automated Execution
AF -Airway Facilities	AFB -Air Force Base
AFIS -Automated Flight Inspection System	AFP -Area Flight Plan
AFRES -Air Force Reserve Station	AFS -Airways Facilities Sector
AFSFO -AFS Field Office	AFSFU -AFS Field Unit
AFSOU -AFS Field Office Unit (Standard is AFSFOU)	AFSS -Automated Flight Service Station
AFTN -Automated Fixed Telecommunications Network	AGL -Above Ground Level
AID -Airport Information Desk	AIG -Airbus Industries Group
AIM -Airman's Information Manual	AIP -Airport Improvement Plan
AIRMET -Airmen's Meteorological Information	AIRNET -Airport Network Simulation Model
AIS -Aeronautical Information Service	AIT -Automated Information Transfer
ALP -Airport Layout Plan	ALS -Approach Lighting System
ALSF1 -ALS with Sequenced Flashers I	ALSF2 -ALS with Sequenced Flashers II
ALSIP -Approach Lighting System Improvement Plan	ALTRV -Altitude Reservation
AMASS -Airport Movement Area Safety System	AMCC -ACF/ARTCC Maintenance Control Center
AMOS -Automated Meteorological Observation Station	AMP -ARINC Message Processor (OR) Airport Master Plan
AMVER -Automated Mutual Assistance Vessel Rescue System	ANC -Alternate Network Connectivity
ANG -Air National Guard	ANGB -Air National Guard Base
ANMS -Automated Network Monitoring System	ANSI -American National Standards Group
AP -Acquisition Plan	APP -Approach
APS -Airport Planning Standard	AQAFO -Aeronautical Quality Assurance Field Office
ARAC -Army Radar Approach Control (AAF)	ARAC -Aviation Rulemaking Advisory Committee
ARCTR -FAA Aeronautical Center or Academy	ARF -Airport Reservation Function
ARLNO -Airline Office ARO -Airport Reservation Office	AWS -Air Weather Station
ARO -Airport Reservation Office	ARP -Airport Reference Point
ARSA -Airport Service Radar Area	ARSR -Air Route Surveillance Radar
ARTCC -Air Route Traffic Control Centre	ARTS -Automated Radar Terminal System
ASAS -Aviation Safety Analysis System	ASC -AUTODIN Switching Center
ASCP -Aviation System Capacity Plan	ASD -Aircraft Situation Display
ASDA -Accelerate - Stop Distance Available	ASLAR -Aircraft Surge Launch And Recovery
ASM -Available Seat Mile	ASP -Arrival Sequencing Program
ASOS -Automatic Surface Observation System	ASQP -Airline Service Quality Performance
ASR -Airport Surveillance Radar	ASTA -Airport Surface Traffic Automation

ASV -Airline Schedule Vendor	AT -Air Traffic
ATA -Air Transport Association of America	ATAS -Airspace and Traffic Advisory Service
ATCAA -Air Traffic Control Assigned Airspace	AT&T -American Telephone and Telegraph
AT&T ASDC -AT&T Agency Service Delivery Center	AT&T CSA -AT&T Customer Support Associate
ATC -Air Traffic Control	ATCBI -Air Traffic Control Beacon Indicator
ATCCC -Air Traffic Control Command Center	ATCO -Air Taxi Commercial Operator
ATCRB -Air Traffic Control Radar Beacon	ATCRBS -Air Traffic Control Radar Beacon System
ATCSCC -Air Traffic Control Systems Command Center	ATCT -Airport Traffic Control Tower
ATIS -Automated Terminal Information Service	ATISR -ATIS Recorder
ATM -Air Traffic Management	ATM -Asynchronous Transfer Mode
ATMS -Advanced Traffic Management System	ATN -Aeronautical Telecommunications Network
ATODN -AUTODIN Terminal (FUS)	ATOVN -AUOTVON (Facility)
ATOMS -Air Traffic Operations Management System	ATS -Air Traffic Service
ATSCCP -ATS Contingency Command Post	ATTIS -AT&T Information Systems
AUTODIN -DoD Automatic Digital Network	AUTOVON -DoD Automatic Voice Network
AVON -AUTOVON Service	AVN -Aviation Standards National Field Office, Oklahoma City
AWIS -Airport Weather Information	AWOS -Automated Weather Observation System
AWP -Aviation Weather Processor	AWPG -Aviation Weather Products Generator
<b>-B-</b>	
BANS-BRITE Alphanumeric System	BART -Billing Analysis Reporting Tool (GSA software tool)
BASIC -Basic Contract Observing Station	BASOP -Military Base Operations
BCA -Benefit/Cost Analysis	BCR -Benefit/Cost Ratio
BDAT -Digitized Beacon Data	BMP -Best Management Practices
BOC -Bell Operating Company	bps -bits per second
BRI -Basic Rate Interface	BRITE -Bright Radar Indicator Terminal Equipment
BRL -Building Restriction Line	BUEC -Back-up Emergency Communications
BUECE -Back-up Emergency Communications Equipment	
<b>-C-</b>	
CAA -Civil Aviation Authority	CAB -Civil Aeronautics Board
CARF -Central Altitude Reservation Facility	CASFO -Civil Aviation Security Office
CAT -Category	CAT -Clear - Air Turbulence
CAU -Crypto Ancillary Unit	CBI -Computer Based Instruction
CCC -Communications Command Center	CCCC -Staff Communications
CCCH -Central Computer Complex Host	CC&O -Customer Cost and Obligation
CCSD -Command Communications Service Designator	CCS7-NI -Communication Channel Signal-7 - Network Interconnect
CCU -Central Control Unit	CD -Common Digitizer
CDR -Cost Detail Report	CDT -Controlled Departure Time
CDTI -Cockpit Display of Traffic Information	CENTX -Central Telephone Exchange
CEQ -Council on Environmental Quality	CERAP -Central Radar Approach
CFC -Central Flow Control	CFCF -Central Flow Control Facility
CFCFS -Central Flow Control Service	CFWP -Central Flow Weather Processor
CFWU -Central Flow Weather Unit	CGAS -Coast Guard Air Station
CLC -Course Line Computer	CLIN -Contract Line Item
CLT -Calculated Landing Time	CM -Commercial Service Airport
CNMPS -Canadian Minimum Navigation Performance Specification Airspace	CNS -Consolidated NOTAM System
CNSP -Consolidated NOTAM System Processor	CO -Central Office
COE -U.S. Army Corps of Engineers	COMCO -Command Communications Outlet
CONUS -Continental United States	CORP -Private Corporation other than ARINC or MITRE
CPE -Customer Premise Equipment	CPMIS -Consolidated Personnel Management Information System
CRA -Conflict Resolution Advisory	CRDA -Converging Runway Display Aid
CRT -Cathode Ray Tube	CSA -Communications Service Authorization
CSIS -Centralized Storm Information System	CSO -Customer Service Office
CSR -Communications Service Request	CSS -Central Site System
CTA -Controlled Time of Arrival	CTA -Control Area
CTA/FIR -Control Area/Flight Information Region	CTAF -Common Traffic Advisory Frequency
CTAS -Center - Tracon Automation System	CTMA -Center Traffic Management Advisor
CUPS -Consolidated Uniform Payroll System	CVFR -Controlled Visual Flight Rules
CVTS -Compressed Video Transmission Service	CW -Continuous Wave

CWSU -Central Weather Service Unit	CWY -Clearway
<b>-D-</b>	
DA-Direct Access	DA -Decision Altitude/Decision Height
DA -Descent Advisor	DABBS -DITCO Automated Bulletin Board System
DAIR -Direct Altitude and Identity Readout	DAR -Designated Agency Representative
DARC -Direct Access Radar Channel	dBA -Decibels A-weighted
DBCRC -Defense Base Closure and Realignment Commission	DBMS -Data Base Management System
DBRITE -Digital Bright Radar Indicator Tower Equipment	DCA -Defense Communications Agency
DCAA -Dual Call, Automatic Answer Device	DCCU -Data Communications Control Unit
DCE -Data Communications Equipment	DDA -Dedicated Digital Access
DDD -Direct Distance Dialing	DDM -Difference in Depth of Modulation
DDS -Digital Data Service	DEA -Drug Enforcement Agency
DEDS -Data Entry and Display System	DEIS -Draft Environmental Impact Statement
DEP -Departure	DEWIZ -Distance Early Warning Identification Zone
DF -Direction Finder	DFAX -Digital Facsimile
DFI -Direction Finding Indicator	DGPS -Differential Global Positioning Satellite (System)
DH -Decision Height	DID -Direct Inward Dial
DIP -Drop and Insert Point	DIRF -Direction Finding
DITCO -Defense Information Technology Contracting Office Agency	DME -Distance Measuring Equipment
DME/P -Precision Distance Measuring Equipment	DMN -Data Multiplexing Network
DNL -Day-Night Equivalent Sound Level (Also called Ldn)	DOD -Direct Outward Dial
DoD -Department of Defense	DOI -Department of Interior
DOS -Department of State	DOT -Department of Transportation
DOTS -Dynamic Ocean Tracking System	DOTCC -Department of Transportation Computer Center
DSCS -Digital Satellite Compression Service	DSUA -Dynamic Special Use Airspace
DTS -Dedicated Transmission Service	DUAT -Direct User Access Terminal
DVFR -Defense Visual Flight Rules	DVFR -Day Visual Flight Rules
DVOR -Doppler Very High Frequency Omni-Directional Range	DYSIM -Dynamic Simulator
<b>-E-</b>	
E-MSAW -En-Route Automated Minimum Safe Altitude Warning	EARTS -En Route Automated Radar Tracking System
ECOM -En Route Communications	ECVFP -Expanded Charted Visual Flight Procedures
EDCT -Expedite Departure Path	EFAS -En Route Flight Advisory Service
EFC -Expect Further Clearance	EFIS -Electronic Flight Information Systems
EIAF -Expanded Inward Access Features	EIS - Environmental Impact Statement
ELT -Emergency Locator Transmitter	ELWRT -Electrowriter
EMPS -En Route Maintenance Processor System	ENAV -En Route Navigational Aids
EPA -Environmental Protection Agency	EPS -Engineered Performance Standards
EOF -Emergency Operating Facility	EPSS -Enhanced Packet Switched Service
ERAD -En Route Broadband Radar	ESEC -En Route Broadband Secondary Radar
ESP -En Route Spacing Program	ESYS -En Route Equipment Systems
ESF -Extended Superframe Format	ETA -Estimated Time of Arrival
ETE -Estimated Time En Route	ETG -Enhanced Target Generator
ETMS -Enhanced Traffic Management System	ETN -Electronic Telecommunications Network
EVAS -Enhanced Vortex Advisory System	EVCS -Emergency Voice Communications System
<b>-F-</b>	
FAA-Federal Aviation Administration	F&E -Facility and Equipment
FAAAC -FAA Aeronautical Center	FAACIS -FAA Communications Information System
FAATC -FAA Technical Center	FAC -Facility
FAF -Final Approach Fix	FAP -Final Approach Point
FAPM -FTS2000 Associate Program Manager	FAR -Federal Aviation Regulation
FAATSAT -FAA Telecommunications Satellite	FAST -Final Approach Spacing Tool
FAX -Facsimile Equipment	FBO -Fixed Base Operator
FBS -Fall Back Switch	FCC -Federal Communications Commission
FCLT -Freeze Calculated Landing Time	FCOM -FSS Radio Voice Communications
FCPU -Facility Central Processing Unit	FDAT -Flight Data Entry and Printout (FDEP) and Flight Data Service
FDE -Flight Data Entry	FDEP -Flight Data Entry and Printout

FDIO -Flight Data Input/Output	FDIOC -Flight Data Input/Output Center
FDIOR -Flight Data Input/Output Remote	FDM -Frequency Division Multiplexing
FDP -Flight Data Processing	FED -Federal
FEIS -Final Environmental Impact Statement	FEP -Front End Processor
FFAC -From Facility	FIFO -Flight Inspection Field Office
FIG -Flight Inspection Group	FINO -Flight Inspection National Field Office
FIPS -Federal Information Publication Standard	FIR -Flight Information Region
FIRE -Fire Station	FIRMR -Federal Information Resource Management Regulation
FL -Flight Level	FLOWSIM -Traffic Flow Planning Simulation
FMA -Final Monitor Aid	FMF -Facility Master File
FMIS -FTS2000 Management Information System	FMS -Flight management System
FNMS -FTS2000 Network Management System	FOIA -Freedom Of Information Act
FP -Flight Plan	FRC -Request Full Route Clearance
FSAS -Flight Service Automation System	FSDO -Flight Standards District Office
FSDPS -Flight Service Data Processing System	FSEP -Facility/Service/Equipment Profile
FSP -Flight Strip Printer	FSPD -Freeze Speed Parameter
FSS -Flight Service Station	FSSA -Flight Service Station Automated Service
FSTS -Federal Secure Telephone Service	FSYS -Flight Service Station Equipment Systems
FTS -Federal Telecommunications System	FTS2000 -Federal Telecommunications System 2000
FUS -Functional Units or Systems	FWCS -Flight Watch Control Station
<b>-G-</b>	
GA-General Aviation	GAA -General Aviation Activity
GAAA -General Aviation Activity and Avionics	GADO -General Aviation District Office
GCA -Ground Control Approach	GNAS -General National Airspace System
GNSS -Global Navigation Satellite System	GOES -Geostationary Operational Environmental Satellite
GOESF -GOES Feed Point	GOEST -GOES Terminal Equipment
GPS -Global Positioning Satellite	GPWS -Ground Proximity Warning System
GRADE -Graphical Airspace Design Environment	GS -Glide Slope Indicator
GSA -General Services Administration	
<b>-H-</b>	
H-Non-Directional Radio Homing Beacon (NDB)	HAA -Height Above Airport
HAL -Height Above Landing	HARS -High Altitude Route System
HAT -Height Above Touchdown	HAZMAT -Hazardous Materials
HCAP -High Capacity Carriers	HLDC -High Level Data Link Control
HDME -NDB with Distance Measuring Equipment	HDQ -FAA Headquarters
HELI -Heliport	HF -High Frequency
HH -NDB, 2kw or More	HI-EFAS -High Altitude EFAS
HOV -High Occupancy Vehicle	HSI -Horizontal Situation Indicators
HUD -Housing and Urban Development	HWAS -Hazardous In-Flight Weather Advisory
Hz -HERTZ	
<b>-I-</b>	
IA-Indirect Access	IAF -Initial Approach Fix
I/AFSS -International AFSS	IAP -Instrument Approach Procedures
IAPA -Instrument Approach Procedures Automation	IBM -International Business Machines
IBP -International Boundary Point	IBR -Intermediate Bit Rate
ICAO -International Civil Aviation Organization	ICSS -International Communications Switching Systems
IDAT -Interfacility Data	IF -Intermediate Fix
IFCP -Interfacility Communications Processor	IFDS -Interfacility Data System
IFEA -In-Flight Emergency Assistance	IFO -International Field Office
IFR -Instrument Flight Rules	IFSS -International Flight Service Station
ILS -Instrument Landing System	IM -Inner Marker
IMC -Instrument Meteorological Conditions	INM -Integrated Noise Model
INS -Inertial Navigation System	IRMP -Information Resources Management Plan
ISDN -Integrated Services Digital Network	ISMLS -Interim Standard Microwave Landing System
ITI -Interactive Terminal Interface	IVRS -Interim Voice Response System
IW -Inside Wiring	
<b>-J-</b>	
<b>-K-</b>	
Kbps-Kilobits Per Second	KHz -Kilohertz
KVDT -Keyboard Video Display Terminal	
<b>-L-</b>	

LAA-Local Airport Advisory	LAAS -Low Altitude Alert System
LABS -Leased A B Service	LABSC -LABS GS-200 Computer
LABSR -LABS Remote Equipment	LABSW -LABS Switch System
LAHSO -Land and Hold Short Operation	LAN -Local Area Network
LATA -Local Access and Transport Area	LAWRS -Limited Aviation Weather Reporting System
LCF -Local Control Facility	LCN -Local Communications Network
LDA -Localizer Directional Aid	LDA -Landing Directional Aid
LDIN -Lead-in Lights	LEC -Local Exchange Carrier
LF -Low Frequency	LINCS -Leased Interfacility NAS Communications System
LIS -Logistics and Inventory System	LLWAS -Low Level Wind Shear Alert System
LM/MS -Low/Medium Frequency	LMM -Locator Middle Marker
LMS -LORAN Monitor Site	LOC -Localizer
LOCID -Location Identifier	LOI -Letter of Intent
LOM -Compass Locator at Outer Marker	LORAN -Long Range Aid to Navigation
LRCO -Limited Remote Communications Outlet	LRNAV -Long Range Navigation
LRR -Long Range Radar	
<b>-M-</b>	
FAA-Maximum Authorized Altitude	MALS -Medium Intensity Approach Lighting System
MALSF -MALS with Sequenced Flashers	MALSR -MALS with Runway Alignment Indicator Lights
MAP -Modified Access Pricing	MAP -Military Airport Program
MAP -Missed Approach Point	MAP -Maintenance Automation Program
Mbps -Megabits Per Second	MCA -Minimum Crossing Altitude
MCAS -Marine Corps Air Station	MCC -Maintenance Control Center
MCL -Middle Compass Locator	MCS -Maintenance and Control System
MDA -Minimum Descent Altitude	MDT -Maintenance Data Terminal
MEA -Minimum En Route Altitude	METI -Meteorological Information
MF -Middle Frequency	MFJ -Modified Final Judgement
MFT -Meter Fix Crossing Time/Slot Time	MHA -Minimum Holding Altitude
MHz -Megahertz	MIA -Minimum IFR Altitudes
MIDO -Manufacturing Inspection District Office	MIS -Meteorological Impact Statement
MISC -Miscellaneous	MISO -Manufacturing Inspection Satellite Office
MIT -Miles In Trail	MITRE -Mitre Corporation
MLS -Microwave Landing System	MM -Middle Marker
MMC -Maintenance Monitoring Console	MMS -Maintenance Monitoring System
MNPS -Minimum Navigation Performance Specification	MNPSA -Minimum Navigation Performance Specifications Airspace
MOA -Memorandum of Agreement	MOA -Military Operations Area
MOCA -Minimum Obstruction Clearance Altitude	MODE C -Altitude-Encoded Beacon Reply
MODE C -Altitude Reporting Mode of Secondary Radar	MODE S -Mode Select Beacon System
MOU -Memorandum of Understanding	MPO -Metropolitan Planning Organization
MPS -Maintenance Processor Subsystem (OR) Master Plan Supplement	MRA -Minimum Reception Altitude
MRC -Monthly Recurring Charge	MSA -Minimum Safe Altitude
MSAW -Minimum Safe Altitude Warning	MSL -Mean Sea Level
MSN -Message Switching Network	MTCS -Modular Terminal Communications System
MTI -Moving Target Indicator	MUX -Multiplexer
MVA -Minimum Vectoring Altitude	MVFR -Marginal Visual Flight Rules
<b>-N-</b>	
NAAQS-National Ambient Air Quality Standards	NADA -NADIN Concentrator
NADIN -National Airspace Data Interchange Network	NADSW -NADIN Switches
NAILS -National Airspace Integrated Logistics Support	NAMS -NADIN IA
NAPRS -National Airspace Performance Reporting System	NAS -National Airspace System or Naval Air Station
NASDC -National Aviation Safety Data	NASP -National Airspace System Plan
NASPAC -National Airspace System Performance Analysis Capability	NATCO -National Communications Switching Center
NAVAID -Navigation Aid	NAVMN -Navigation Monitor and Control
NAWAU -National Aviation Weather Advisory Unit	NAWPF -National Aviation Weather Processing Facility
NCAR -National Center for Atmospheric Research; Boulder, CO	NCF -National Control Facility
NCIU -NEXRAD Communications Interface Unit	NCS -National Communications System
NDB -Non-Directional Radio Homing Beacon	NDNB -NADIN II
NEPA -National Environmental Policy Act	NEXRAD -Next Generation Weather Radar

NFAX -National Facsimile Service	NFDC -National Flight Data Center
NFIS -NAS Facilities Information System	NI -Network Interface
NICS -National Interfacility Communications System	NPIAS -National Plan of Integrated Airport Systems
NM -Nautical Mile	NMAC -Near Mid Air Collision
NMC -National Meteorological Center	NMCE -Network Monitoring and Control Equipment
NMCS -Network Monitoring and Control System	NOAA -National Oceanic and Atmospheric Administration
NOC -Notice Of Completion	NOTAM -Notice to Airmen
NPDES -National Pollutant Discharge Elimination System	NPIAS -National Plan of Integrated Airport Systems
NRC -Non-Recurring Charge	NRCS -National Radio Communications Systems
NSAP -National Service Assurance Plan	NSSFC -National Severe Storms Forecast Center
NSSL -National Severe Storms Laboratory; Norman, OK	NTAP -Notices To Airmen Publication
NTP -National Transportation Policy	NTSB -National Transportation Safety Board
NTZ -No Transgression Zone	NWS -National Weather Service
NWSR -NWS Weather Excluding NXRD	NSWRH -NWS Regional Headquarters
NXRD -Advanced Weather Radar System	
<b>-O-</b>	
OAG-Official Airline Guide	OALT -Operational Acceptable Level of Traffic
OAW -Off-airway Weather Station	ODAL -Omni directional Approach Lighting System
ODAPS -Oceanic Display and Processing Station	OFA -Object Free Area
OFDPS -Offshore Flight Data Processing System	OFT -Outer Fix Time
OFZ -Obstacle Free Zone	OM -Outer Marker
OMB -Office of Management and Budget	ONER -Oceanic Navigational Error Report
OPLT -Operational Acceptable Level of Traffic	OPSW -Operational Switch
OPX -Off Premises Exchange	ORD -Operational Readiness Demonstration
OTR -Oceanic Transition Route	OTS -Organized Track System
<b>-P-</b>	
PABX-Private Automated Branch Exchange	PAD -Packet Assembler/Disassembler
PAM -Peripheral Adapter Module	PAPI -Precision Approach Path Indicator
PAR -Precision Approach Radar	PAR -Preferential Arrival Route
PATWAS -Pilots Automatic Telephone Weather Answering Service	PBCT -Proposed Boundary Crossing Time
PBRF -Pilot Briefing	PBX -Private Branch Exchange
PCA -Positive Control Airspace	PCM -Pulse Code Modulation
PDAR -Preferential Arrival And Departure Route	PDC -Pre-Departure Clearance
PDC -Program Designator Code	PDR -Preferential Departure Route
PDN -Public Data Network	PFC -Passenger Facility Charge
PHONE -Telephone	PIC -Principal Interexchange Carrier
PIDP -Programmable Indicator Data Processor	PIREP -Pilot Weather Report
PMS -Program Management System	POLIC -Police Station
POP -Point Of Presence	POT -Point Of Termination
PPIMS -Personal Property Information Management System	PR -Primary Commercial Service Airport
PRI -Primary Rate Interface	PRM -Precision Runway Monitor
PSDN -Public Switched Data Network	PSN -Packet Switched Network
PSS -Packet Switched Service	PSTN -Public Switched Telephone Network
PUB -Publication	PUP -Principal User Processor
PVC -Permanent Virtual Circuit	PVD -Plan View Display
<b>-Q-</b>	
<b>-R-</b>	
RAIL-Runway Alignment Indicator Lights	RAPCO -Radar Approach Control (USAF)
RAPCON -Radar Approach Control	RATCC -Radar Air Traffic Control Center
RATCF -Radar Air Traffic Control Facility (USN)	RBC -Rotating Beam Ceilometer
RBDPE -Radar Beacon Data Processing Equipment	RBSS -Radar Bomb Scoring Squadron
RCAG -Remote Communications Air/Ground	RCC -Rescue Coordination Center
RCF -Remote Communication Facility	RCCC -Regional Communications Control Centers
RCIU -Remote Control Interface Unit	RCL -Radio Communications Link
RCLR -RCL Repeater	RCLT -RCL Terminal
RCO -Remote Communications Outlet	RCU -Remote Control Unit
RDAT -Digitized Radar Data	RDP -Radar Data Processing
RDSIM -Runway Delay Simulation Model	REIL -Runway End Identification Lights
RF -Radio Frequency	RL -General Aviation Reliever Airport
RMCC -Remote Monitor Control Center	RMCF -Remote Monitor Control Facility
RML -Radio Microwave Link	RMLR -RML Repeater

RMLT -RML Terminal	RMM -Remote Maintenance Monitoring
RMMS -Remote Maintenance Monitoring System	RMS -Remote Monitoring Subsystem
RMSC -Remote Monitoring Subsystem Concentrator	RNAV -Area Navigation
RNP -Required Navigation Performance	ROD -Record of Decision
ROSA -Report of Service Activity	ROT -Runway Occupancy Time
RP -Restoration Priority	RPC -Restoration Priority Code
RPG -Radar Processing Group	RPZ -Runway Protection Zone
RRH -Remote Reading Hygrothermometer	RRHS -Remote Reading Hydrometer
RRWDS -Remote Radar Weather Display	RRWSS -RWDS Sensor Site
RSS -Remote Speaking System	RT -Remote Transmitter
RT & BTL -Radar Tracking And Beacon Tracking Level	RTAD -Remote Tower Alphanumeric Display
RTCA -Radio Technical Commission for Aeronautics	RTR -Remote Transmitter/Receiver
RTRD -Remote Tower Radar Display	RVR -Runway Visual Range
RW -Runway	RWDS -Same as RRWDS
RWP -Realtime Weather Processor	
<b>-S-</b>	
S/S - Sector Suite	SAC -Strategic Air Command
SAFI -Semi Automatic Flight Inspection	SALS -Short Approach Lighting System
SATCOM -Satellite Communications	SAWRS -Supplementary Aviation Weather Reporting System
SCC -System Command Center	SCVTS -Switched Compressed Video Telecommunications Service
SDF -Simplified Direction Finding	SDF -Software Defined Network
SDIS -Switched Digital Integrated Service	SDP -Service Delivery Point
SDS -Switched Data Service	SEL -Single Event Level
SELF -Simplified Short Approach Lighting System With Sequenced Flashing Lights	SFAR-38 -Special Federal Aviation Regulation 38
SHPO -State Historic Preservation Officer	SIC -Service Initiation Charge
SID -Station Identifier	SID -Standard Instrument Departure
SIGMET -Significant Meteorological Information	SIMMOD -Airport and Airspace Simulation Model
SIP -State Implementation Plan	SM -Statute Miles
SMGC -Surface Movement Guidance and Control	SMPS -Sector Maintenance Processor Subsystem
SMS -Simulation Modeling System	SNR -Signal-to-Noise Ratio, also: S/N
SOC -Service Oversight Center	SOIR -Simultaneous Operations On Intersecting Runways
SOIWR -Simultaneous Operations on Intersecting Wet Runways	SRAP -Sensor Receiver and Processor
SSALF -SSALS with Sequenced Flashers	SSALR -Simplified Short Approach Lighting System
SSB -Single Side Band	STAR -Standard Terminal Arrival Route
STD -Standard	STMUX -Statistical Data Multiplexer
STOL -Short Takeoff and Landing	SURPIC -Surface Picture
SVCA -Service A	SVCB -Service B
SVCC -Service C	SVCO -Service O
SVFO -Interphone Service F (A)	SVFB -Interphone Service F (B)
SVFC -Interphone Service F (C)	SVFD -Interphone Service F (D)
SVFR -Special Visual Flight Rules	
<b>-T-</b>	
T1MUX-T1 Multiplexer	TAAS -Terminal Advance Automation System
TACAN -Tactical Aircraft Control and Navigation	TACR -TACAN at VOR, TACAN only
TAF -Terminal Area Forecast	TARS -Terminal Automated Radar Service
TAS -True Air Speed	TATCA -Terminal Air Traffic Control Automation
TAVT -Terminal Airspace Visualization Tool	TCA -Traffic Control Airport or Tower Control Airport
TCA -Terminal Control Area	TCACCIS -Transportation Coordinator Automated Command and Control Information System
TCAS -Traffic Alert And Collision Avoidance System	TCC -DOT Transportation Computer Center
TCCC -Tower Control Computer Complex	TCE -Tone Control Equipment
TCLT -Tentative Calculated Landing Time	TCO -Telecommunications Certification Officer
TCOM -Terminal Communications	TCS -Tower Communications System
TDLS -Tower Data-Link Services	TDMUX -Time Division Data Multiplexer
TDWR -Terminal Doppler Weather Radar	TELCO -Telephone Company
TELEMS -Telecommunications Management System	TERPS -Terminal Instrument Procedures
TFAC -To Facility	TH -Threshold
TIMS -Telecommunications Information Management System	TIPS -Terminal Information Processing System
TL -Taxilane	TMA -Traffic Management Advisor

TMC -Traffic Management Coordinator	TMC/MC -Traffic Management Coordinator/Military Coordinator
TMCC -Terminal Information Processing System	TMCC -Traffic Management Computer Complex
TMF -Traffic Management Facility	TML -Television Microwave Link
TMLI -Television Microwave Link Indicator	TMLR -Television Microwave Link Repeater
TMLT -Television Microwave Link Terminal	TM&O -Telecommunications Management and Operations
TMP -Traffic Management Processor	TMS -Traffic Management System
TMSPS -Traffic Management Specialists	TMU -Traffic Management Unit
TODA -Takeoff Distance Available	TOF -Time Of Flight
TOFMS -Time of Flight Mass Spectrometer	TOPS -Telecommunications Ordering and Pricing System (GSA software tool)
TORA -Take-off Run Available	TNAV -Terminal Navigational Aids
TR -Telecommunications Request	TRACAB -Terminal Radar Approach Control in Tower Cab
TRACON -Terminal Radar Approach Control Facility	TRAD -Terminal Radar Service
TRNG -Training	TSA -Taxiway Safety Area
TSEC -Terminal Secondary Radar Service	TSP -Telecommunications Service Priority
TSR -Telecommunications Service Request	TSYS -Terminal Equipment Systems
TTMA -TRACON Traffic Management Advisor	TTY -Teletype
TVOR -Terminal VHF Omnidirectional Range	TW -Taxiway
TWEB -Transcribed WeatherBroadcastTWR-Tower (non-controlled)	TY -Type (FAACIS)
<b>-U-</b>	
UAS -Uniform Accounting System	UHF -Ultra High Frequency
URA -Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970	USAF -United States Air Force
USOC -Uniform Service Order Code	
<b>-V-</b>	
VASI-Visual Approach Slope Indicator	VDME -VOR with Distance Measuring Equipment
VF -Voice Frequency	VFR -Visual Flight Rules
VHF -Very High Frequency	VLF -Very Low Frequency
VMC -Visual Meteorological Conditions	VNAV -Visual Navigational Aids
VNTSC -Volpe National Transportation System Center	VON -Virtual On-net
VOR -VHF Omnidirectional Range	VOR/DME -VHF Omnidirectional Range/Distance Measuring Equipment
VORTAC -VOR collocated with TACAN	VOT -VOR Test Facility
VRS -Voice Recording System	VSCS -Voice Switching and Control System
VTAC -Vertex Time of Arrival	VTAC -VOR collocated with TACAN
VTOL -Vertical Takeoff and Landing	VTCS -Voice Telecommunications System
<b>-W-</b>	
WAAS-Wide Area Augmentation System	WAN -Wide Area Network
WC -Work Center	WCP -Weather Communications Processor
WECO -Western Electric Company	WESCOM -Western Electric Satellite Communications
WMSC -Weather Message Switching Center	WMSCR -Weather Message Switching Center Replacement
WSCMO -Weather Service Contract Meteorological Observatory	WSFO -Weather Service Forecast Office
WSMO -Weather Service Meteorological Observatory	WSO -Weather Service Office
WTHR -"Weather"	WX -Weather
<b>-X-</b>	
<b>-Y-</b>	
<b>-Z-</b>	



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# APPENDIX D

## MAA STANDARD CONTRACT DRAWINGS



GENERAL CONSTRUCTION NOTES

1. THIS PROJECT IS FOR WORK AT BALTIMORE/WASHINGTON INTERNATIONAL THURGOOD MARSHALL AIRPORT, HEREAFTER REFERRED TO AS "THE AIRPORT" OR "BWI".
2. THIS PROJECT SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE CONTRACT PLANS AND SPECIFICATIONS AND ANY RULES, REGULATIONS, STANDARDS, OR SPECIFICATIONS REFERENCED THEREIN. THE PROJECT IS SUBJECT TO INSPECTION BY REPRESENTATIVES OF THE MARYLAND AVIATION ADMINISTRATION (MAA), THE FEDERAL AVIATION ADMINISTRATION (FAA), AND OTHER GOVERNING AGENCIES.
3. PROJECT PHASING - THE PROJECT IS TO BE COMPLETED IN CLOSE CONFORMANCE WITH THE PHASING PLANS, IF PROVIDED, AND NOTES AS CONTAINED IN THE CONTRACT DOCUMENTS. CHANGES TO THE PHASING PLANS SHALL BE COORDINATED WITH THE ENGINEER AND REVIEWED WITH THE DESIGNER PRIOR TO IMPLEMENTATION.
4. PROJECT COMPLETION TIMES - THE CONTRACTOR IS EXPECTED TO COMPLETE CRITICAL PORTIONS OF THE PROJECT WITHIN THE SPECIFIED TIMEFRAMES AND TO COMPLETE THE ENTIRE PROJECT ON TIME. LIQUIDATED DAMAGES, IF SPECIFIED, WILL BE ASSESSED SHOULD THE TIMEFRAME BE EXCEEDED.
5. CONSTRUCTION LIMITS - ALL CONTRACTOR VEHICLES SHALL REMAIN WITHIN THE DESIGNATED CONSTRUCTION LIMITS OR HAUL ROUTES (UNLESS OTHERWISE AUTHORIZED).
6. DIMENSIONS IDENTIFIED ON THE PLANS SHALL BE VERIFIED IN THE FIELD. IN GENERAL, SMALL-SCALE DRAWINGS WITH GREATER RESOLUTION (I.E. 1"=50') GOVERN OVER LARGER SCALE DRAWINGS OF LESS RESOLUTION (I.E. 1"=500'). WRITTEN NOTES GOVERN OVER GRAPHIC REPRESENTATION AND SPECIFICATIONS GOVERN OVER DRAWINGS. ANY DISCREPANCIES SHALL BE REPORTED TO THE ENGINEER FOR CLARIFICATION.
7. THE CONTRACTOR SHALL PROVIDE COLLAPSIBLE BARRICADES MARKED WITH DIAGONAL ALTERNATING ORANGE AND WHITE STRIPES, AND WITH FLASHING RED LIGHTS, AS SHOWN ON THE DRAWINGS TO DELINEATE THE WORK AREAS WHEN CLOSED TO AIRPORT TRAFFIC. ALL BARRICADES PLACED ADJACENT TO AN OPEN RUNWAY, TAXIWAY, OR TAXILANE MUST BE AS LOW AS POSSIBLE TO THE GROUND, OF LOW MASS, EASILY COLLAPSIBLE UPON IMPACT WITH AN AIRCRAFT, AND WEIGHTED OR STURDILY ATTACHED TO THE SURFACE TO PREVENT DISPLACEMENTS FROM PROP WASH, JET BLAST, WING VORTEX, OR OTHER SURFACE WIND CURRENTS. IF AFFIXED TO THE SURFACE, THE BARRICADES MUST BE FRANGIBLE AT GRADE LEVEL OR AS LOW AS POSSIBLE, BUT NO GREATER THAN THREE INCHES ABOVE THE GROUND
8. OPEN TRENCHES, EXCAVATIONS, AND STOCKPILED MATERIAL LOCATED IN THE AIR OPERATIONS AREA (AOA) (I.E., THE SECURE PORTION OF THE AIRPORT) SHALL BE PROMINENTLY MARKED WITH ORANGE FLAGS AND LIGHTED BY APPROVED LIGHT UNITS DURING HOURS OF LIMITED VISIBILITY AND DARKNESS. THE CONTRACTOR SHALL CONTINUOUSLY MAINTAIN LIGHTS IN OPERATING CONDITION AND REPLACE BATTERIES, BULBS, ETC. AS NEEDED SO THAT THEY MAY ALWAYS BE LIGHTED IN HOURS OF DARKNESS.
9. EXISTING TOPOGRAPHIC FIELD SURVEYS WERE PROVIDED BY [REDACTED] 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. [REDACTED]
10. EXISTING AIRFIELD LIGHTING SYSTEMS - INTERRUPTION OF EXISTING AIRFIELD LIGHTING SYSTEMS NOT IDENTIFIED ON THE CONSTRUCTION DOCUMENTS SHALL NOT BE PERMITTED. ALL AIRFIELD LIGHTING CIRCUITS AFFECTED BY THIS PROJECT SHALL BE TEMPORARILY MAINTAINED BY THE CONTRACTOR DURING OPERATIONAL PERIODS.
11. THE CONTRACTOR SHALL PROVIDE AN ADEQUATE NUMBER OF WATER TRUCKS TO CONTROL DUST IN THE PROJECT WORK AREA, STAGING AREA, STORAGE AREAS, HAUL ROUTES AND THE WASTE SITE.
12. ALL THE PERMITS AND LICENSES REQUIRED FOR THE PROJECT WORK SHALL BE OBTAINED AT THE CONTRACTOR'S EXPENSE.
13. [REDACTED]

GENERAL AIRFIELD SAFETY DURING CONSTRUCTION

1. THE CONTRACTOR SHALL ACQUAINT SUPERVISORS AND EMPLOYEES WITH ACTIVITY AND OPERATIONS THAT ARE INHERENT TO THE AIRPORT AND SHALL CONDUCT CONSTRUCTION ACTIVITIES TO CONFORM TO ALL ROUTINE AND EMERGENCY AIR TRAFFIC REQUIREMENTS AND GUIDELINES FOR SAFETY SPECIFIED HEREIN.
2. THE CONTRACTOR AND HIS/HER SUBCONTRACTOR(S) SHALL PROTECT WORKERS, MAA AND AIRPORT TENANT EMPLOYEES, AND THE GENERAL PUBLIC. THE CONTRACTOR SHALL ALSO ENSURE THAT PROPERTY OR EQUIPMENT, UNRELATED TO WORK, WHICH BELONGS TO MAA OR AIRPORT TENANTS IS NOT DAMAGED DURING CONSTRUCTION.
3. THE CONTRACTOR SHALL NOT ALLOW EMPLOYEES, SUBCONTRACTORS, SUPPLIERS, OR ANY OTHER UNAUTHORIZED PERSON TO ENTER OR REMAIN IN ANY AIRPORT AREA WHICH WOULD BE HAZARDOUS TO PERSONS OR TO AIRCRAFT OPERATIONS.
4. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING ALL NECESSARY PROTECTIVE GEAR AND EQUIPMENT REQUIRED FOR THE PROTECTION OF THE CONTRACTOR'S PERSONNEL DURING CONSTRUCTION.
5. DURING PERFORMANCE OF THIS CONTRACT, THE AIRPORT RUNWAYS, TAXIWAYS, AND AIRCRAFT PARKING APRONS SHALL REMAIN IN USE BY AIRCRAFT TO THE MAXIMUM EXTENT POSSIBLE. ALL AIRCRAFT TRAFFIC ON THESE SURFACES SHALL HAVE PRIORITY OVER CONTRACTOR'S TRAFFIC. WHILE USE OF AREAS NEAR THE CONTRACTOR'S WORK MAY BE CONTROLLED TO MINIMIZE DISTURBANCE TO THE CONTRACTOR'S OPERATION, THE OWNER RESERVES THE RIGHT TO ORDER THE CONTRACTOR, AT ANY TIME, TO VACATE ANY AREA NECESSARY TO MAINTAIN SAFE AIRCRAFT OPERATIONS.
6. ALL WORK TO BE PERFORMED WITHIN CERTAIN LIMITS OF AN ACTIVE RUNWAY, TAXIWAY, OR APRON UNDER OPERATIONAL CONDITIONS SHALL BE PERFORMED WHEN THE RUNWAY, TAXIWAY OR APRON IS NOT IN USE. SUCH WORK SHALL ONLY BE ACCOMPLISHED WITH PRIOR PERMISSION FROM THE ENGINEER AND MAA OPERATIONS. REFER TO PROJECT COORDINATION FOR ADDITIONAL INFORMATION ON COORDINATING CLOSURES.
7. THE CONTRACTOR SHALL INSPECT ALL CONSTRUCTION AND STORAGE AREAS AS OFTEN AS NECESSARY AND PROMPTLY TAKE ALL STEPS NECESSARY TO PREVENT OR REMEDY ANY UNSAFE OR POTENTIALLY UNSAFE CONDITIONS OR ACTIVITIES DISCOVERED.
8. THE CONTRACTOR SHALL BE AWARE OF THE FOLLOWING TYPES OF SAFETY PROBLEMS AND/OR HAZARDS:
- a. TRENCHES, HOLES, OR EXCAVATION ON OR ADJACENT TO ANY OPEN RUNWAY OR IN SAFETY AREAS.
  - b. PAVEMENT DROP-OFFS OR PAVEMENT TURF-LIPS GREATER THAN 1½ INCHES WHETHER PERMANENT OR TEMPORARY.
  - c. UNMARKED/UNLIGHTED HOLES OR EXCAVATION IN ANY APRON, OPEN TAXIWAY, OPEN TAXILANE, OR RELATED SAFETY AREA.
  - d. MOUNDS OR PILES OF EARTH, CONSTRUCTION MATERIALS, TEMPORARY STRUCTURES, OR OTHER OBJECTS IN THE VICINITY OF ANY OPEN RUNWAY, TAXIWAY, TAXILANE, OR IN A RELATED SAFETY AREA, APPROACH, OR DEPARTURE AREA.
  - e. VEHICLES OR EQUIPMENT, WHETHER OPERATING OR IDLE, ON ANY OPEN RUNWAY, TAXIWAY, TAXILANE, OR IN ANY RELATED SAFETY AREA, APPROACH, OR DEPARTURE AREA.
  - f. VEHICLES, EQUIPMENT, EXCAVATION, STOCKPILES, OR OTHER MATERIALS WHICH COULD DEGRADE OR OTHERWISE INTERFERE WITH ELECTRONIC SIGNALS FROM RADIOS OR ELECTRONIC NAVIGATIONAL AIDS (NAVAIDS).
  - g. UNMARKED UTILITY, NAVAID, WEATHER SERVICE, RUNWAY LIGHTING, OR OTHER POWER OR SIGNAL CABLES THAT COULD BE DAMAGED DURING CONSTRUCTION.
  - h. OBJECTS, WHETHER OR NOT MARKED OR FLAGGED, OR ACTIVITIES ANYWHERE ON OR IN THE VICINITY OF THE AIRPORT WHICH COULD BE DISTRACTING, CONFUSING, OR ALARMING TO PILOTS DURING AIRCRAFT OPERATIONS.
- i. UNFLAGGED/UNLIGHTED LOW VISIBILITY ITEMS SUCH AS TALL CRANES, DRILLS, ETC. ANYWHERE IN THE VICINITY OF ACTIVE RUNWAYS OR IN ANY APPROACH OR DEPARTURE AREA. SUCH EQUIPMENT SHALL BE PARKED IN THE CONTRACTOR'S STAGING AREA AND THE BOOM(S) LOWERED TO THE GROUND WHEN NOT IN USE.
- j. MISLEADING OR MALFUNCTIONING LIGHTS OR UNLIGHTED/UNMARKED OBSTRUCTIONS IN THE APPROACH TO ANY ACTIVE RUNWAY.
- k. INADEQUATE APPROACH OR DEPARTURE SURFACES (THESE SURFACES ARE NEEDED TO ASSURE ADEQUATE LANDING OR TAKEOFF CLEARANCE OVER OBSTRUCTIONS, INCLUDING THE CONTRACTOR'S WORK AND STORAGE AREAS).

- l. MARKING AND LIGHTING OF RUNWAYS, TAXIWAYS OR TAXILANES THAT COULD BE CONFUSING OR MISLEADING TO PILOTS, INCLUDING IMPROPERLY MARKED DISPLACED OR RELOCATED THRESHOLDS.
- m. INADEQUATE OR IMPROPER METHODS OF MARKING, BARRICADING, AND LIGHTING OF TEMPORARILY CLOSED PORTIONS OF THE AIRPORT AOA.
- n. WATER, SNOW, DIRT, DEBRIS, OR OTHER TRANSIENT ACCUMULATION WHICH TEMPORARILY OBSCURES PAVEMENT MARKINGS OR PAVEMENT EDGES, OR DIMINISHES THE VISIBILITY OF RUNWAY OR TAXIWAY LIGHTING.
- o. BIRD ATTRACTANTS SUCH AS EDIBLES (FOOD SCRAPS, ETC.), MISCELLANEOUS TRASH, OR PONDED WATER. FOOD SCRAPS AND MISCELLANEOUS TRASH SHALL BE SECURED BY THE CONTRACTOR AND DISPOSED OF USING PROPER SANITARY METHODS.
- p. FOREIGN OBJECTS DEBRIS:
- i. DEBRIS, WASTE, LOOSE MATERIAL (INCLUDING DUST AND DIRT), TRASH OR OTHER MATERIALS WHETHER ON RUNWAYS, TAXIWAYS, APRONS, OR IN RELATED SAFETY AREAS IS CONSIDERED FOREIGN OBJECT DEBRIS AND PRESENTS THE POTENTIAL FOR DAMAGE TO AIRCRAFT. SUCH MATERIAL SHALL NOT BE ALLOWED ON ANY AIRCRAFT MOVEMENT AREAS (REGARDLESS OF WHETHER THE AREA IS OPEN OR CLOSED) OR ADJACENT GRASSED AREAS. ANY DEBRIS (WHETHER CAUSED BY THE CONTRACTOR OR NOT) OBSERVED TO BE WITHIN THESE AREAS SHALL BE REMOVED IMMEDIATELY AND CONTINUOUSLY BY THE CONTRACTOR.
  - ii. THE CONTRACTOR SHALL BE REQUIRED TO HAVE A VACUUM SWEEPER WITH PLASTIC BRUSHES (NOT STEEL) AND OPERATOR ON SITE AND READY AT ALL TIMES DURING CONSTRUCTION ACTIVITY.
  - iii. WHERE TRAVEL ON OR ACROSS RUNWAYS, RAMP AREAS, TAXIWAYS, OR AIRCRAFT APRONS IS REQUIRED, THE CONTRACTOR SHALL PROVIDE ADEQUATE PERSONNEL AND EQUIPMENT TO KEEP SUCH SURFACES CLEAR OF DEBRIS.
  - iv. ALL MATERIALS THAT COULD BLOW ACROSS ANY PAVEMENTS SHALL BE SECURED BY THE CONTRACTOR AND DISPOSED OF USING PROPER SANITARY METHODS.
- q. INADEQUATE BARRICADING OR OTHER MARKING WHICH IS PLACED TO SEPARATE CONSTRUCTION OR MAINTENANCE AREAS FROM OPEN AIRCRAFT OPERATING AREAS.
- r. FAILURE TO CONTROL UNAUTHORIZED VEHICLE AND HUMAN ACCESS THROUGH ACTIVE AIRCRAFT OPERATING AREAS. REFER TO VEHICLE ACCESS, RADIO COMMUNICATIONS, AND SECURITY REQUIREMENTS FOR MORE INFORMATION.
- s. FAILURE TO MAINTAIN RADIO COMMUNICATION BETWEEN CONSTRUCTION AND MAINTENANCE VEHICLES AND ATCT. REFER TO VEHICLE ACCESS, RADIO COMMUNICATIONS, AND SECURITY REQUIREMENTS FOR MORE INFORMATION.
- t. CONSTRUCTION AND MAINTENANCE ACTIVITIES OR MATERIALS WHICH COULD HAMPER THE RESPONSE OF AIRCRAFT RESCUE AND FIRE FIGHTING EQUIPMENT FROM REACHING AIRCRAFT, ALL OR ANY PART OF THE RUNWAY/TAXIWAY SYSTEM, RUNWAY APPROACH AND DEPARTURE AREAS, AND AIRCRAFT PARKING LOCATIONS.

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

1. ACCESS TO THE SITE - THE CONTRACTOR'S ACCESS POINTS TO THE SITE SHALL BE AS SHOWN ON THE PROJECT SECURITY PLAN. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL VEHICLES AND PERSONNEL WHO ENTER THE AIRPORT THROUGH THESE ACCESS POINTS. THE CONTRACTOR IS RESPONSIBLE FOR TRANSPORTING EMPLOYEES TO AND FROM THE JOB SITE. PERSONAL VEHICLES SHALL NOT BE PARKED ANYWHERE WITHIN THE AIRPORT OPERATIONS AREA. REFER TO VEHICLE ACCESS, RADIO COMMUNICATIONS, AND SECURITY REQUIREMENTS FOR ADDITIONAL INFORMATION.
2. ALL OFF-SITE HAUL ROUTES SHALL BE SELECTED TO MINIMIZE DISTURBANCE TO THE PUBLIC. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO COORDINATE OFF-SITE HAUL ROUTES (STATE HIGHWAYS, COUNTY ROADS, OR CITY STREETS) WITH THE APPROPRIATE OWNER WHO HAS JURISDICTION OVER THE AFFECTED ROUTE. THE CONTRACTOR'S ON-AIRPORT HAUL ROUTES ARE INDICATED ON THE PROJECT SECURITY PLAN. THESE SHALL BE EXISTING HAUL ROADS, WHERE AVAILABLE, OR ALONG TAXIWAY/TAXILANE PAVEMENTS UNLESS OTHERWISE INDICATED IN THE CONTRACT DRAWINGS.
3. ON-SITE ROADS AND OTHER AIRFIELD PAVEMENTS USED AS HAUL ROUTES SHALL BE MAINTAINED BY THE CONTRACTOR AND SHALL BE RESTORED AT THE CONTRACTOR'S EXPENSE TO THEIR ORIGINAL CONDITION UPON COMPLETION OF BEING USED AS A HAUL ROUTE, UNLESS OTHERWISE DIRECTED BY THE CONTRACT DOCUMENTS OR BY THE ENGINEER. THE BEFORE AND AFTER CONDITION OF ALL ON-SITE HAUL ROUTES (TEMPORARY OR PERMANENT) SHALL BE JOINTLY INSPECTED AND DETERMINED BY THE CONTRACTOR AND THE ENGINEER

THROUGH THE USE OF DIGITAL PHOTOGRAPHY AND/OR VIDEO. THE CONTRACTOR MAY NEED TO COORDINATE HAUL ROUTE USAGE WITH OTHER CONTRACTORS WORKING ON THE AIRPORT.

4. FENCING, DRAINAGE, GRADING AND OTHER MISCELLANEOUS CONSTRUCTION REQUIRED TO CONSTRUCT OR RESTORE TEMPORARY OR PERMANENT HAUL ROUTES OR ACCESS POINTS ON THE AIRPORT WILL BE THE CONTRACTOR'S RESPONSIBILITY AND SHALL BE APPROVED BY THE ENGINEER PRIOR TO COMMENCING THE WORK.
5. ALL ON-SITE ACCESS ROADS TO AIRPORT FACILITIES SHALL REMAIN OPEN AND MAINTAINED AT ALL TIMES.
6. CONTRACTOR'S STAGING AREA - AN AREA WILL BE MADE AVAILABLE FOR CONTRACTOR'S MOBILIZATION AND STORAGE. THE CONTRACTOR'S STAGING AREA SHALL BE FREE OF DEBRIS. IF DIRECTED BY THE ENGINEER, THE CONTRACTOR WILL BE REQUIRED TO STAKE OUT AND FLAG THE STAGING AREA LIMITS. NO STAGING WILL BE ALLOWED WITHIN RUNWAY SAFETY AREAS. UPON COMPLETION OF THE PROJECT, THE STAGING AREA SHALL BE RESTORED TO ITS ORIGINAL CONDITION.
7. ALL MATERIALS AND EQUIPMENT (INCLUDING STOCKPILED MATERIAL) WHEN NOT IN USE SHALL BE PLACED IN APPROVED AREAS WHERE THEY WILL NOT CONSTITUTE A HAZARD TO AIRCRAFT OPERATIONS AND NOT PENETRATE CLEARANCE SURFACES SHOWN ON THE GENERAL CONSTRUCTION AND SAFETY NOTES II.
- THE OBSTACLE FREE ZONE (OFZ) GOVERNS EQUIPMENT CLEARANCE DURING CONSTRUCTION ADJACENT TO AN ACTIVE RUNWAY. UNDER NO CIRCUMSTANCES SHALL ANY MEN OR EQUIPMENT PENETRATE THESE SURFACES UNLESS PRIOR ARRANGEMENTS HAVE BEEN MADE WITH AIRPORT OPERATIONS.
  - THE FAR PART 77 APPROACH, PRIMARY, AND TRANSITIONAL SURFACES GOVERN STOCKPILES AND PARKED EQUIPMENT. UNDER NO CIRCUMSTANCES SHALL STOCKPILES, PARKED EQUIPMENT, OR OTHER CONSTRUCTION ITEMS PENETRATE THESE SURFACES ADJACENT TO AN ACTIVE RUNWAY.
  - EQUIPMENT SHALL BE PARKED AT THE CONTRACTOR'S STAGING AREA WHEN NOT IN USE. TALL EQUIPMENT SUCH AS CRANES SHALL BE LOWERED TO THE GROUND WHEN NOT IN USE. STOCKPILED MATERIAL SHALL BE CONSTRAINED IN A MANNER TO PREVENT MOVEMENT RESULTING FROM AIRCRAFT JET BLAST OR WIND CONDITIONS IN EXCESS OF 10 KNOTS.

VEHICLE ACCESS, RADIO COMMUNICATIONS, AND SECURITY REQUIREMENTS

1. THE CONTRACT DOCUMENTS INCLUDE THE PROJECT SECURITY PLAN/S AND SPECIFICATIONS SECTION X-1, SECURITY REQUIREMENTS DURING CONSTRUCTION. THE CONTRACTOR SHALL REFER TO THESE FOR ADDITIONAL SECURITY REQUIREMENTS.
2. MOVEMENT AREA ACCESS REQUIREMENTS:
- a. DEFINITION - MOVEMENT AREA: THE MOVEMENT AREA DESIGNATION INCLUDES RUNWAYS, TAXIWAYS, AND OTHER AREAS OF AN AIRPORT WHICH ARE USED FOR TAXIING, HOVER-TAXIING, AIR-TAXIING, TAKEOFF, AND LANDING OF AIRCRAFT, EXCLUSIVE OF LOADING RAMPS AND AIRCRAFT PARKING AREAS.
  - b. MOVEMENT AREA MARKINGS ARE DESIGNATED BY TWO PARALLEL LINES, ONE SOLID AND ONE DASHED, ON THE PAVEMENT.
  - c. NOTE THAT AOA DRIVING PRIVILEGES ARE FOR NON MOVEMENT AREAS ONLY. ALL UNESCORTED ACCESS TO THE AIRFIELD MOVEMENT AREAS WILL REQUIRE CONTRACTOR PERSONNEL TO COMPLETE THE BWI AIRPORT MOVEMENT AREA TRAINING PROGRAM PROVIDED BY AIRPORT OPERATIONS. IF MOVEMENT AREA TRAINING IS REQUIRED TO ALLOW THE CONTRACTOR ACCESS TO THE AIRFIELD WITHOUT AN MAA OPERATIONS (OPS) ESCORT, A LETTER SHOULD BE SUBMITTED TO MAA'S DIRECTOR OF AIRPORT OPERATIONS IDENTIFYING: THE NAMES OF THE PERSONNEL TO BE TRAINED, THE REASON AIRFIELD ACCESS IS NEEDED, THE DURATION THAT ACCESS IS NEEDED, AND THE NUMBER OF TIMES ACCESS IS NEEDED DURING THAT DURATION. BASED ON THE INFORMATION IN THE LETTER, MAA OPS WILL EITHER OFFER A CLASS FOR TRAINING OF CONTRACTOR PERSONNEL OR HAVE AN OPS ESCORT AVAILABLE FOR AIRFIELD ACCESS. THE CONTRACTOR SHALL PROVIDE THE LETTER TO MAA'S DIRECTOR OF OPERATIONS THIRTY CALENDAR DAYS IN ADVANCE OF THE TRAINING. ONCE TRAINING IS SUCCESSFULLY COMPLETED, ONLY THOSE AUTHORIZED BY AIRPORT OPERATIONS WILL BE ALLOWED TO REQUEST COMMUNICATIONS CLEARANCE FROM THE ATCT TO ACCESS MOVEMENT AREAS, TAXIWAYS OR CLOSED RUNWAYS. PERSONNEL AND VEHICLES REQUIRING ACCESS TO CROSS OPEN OR ACTIVE RUNWAYS MUST BE ESCORTED BY AIRPORT OPERATIONS PERSONNEL, REGARDLESS OF TRAINING COMPLETED.

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

- a. ANY VEHICLE TO BE USED ON THE AIRPORT INCLUDING ALL CONTRACTOR EQUIPMENT AND MACHINERY CAPABLE OF BEING DRIVEN SHALL BE INSPECTED BY MAA OPERATIONS AND MUST DISPLAY A VALID AIRFIELD REGISTRATION DECAL. ALL OTHER (UNREGISTERED) VEHICLES MUST REMAIN UNDER CONTINUOUS ESCORT WHILE IN THE WORKSITE AND WHILE TRAVELING IN THE RESTRICTED AREAS OR TO AND FROM THE WORKSITE. IT IS THE CONTRACTOR'S RESPONSIBILITY TO ENSURE THAT VEHICLES ARE REGISTERED IN A TIMELY MANNER AS NOT TO DELAY THE PROJECT.
  - b. ONLY VEHICLES REGISTERED BY THE MAA AND OPERATED BY APPROPRIATELY BADGED DRIVERS MAY PROCEED ON THE AIRFIELD WITHOUT AN ESCORT. UNREGISTERED VEHICLES MUST BE ESCORTED AT ALL TIMES BY A REGISTERED VEHICLE. APPROPRIATELY BADGED INDIVIDUALS OPERATING REGISTERED VEHICLES MAY ESCORT NO MORE THAN THREE VEHICLES AT ONE TIME. IF IT BECOMES NECESSARY TO ESCORT MORE THAN THREE VEHICLES, THE ESCORT SHOULD BE PERFORMED AS A MOTORCADE WITH ONE REGISTERED VEHICLE LEADING THE ESCORTED VEHICLES AND A SECOND REGISTERED VEHICLE COMPRISING THE REAR OF THE MOTORCADE.
  - c. ALL PERMITTED VEHICLES SHALL BE MAINTAINED IN ACCORDANCE WITH ALL AIRPORT STANDARD OPERATING PROCEDURES.
  - d. ALL PERMITTED VEHICLES SHALL BE CLEARLY MARKED WITH THE COMPANY NAME, LOGO, OR OTHER IDENTIFICATION ACCEPTABLE TO THE MAA. VEHICLE IDENTIFICATION SHALL BE IN ACCORDANCE WITH BWI TENANT DIRECTIVE 200.2, PARAGRAPH 3.2.8 "VEHICLE REGISTRATION PROGRAM", WHICH STATES THAT CHARACTERS ON THE SIDE ARE TO BE A MINIMUM OF 8 INCHES HIGH; CHARACTERS ON THE TOP (OR HOOD) ARE TO BE A MINIMUM OF 12 INCHES HIGH. TOP MARKINGS ARE TO BE ORIENTED LONGITUDINALLY. IN ADDITION, PERMITTED CONSTRUCTION VEHICLES SHALL, WHEN REQUESTED, DISPLAY IN FULL VIEW, ABOVE THE VEHICLE, A 3-FOOT X 3-FOOT, OR LARGER, ORANGE AND WHITE CHECKERBOARD PLASTIC FLAG. EACH CHECKERBOARD COLOR SHALL BE 1-FOOT SQUARE.
  - e. EACH VEHICLE OPERATING ON A TAXIWAY OR RUNWAY DURING THE HOURS OF DARKNESS SHALL BE EQUIPPED WITH FLASHING OR NON-FLASHING IDENTIFICATION LIGHTS ON TOP OF THE VEHICLE AND OF SUCH INTENSITY TO CONFORM TO LOCAL CODES FOR MAINTENANCE VEHICLES. DARKNESS SHALL BE DEFINED AS ONE HOUR BEFORE OFFICIAL SUNSET UNTIL ONE HOUR AFTER SUNRISE.
  - f. VEHICLES MAKING ONLY OCCASIONAL VISITS TO THE JOB SITE DO NOT NEED TO BE PERMITTED AND ARE EXEMPT FROM THE IDENTIFICATION REQUIREMENTS CONTAINED ABOVE, EXCEPT THAT THEY MUST ALSO BE LIGHTED WHEN ENTERING THE JOB SITE DURING THE HOURS OF DARKNESS.
  - g. REFER TO SPECIFICATIONS ITEM X-1 FOR SECURITY ACCESS INFORMATION.
4. RADIO COMMUNICATIONS - FOR THOSE AUTHORIZED TO OPERATE OR WORK IN THE AIRFIELD MOVEMENT AREA, RADIO COMMUNICATION WITH THE FAA CONTROL TOWER IS REQUIRED AT ALL TIMES. ALL VEHICULAR MOVEMENTS IN THE MOVEMENT AREA ARE UNDER THE DIRECT CONTROL OF THE ATCT AND REQUESTS FOR MOVEMENT MUST BE APPROVED BY THE ATCT VIA RADIO COMMUNICATION PRIOR TO ENTERING OR MOVING WITHIN THE MOVEMENT AREA. RADIOS SHALL BE FURNISHED BY THE CONTRACTOR AND SHALL BE CAPABLE OF TRANSMITTING AND RECEIVING AT A GROUND FREQUENCY OF 121.9 MHZ. THIS FREQUENCY IS TO BE UTILIZED WHEN CROSSING ACTIVE FACILITIES. SUFFICIENT RADIOS SHALL BE ON SITE AND OPERATING AT ALL TIMES SO THAT INSTRUCTIONS OR COMMUNICATIONS MAY BE DISPATCHED TO ALL CREWS WITHIN AN ACTIVE AOA WITHIN ONE MINUTE AFTER RECEIPT OF DIRECTION FROM THE TOWER.

CLIENT LOGO HERE.

DESIGNED:  
DRAWN:  
CHECKED:  
APPROVED:

REVISION NO.: REVISION DATE: DESCRIPTION:



MARYLAND DEPARTMENT OF TRANSPORTATION  
MARYLAND AVIATION ADMINISTRATION  
OFFICE OF ENGINEERING AND CONSTRUCTION MANAGEMENT  
BALTIMORE/WASHINGTON  
INTERNATIONAL AIRPORT

PROJECT TITLE:

SHEET TITLE:

SCALE:

DATE:

GENERAL CONSTRUCTION AND SAFETY  
NOTES I - SIDA

AS SHOWN

-

CONTRACT NO.:

SHEET NO.:

PROJECT COORDINATION

1. ALL COORDINATION BETWEEN THE CONTRACTOR AND MAA OFFICES SHALL BE DONE THROUGH THE ENGINEER EXCEPT AS NOTED UNDER EMERGENCY COORDINATION.
2. THE CONTRACTOR SHALL PROVIDE THE ENGINEER WITH A CURRENT LIST OF ALL EMPLOYEES WORKING ON THE AIRPORT INCLUDING SUBCONTRACTORS. THE LIST SHALL BE MAINTAINED CURRENT BY THE CONTRACTOR.
3. CONTRACTOR COORDINATION - CONSTRUCTION AND MAINTENANCE OPERATIONS BY OTHERS MAY OCCUR CONCURRENTLY AND IN THE VICINITY OF CONSTRUCTION ASSOCIATED WITH THIS PROJECT. THE CONTRACTOR SHALL COORDINATE OPERATIONS AND COOPERATE WITH MAINTENANCE CREWS AND OTHER CONTRACTORS WORKING ON THE AIRPORT.
4. COORDINATION WITH BWI AIRPORT FIRE RESCUE SERVICE (VIA THE ENGINEER):
- a. THE CONTRACTOR SHALL COMPLY WITH MARYLAND FIRE LAWS, NFPA 1 - UNIFORM FIRE CODE, ; CHAPTER 16, 'SAFETY DURING CONSTRUCTION AND DEMOLITION OPERATIONS' (CURRENT EDITIONS) AND CHAPTER 21, 'AIRPORTS'.
- b. OPEN FLAME, WELDING OR TORCH CUTTING OPERATIONS ARE PROHIBITED WITHOUT FIRST OBTAINING A BWI AIRPORT WELDING AND BURNING PERMIT. THE PERMIT IS AVAILABLE AT THE BWI FIRE MARSHAL'S OFFICE, 1334 ASHTON ROAD, SUITE C, 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.
- d. PORTABLE FLOODLIGHTING - USE OF PORTABLE FLOODLIGHTING SHALL BE COORDINATED WITH AIRPORT OPERATIONS AND THE ENGINEER TO ENSURE THAT THE LIGHTING DOES NOT COMPROMISE THE CONTROL TOWER'S VISIBILITY OR THAT IT IS NOT POSITIONED SUCH THAT IT FACES INTO ANY RUNWAY APPROACH WHERE IT MIGHT CAUSE CONFUSION TO PILOTS. THE CONTRACTOR SHALL PROVIDE PORTABLE FLOODLIGHTING AS REQUIRED FOR NIGHT CONSTRUCTION OPERATIONS.
- e. FLAGMEN AND VEHICLE ESCORTS -
- THE CONTRACTOR SHALL FURNISH FLAGMEN AS NECESSARY TO CONTROL CONSTRUCTION TRAFFIC UNLESS OTHERWISE DIRECTED BY THE ENGINEER OR AIRPORT OPERATIONS.
  - ALL CONTRACTOR VEHICLES THAT ARE REQUIRED TO CROSS ACTIVE RUNWAYS AND RUNWAY SAFETY AREAS SHALL DO SO UNDER A DIRECT CONTROL ESCORT FROM AIRPORT OPERATIONS PERSONNEL.
  - CONTRACTOR VEHICLES THAT ARE REQUIRED TO CROSS ACTIVE TAXIWAYS MUST BE EITHER ESCORTED BY AIRPORT OPERATIONS OR HAVE COMPLETED THE BWI MOVEMENT AREA TRAINING PROGRAM AND BE AUTHORIZED TO OPERATE VEHICLES IN THE MOVEMENT AREA.
  - VEHICLES REQUIRED TO OPERATE ON TAXIWAYS OR CLOSED RUNWAYS SHALL DO SO UNDER THE DIRECT CONTROL OF A COMPETENT FLAGMAN WHO HAS COMPLETED MOVEMENT AREA TRAINING AND WHO IS IN DIRECT CONTACT WITH THE FAA AIR TRAFFIC CONTROL TOWER (ATCT) GROUND CONTROL.
  - VEHICLES REQUIRED TO OPERATE ON TAXILANES, APRONS, OR NON-MOVEMENT AREA HAUL ROUTES SHALL DO SO UNDER THE DIRECT CONTROL OF A COMPETENT FLAGMAN.

- f. FACILITY CLOSURES - REQUESTS FOR FACILITY CLOSURES SHALL BE MADE AT LEAST FOURTEEN CALENDAR DAYS IN ADVANCE OF THE PROPOSED CLOSING TO ALLOW AIRPORT OPERATIONS TIME TO ISSUE A TENANT INFORMATION ADVISORY. CLOSURES SHALL BE CONFIRMED FOUR WORKING DAYS PRIOR TO THE CLOSURE. THE CONTRACTOR MAY BE REQUIRED TO MEET WITH AIRPORT OPERATIONS AND THE FAA TO EVALUATE AND ESTABLISH ANY RUNWAY AND TAXIWAY CLOSURE TIMES AND DURATIONS. TO THE EXTENT POSSIBLE, THE CONTRACTOR SHALL COORDINATE CONSTRUCTION TO COINCIDE WITH RUNWAY AND TAXIWAY CLOSURES ALREADY SCHEDULED FOR CONSTRUCTION AND MAINTENANCE OPERATIONS BY OTHERS.
- g. UPON COMPLETION OF ANY STAGE OR PHASE OF WORK, THE ENGINEER WILL ARRANGE A PHYSICAL INSPECTION OF THE AREA WITH AIRPORT OPERATIONS PERSONNEL PRIOR TO THE OPENING OF ANY TAXIWAY, RUNWAY, RAMP AREA OR AIRPORT ROADWAY THAT HAS BEEN CLOSED FOR WORK OR USED FOR A CROSSING POINT OR HAUL ROUTE BY THE CONTRACTOR.
- h. UPON COMPLETION OF WORK AND RETURN OF ALL RELATED AREAS TO STANDARD CONDITIONS, THE CONTRACTOR SHALL NOTIFY MAA (IN WRITING) AND DESCRIBE THE AREA THAT IS COMPLETE AND AVAILABLE FOR NORMAL AIRPORT OPERATIONS.

6. UTILITIES:

- a. UNDERGROUND UTILITIES - LOCATIONS OF KNOWN UNDERGROUND UTILITIES SHOWN ON THE PLANS ARE APPROXIMATE. ALL UTILITY LOCATIONS SHALL BE FIELD VERIFIED BY THE CONTRACTOR PRIOR TO COMMENCING CONSTRUCTION. THE CONTRACTOR IS REQUIRED TO COMPLETE A DIGGING AUTHORIZATION FORM, AS SUPPLIED BY THE ENGINEER, PRIOR TO INITIATION OF EXCAVATION OPERATIONS.
- b. REPAIR OF UTILITIES DAMAGED DURING CONSTRUCTION MUST BE STARTED IMMEDIATELY AND CONTINUE UNTIL COMPLETED.
- i. ALL SUCH REPAIRS SHALL BE IN ACCORDANCE WITH THE CONTRACT SPECIFICATIONS OR AS DIRECTED BY THE ENGINEER AND SHALL BE AT THE CONTRACTOR'S EXPENSE.
- ii. IF FAA CABLES ARE DAMAGED, REPAIRS SHALL BE DONE IN ACCORDANCE WITH FAA REQUIREMENTS AND IN THE PRESENCE OF AN FAA REPRESENTATIVE. THE FAA MAY ELECT TO HAVE THE REPAIR PERFORMED BY OTHERS IN WHICH CASE THE CONTRACTOR SHALL BE RESPONSIBLE FOR PAYING THE INCURRED COSTS OF REPAIRS.
- c. UTILITIES NOTIFICATION - AT LEAST TWO WORKING DAYS PRIOR TO COMMENCING CONSTRUCTION OPERATIONS IN AN AREA WHICH MAY INVOLVE UNDERGROUND UTILITIES, THE CONTRACTOR SHALL NOTIFY THE ENGINEER AND THE OWNER OF EACH UNDERGROUND UTILITY AFFECTED.

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

UTILITY OWNERSHIP:

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

EMERGENCY CONTACT INFORMATION

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

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

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

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

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

RELATED DOCUMENTS

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

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

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

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

- i. ESTABLISHES STANDARDS FOR DETERMINING OBSTRUCTIONS TO NAVIGABLE AIRSPACE. IMAGINARY SURFACES ARE DEFINED IN THE PUBLICATION AND ARE SHOWN ON THIS SHEET.
- ii. ESTABLISHES REQUIREMENTS FOR FILING NOTICE TO THE FAA FOR CERTAIN PROPOSED CONSTRUCTION OR ALTERATION PROPOSALS. COMPLETION OF THE 'NOTICE OF PROPOSED CONSTRUCTION OR ALTERATION' FORM (FAA FORM 7460-1) IS DISCUSSED IN AC 70/7460-1 'OBSTRUCTION MARKING AND LIGHTING', CURRENT EDITION.

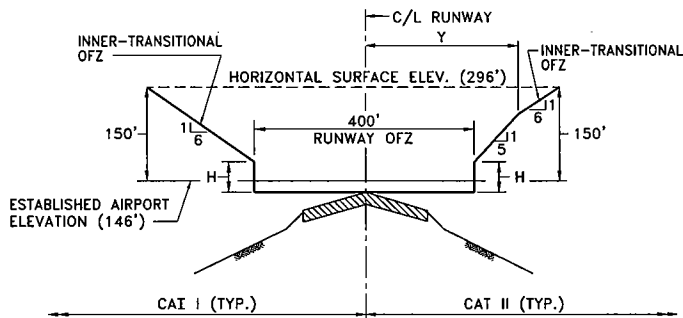
- c. AC 70/7460-2, 'PROPOSED CONSTRUCTION OF OBJECTS THAT MAY AFFECT THE NAVIGABLE AIRSPACE', CURRENT EDITION, PROVIDES INFORMATION TO PERSONS PROPOSING TO ERECT OR ALTER AN OBJECT THAT MAY AFFECT NAVIGABLE AIRSPACE. THE AC EXPLAINS THE REQUIREMENT TO NOTIFY THE FAA BEFORE CONSTRUCTION BEGINS AND THE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

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

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

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

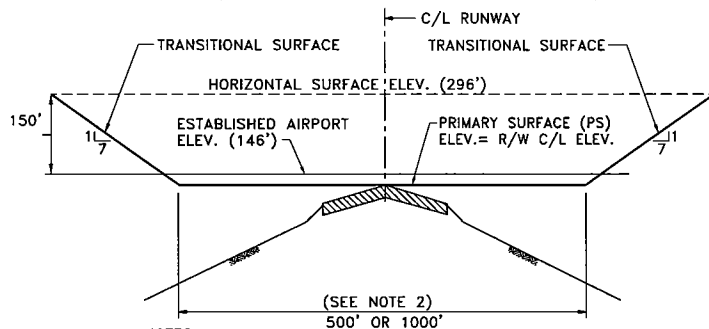
- iii. SAFETY AREA - THE SURFACE ADJACENT TO RUNWAYS, TAXIWAYS, AND TAXILANES OVER WHICH AIRCRAFT SHOULD, IN DRY WEATHER, BE ABLE TO CROSS AT NORMAL SPEEDS WITHOUT INCURRING ANY SIGNIFICANT DAMAGE. A SAFETY AREA IS GRADED, DRAINED AND COMPACTED. IT IS FREE OF ANY HOLES, TRENCHES, BUMPS OR OTHER SIGNIFICANT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



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

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

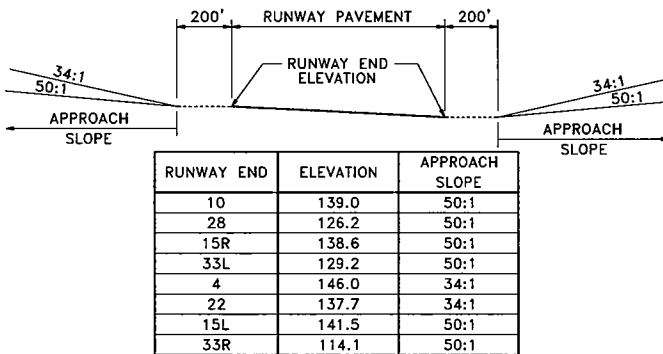
TYPICAL SECTION OBSTACLE FREE ZONE (OFZ) NOT TO SCALE



NOTES:

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

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



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

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

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REVISION NO.:	REVISION DATE:
	DESCRIPTION:



MARYLAND DEPARTMENT OF TRANSPORTATION  
MARYLAND AVIATION ADMINISTRATION  
OFFICE OF ENGINEERING AND CONSTRUCTION MANAGEMENT  
BALTIMORE/WASHINGTON INTERNATIONAL AIRPORT

PROJECT TITLE:

SHEET TITLE:

SCALE:

DATE:

CONTRACT NO.:

SHEET NO.:

GENERAL CONSTRUCTION NOTES

1. THIS PROJECT IS FOR WORK AT BALTIMORE/WASHINGTON INTERNATIONAL THURGOOD MARSHALL AIRPORT, HEREAFTER REFERRED TO AS 'THE AIRPORT' OR 'BWI'.
2. THIS PROJECT SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE CONTRACT PLANS AND SPECIFICATIONS AND ANY RULES, REGULATIONS, STANDARDS, OR SPECIFICATIONS REFERENCED THEREIN. THE PROJECT IS SUBJECT TO INSPECTION BY REPRESENTATIVES OF THE MARYLAND AVIATION ADMINISTRATION (MAA), THE FEDERAL AVIATION ADMINISTRATION (FAA), AND OTHER GOVERNING AGENCIES.
3. PROJECT PHASING – THE PROJECT IS TO BE COMPLETED IN CLOSE CONFORMANCE WITH THE PHASING PLANS, IF PROVIDED, AND NOTES AS CONTAINED IN THE CONTRACT DOCUMENTS. CHANGES TO THE PHASING PLANS SHALL BE COORDINATED WITH THE ENGINEER AND REVIEWED WITH THE DESIGNER PRIOR TO IMPLEMENTATION.
4. PROJECT COMPLETION TIMES – THE CONTRACTOR IS EXPECTED TO COMPLETE CRITICAL PORTIONS OF THE PROJECT WITHIN THE SPECIFIED TIMEFRAMES AND TO COMPLETE THE ENTIRE PROJECT ON TIME. LIQUIDATED DAMAGES, IF SPECIFIED, WILL BE ASSESSED SHOULD THE TIMEFRAME BE EXCEEDED.
5. CONSTRUCTION LIMITS – ALL CONTRACTOR VEHICLES SHALL REMAIN WITHIN THE DESIGNATED CONSTRUCTION LIMITS OR HAUL ROUTES (UNLESS OTHERWISE AUTHORIZED).
6. DIMENSIONS IDENTIFIED ON THE PLANS SHALL BE VERIFIED IN THE FIELD. IN GENERAL, SMALL-SCALE DRAWINGS WITH GREATER RESOLUTION (I.E. 1"=50') GOVERN OVER LARGER SCALE DRAWINGS OF LESS RESOLUTION (I.E. 1"=500'), WRITTEN NOTES GOVERN OVER GRAPHIC REPRESENTATION AND SPECIFICATIONS GOVERN OVER DRAWINGS. ANY DISCREPANCIES SHALL BE REPORTED TO THE ENGINEER FOR CLARIFICATION.
7. EXISTING TOPOGRAPHIC FIELD SURVEYS WERE PROVIDED BY [REDACTED] 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. [REDACTED]
8. ALL THE PERMITS AND LICENSES REQUIRED FOR THE PROJECT WORK SHALL BE OBTAINED AT THE CONTRACTOR'S EXPENSE.
9. [REDACTED]

GENERAL AIRFIELD SAFETY DURING CONSTRUCTION

1. THE CONTRACTOR SHALL ACQUAINT SUPERVISORS AND EMPLOYEES WITH ACTIVITY AND OPERATIONS THAT ARE INHERENT TO THE AIRPORT AND SHALL CONDUCT CONSTRUCTION ACTIVITIES TO CONFORM TO ALL ROUTINE AND EMERGENCY AIR TRAFFIC REQUIREMENTS AND GUIDELINES FOR SAFETY SPECIFIED HEREIN.
2. THE CONTRACTOR AND HIS/HER SUBCONTRACTOR(S) SHALL PROTECT WORKERS, MAA AND AIRPORT TENANT EMPLOYEES, AND THE GENERAL PUBLIC. THE CONTRACTOR SHALL ALSO ENSURE THAT PROPERTY OR EQUIPMENT, UNRELATED TO WORK, WHICH BELONGS TO MAA OR AIRPORT TENANTS IS NOT DAMAGED DURING CONSTRUCTION.
3. THE CONTRACTOR SHALL NOT ALLOW EMPLOYEES, SUBCONTRACTORS, SUPPLIERS, OR ANY OTHER UNAUTHORIZED PERSON TO ENTER OR REMAIN IN ANY AIRPORT AREA WHICH WOULD BE HAZARDOUS TO PERSONS OR TO AIRCRAFT OPERATIONS.
4. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING ALL NECESSARY PROTECTIVE GEAR AND EQUIPMENT REQUIRED FOR THE PROTECTION OF THE CONTRACTOR'S PERSONNEL DURING CONSTRUCTION.
5. THE CONTRACTOR SHALL INSPECT ALL CONSTRUCTION AND STORAGE AREAS AS OFTEN AS NECESSARY AND PROMPTLY TAKE ALL STEPS NECESSARY TO PREVENT OR REMEDY ANY UNSAFE OR POTENTIALLY UNSAFE CONDITIONS OR ACTIVITIES DISCOVERED.

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

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

2. ALL OFF-SITE HAUL ROUTES SHALL BE SELECTED TO MINIMIZE DISTURBANCE TO THE PUBLIC. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO COORDINATE OFF-SITE HAUL ROUTES (STATE HIGHWAYS, COUNTY ROADS, OR CITY STREETS) WITH THE APPROPRIATE OWNER WHO HAS JURISDICTION OVER THE AFFECTED ROUTE. THE CONTRACTOR'S ON-AIRPORT HAUL ROUTES ARE INDICATED ON THE PROJECT SECURITY PLAN.
3. ON-SITE ROADS AND OTHER AIRFIELD PAVEMENTS USED AS HAUL ROUTES SHALL BE MAINTAINED BY THE CONTRACTOR AND SHALL BE RESTORED AT THE CONTRACTOR'S EXPENSE TO THEIR ORIGINAL CONDITION UPON COMPLETION OF BEING USED AS A HAUL ROUTE, UNLESS OTHERWISE DIRECTED BY THE CONTRACT DOCUMENTS OR BY THE ENGINEER. THE BEFORE AND AFTER CONDITION OF ALL ON-SITE HAUL ROUTES (TEMPORARY OR PERMANENT) SHALL BE JOINTLY INSPECTED AND DETERMINED BY THE CONTRACTOR AND THE ENGINEER THROUGH THE USE OF DIGITAL PHOTOGRAPHY AND/OR VIDEO. THE CONTRACTOR MAY NEED TO COORDINATE HAUL ROUTE USAGE WITH OTHER CONTRACTORS WORKING ON THE AIRPORT.
4. FENCING, DRAINAGE, GRADING AND OTHER MISCELLANEOUS CONSTRUCTION REQUIRED TO CONSTRUCT OR RESTORE TEMPORARY OR PERMANENT HAUL ROUTES OR ACCESS POINTS ON THE AIRPORT WILL BE THE CONTRACTOR'S RESPONSIBILITY AND SHALL BE APPROVED BY THE ENGINEER PRIOR TO COMMENCING THE WORK.
5. ALL ON-SITE ACCESS ROADS TO AIRPORT FACILITIES SHALL REMAIN OPEN AND MAINTAINED AT ALL TIMES.
6. CONTRACTOR'S STAGING AREA – AN AREA WILL BE MADE AVAILABLE FOR CONTRACTOR'S MOBILIZATION AND STORAGE. THE CONTRACTOR'S STAGING AREA SHALL BE FREE OF DEBRIS. IF DIRECTED BY THE ENGINEER, THE CONTRACTOR WILL BE REQUIRED TO STAKE OUT AND FLAG THE STAGING AREA LIMITS. UPON COMPLETION OF THE PROJECT, THE STAGING AREA SHALL BE RESTORED TO ITS ORIGINAL CONDITION.
7. ALL MATERIALS AND EQUIPMENT WHEN NOT IN USE SHALL BE PLACED IN APPROVED AREAS.

PROJECT COORDINATION

1. ALL COORDINATION BETWEEN THE CONTRACTOR AND MAA OFFICES SHALL BE DONE THROUGH THE ENGINEER EXCEPT AS NOTED UNDER EMERGENCY COORDINATION
2. THE CONTRACTOR SHALL PROVIDE THE ENGINEER WITH A CURRENT LIST OF ALL EMPLOYEES WORKING ON THE AIRPORT INCLUDING SUBCONTRACTORS. THE LIST SHALL BE MAINTAINED CURRENT BY THE CONTRACTOR.
3. CONTRACTOR COORDINATION – CONSTRUCTION AND MAINTENANCE OPERATIONS BY OTHERS MAY OCCUR CONCURRENTLY AND IN THE VICINITY OF CONSTRUCTION ASSOCIATED WITH THIS PROJECT. THE CONTRACTOR SHALL COORDINATE OPERATIONS AND COOPERATE WITH MAINTENANCE CREWS AND OTHER CONTRACTORS WORKING ON THE AIRPORT.
4. COORDINATION WITH BWI AIRPORT FIRE RESCUE SERVICE (VIA THE ENGINEER):
- a. THE CONTRACTOR SHALL COMPLY WITH MARYLAND FIRE LAWS, NFPA 1 – UNIFORM FIRE CODE, ; CHAPTER 16, 'SAFETY DURING CONSTRUCTION AND DEMOLITION OPERATIONS' (CURRENT EDITIONS) AND CHAPTER 21, 'AIRPORTS'.
- b. OPEN FLAME, WELDING OR TORCH CUTTING OPERATIONS ARE PROHIBITED WITHOUT FIRST OBTAINING A BWI AIRPORT WELDING AND BURNING PERMIT. THE PERMIT IS AVAILABLE AT THE BWI FIRE MARSHAL'S OFFICE, 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	1-800-257-7777
BGE	(410) 685-0123
	(410) 234-5000
	1-800-685-0123
VERIZON REPAIR BURIED CABLE	(410) 954-2222
	1-800-275-2355
FAA AIRWAY FACILITIES SSC	(410) 859-7252
COMCAST	(410) 931-4600
	(410) 729-8000
MILLENIUM DIGITAL MEDIA	(410) 987-9300
ANNE ARUNDEL COUNTY UTILITY OPERATIONS BUREAU (WATER SUPPLY FROM AIRPORT PERIMETER TO METER)	
EMERGENCIES	(410) 222-8400
GENERAL INFORMATION	(410) 222-7520

EMERGENCY CONTACT INFORMATION

1. EXCEPT FOR EMERGENCIES, ALL CONTACT WITH AIRPORT PERSONNEL SHALL BE MADE THROUGH THE ENGINEER. FOR EMERGENCIES INVOLVING SAFETY (INJURIES, FIRES, SECURITY BREACHES, ETC.) THE CONTRACTOR SHALL MAKE DIRECT CONTACT WITH AIRPORT OPERATIONS FOLLOWED BY NOTIFICATION TO THE ENGINEER AS SOON AS POSSIBLE.
2. THE PROJECT SUPERVISORS SHALL HAVE THE FOLLOWING TELEPHONE NUMBERS WITH THEM AT ALL TIMES:
- i. MAA FIRE MARSHALL (410) 859-7815/7511
- ii. BWI FIRE/RESCUE/MEDICAL EMERGENCY (410) 859-7222
- iii. BWI POLICE EMERGENCY (410) 859-7040
- iv. BWI DUTY AIRPORT OPERATIONS MGR (410) 859-7018
- v. CONSOLIDATED DISPATCH CENTER (410) 859-7117
- vi. BWI OFFICE OF AIRPORT SECURITY (410) 859-7162
- vii. MDE OIL CONTROL PROGRAM (410) 537-3442
- (COMPLIANCE AND REMEDIATION)

CLIENT LOGO HERE.	DESIGNED:				 BALTIMORE/WASHINGTON INTERNATIONAL Thurgood Marshall AIRPORT	MARYLAND DEPARTMENT OF TRANSPORTATION MARYLAND AVIATION ADMINISTRATION OFFICE OF ENGINEERING AND CONSTRUCTION MANAGEMENT  BALTIMORE/WASHINGTON INTERNATIONAL AIRPORT	PROJECT TITLE:	-	CONTRACT NO.:	
	DRAWN:									
	CHECKED:							SHEET TITLE:	GENERAL CONSTRUCTION AND SAFETY NOTES – STERILE BUILDING AREA	SHEET NO.:
	APPROVED:							SCALE:	AS SHOWN	
	REVISION NO.:	REVISION DATE:		DESCRIPTION:						

GENERAL CONSTRUCTION NOTES

1. THIS PROJECT IS FOR WORK AT BALTIMORE/WASHINGTON INTERNATIONAL THURGOOD MARSHALL AIRPORT, HEREAFTER REFERRED TO AS 'THE AIRPORT' OR 'BWI'.
2. THIS PROJECT SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE CONTRACT PLANS AND SPECIFICATIONS AND ANY RULES, REGULATIONS, STANDARDS, OR SPECIFICATIONS REFERENCED THEREIN. THE PROJECT IS SUBJECT TO INSPECTION BY REPRESENTATIVES OF THE MARYLAND AVIATION ADMINISTRATION (MAA), THE FEDERAL AVIATION ADMINISTRATION (FAA), AND OTHER GOVERNING AGENCIES.
3. PROJECT PHASING - THE PROJECT IS TO BE COMPLETED IN CLOSE CONFORMANCE WITH THE PHASING PLANS, IF PROVIDED, AND NOTES AS CONTAINED IN THE CONTRACT DOCUMENTS. CHANGES TO THE PHASING PLANS SHALL BE COORDINATED WITH THE ENGINEER AND REVIEWED WITH THE DESIGNER PRIOR TO IMPLEMENTATION.
4. PROJECT COMPLETION TIMES - THE CONTRACTOR IS EXPECTED TO COMPLETE CRITICAL PORTIONS OF THE PROJECT WITHIN THE SPECIFIED TIMEFRAMES AND TO COMPLETE THE ENTIRE PROJECT ON TIME. LIQUIDATED DAMAGES, IF SPECIFIED, WILL BE ASSESSED SHOULD THE TIMEFRAME BE EXCEEDED.
5. CONSTRUCTION LIMITS - ALL CONTRACTOR VEHICLES SHALL REMAIN WITHIN THE DESIGNATED CONSTRUCTION LIMITS OR HAUL ROUTES (UNLESS OTHERWISE AUTHORIZED).
6. DIMENSIONS IDENTIFIED ON THE PLANS SHALL BE VERIFIED IN THE FIELD. IN GENERAL, SMALL-SCALE DRAWINGS WITH GREATER RESOLUTION (I.E. 1"=50') GOVERN OVER LARGER SCALE DRAWINGS OF LESS RESOLUTION (I.E. 1"=500'). WRITTEN NOTES GOVERN OVER GRAPHIC REPRESENTATION AND SPECIFICATIONS GOVERN OVER DRAWINGS. ANY DISCREPANCIES SHALL BE REPORTED TO THE ENGINEER FOR CLARIFICATION.
7. EXISTING TOPOGRAPHIC FIELD SURVEYS WERE PROVIDED BY [REDACTED]. 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.
8. THE CONTRACTOR SHALL PROVIDE AN ADEQUATE NUMBER OF WATER TRUCKS TO CONTROL DUST IN THE PROJECT WORK AREA, STAGING AREA, STORAGE AREAS, HAUL ROUTES AND THE WASTE SITE.
9. ALL THE PERMITS AND LICENSES REQUIRED FOR THE PROJECT WORK SHALL BE OBTAINED AT THE CONTRACTOR'S EXPENSE.
10. [REDACTED]

GENERAL AIRFIELD SAFETY DURING CONSTRUCTION

1. THE CONTRACTOR SHALL ACQUAINT SUPERVISORS AND EMPLOYEES WITH ACTIVITY AND OPERATIONS THAT ARE INHERENT TO THE AIRPORT AND SHALL CONDUCT CONSTRUCTION ACTIVITIES TO CONFORM TO ALL ROUTINE AND EMERGENCY AIR TRAFFIC REQUIREMENTS AND GUIDELINES FOR SAFETY SPECIFIED HEREIN.
2. THE CONTRACTOR AND HIS/HER SUBCONTRACTOR(S) SHALL PROTECT WORKERS, MAA AND AIRPORT TENANT EMPLOYEES, AND THE GENERAL PUBLIC. THE CONTRACTOR SHALL ALSO ENSURE THAT PROPERTY OR EQUIPMENT, UNRELATED TO WORK, WHICH BELONGS TO MAA OR AIRPORT TENANTS IS NOT DAMAGED DURING CONSTRUCTION.
3. THE CONTRACTOR SHALL NOT ALLOW EMPLOYEES, SUBCONTRACTORS, SUPPLIERS, OR ANY OTHER UNAUTHORIZED PERSON TO ENTER OR REMAIN IN ANY AIRPORT AREA WHICH WOULD BE HAZARDOUS TO PERSONS OR TO AIRCRAFT OPERATIONS.
4. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING ALL NECESSARY PROTECTIVE GEAR AND EQUIPMENT REQUIRED FOR THE PROTECTION OF THE CONTRACTOR'S PERSONNEL DURING CONSTRUCTION.
5. THE CONTRACTOR SHALL INSPECT ALL CONSTRUCTION AND STORAGE AREAS AS OFTEN AS NECESSARY AND PROMPTLY TAKE ALL STEPS NECESSARY TO PREVENT OR REMEDY ANY UNSAFE OR POTENTIALLY UNSAFE CONDITIONS OR ACTIVITIES DISCOVERED.
6. THE CONTRACTOR SHALL BE AWARE OF THE FOLLOWING TYPES OF SAFETY PROBLEMS AND/OR HAZARDS:
- a. UNMARKED UTILITY, NAVAID, WEATHER SERVICE, RUNWAY LIGHTING, OR OTHER POWER OR SIGNAL CABLES THAT COULD BE DAMAGED DURING CONSTRUCTION.

- b. OBJECTS, WHETHER OR NOT MARKED OR FLAGGED, OR ACTIVITIES ANYWHERE ON OR IN THE VICINITY OF THE AIRPORT WHICH COULD BE DISTRACTING, CONFUSING, OR ALARMING TO PILOTS DURING AIRCRAFT OPERATIONS.
- c. UNFLAGGED/UNLIGHTED LOW VISIBILITY ITEMS SUCH AS TALL CRANES, DRILLS, ETC. ANYWHERE IN THE VICINITY OF ACTIVE RUNWAYS OR IN ANY APPROACH OR DEPARTURE AREA. SUCH EQUIPMENT SHALL BE PARKED IN THE CONTRACTOR'S STAGING AREA AND THE BOOM(S) LOWERED TO THE GROUND WHEN NOT IN USE.
- d. MISLEADING OR MALFUNCTIONING LIGHTS OR UNLIGHTED/UNMARKED OBSTRUCTIONS IN THE APPROACH TO ANY ACTIVE RUNWAY.
- e. BIRD ATTRACTANTS SUCH AS EDIBLES (FOOD SCRAPS, ETC.), MISCELLANEOUS TRASH, OR PONDED WATER. FOOD SCRAPS AND MISCELLANEOUS TRASH SHALL BE SECURED BY THE CONTRACTOR AND DISPOSED OF USING PROPER SANITARY METHODS.

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

1. ACCESS TO THE SITE - THE CONTRACTOR'S ACCESS POINTS TO THE SITE SHALL BE AS SHOWN ON THE [REDACTED]. 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 [REDACTED].
3. ON-SITE ROADS AND OTHER PAVEMENTS USED AS HAUL ROUTES SHALL BE MAINTAINED BY THE CONTRACTOR AND SHALL BE RESTORED AT THE CONTRACTOR'S EXPENSE TO THEIR ORIGINAL CONDITION UPON COMPLETION OF BEING USED AS A HAUL ROUTE, UNLESS OTHERWISE DIRECTED BY THE CONTRACT DOCUMENTS OR BY THE ENGINEER. THE BEFORE AND AFTER CONDITION OF ALL ON-SITE HAUL ROUTES (TEMPORARY OR PERMANENT) SHALL BE JOINTLY INSPECTED AND DETERMINED BY THE CONTRACTOR AND THE ENGINEER THROUGH THE USE OF DIGITAL PHOTOGRAPHY AND/OR VIDEO. THE CONTRACTOR MAY NEED TO COORDINATE HAUL ROUTE USAGE WITH OTHER CONTRACTORS WORKING ON THE AIRPORT.
4. FENCING, DRAINAGE, GRADING AND OTHER MISCELLANEOUS CONSTRUCTION REQUIRED TO CONSTRUCT OR RESTORE TEMPORARY OR PERMANENT HAUL ROUTES OR ACCESS POINTS ON THE AIRPORT WILL BE THE CONTRACTOR'S RESPONSIBILITY AND SHALL BE APPROVED BY THE ENGINEER PRIOR TO COMMENCING THE WORK.
5. ALL ON-SITE ACCESS ROADS TO AIRPORT FACILITIES SHALL REMAIN OPEN AND MAINTAINED AT ALL TIMES.
6. CONTRACTOR'S STAGING AREA - AN AREA WILL BE MADE AVAILABLE FOR CONTRACTOR'S MOBILIZATION AND STORAGE. THE CONTRACTOR'S STAGING AREA SHALL BE FREE OF DEBRIS. IF DIRECTED BY THE ENGINEER, THE CONTRACTOR WILL BE REQUIRED TO STAKE OUT AND FLAG THE STAGING AREA LIMITS. UPON COMPLETION OF THE PROJECT, THE STAGING AREA SHALL BE RESTORED TO ITS ORIGINAL CONDITION.
7. ALL MATERIALS AND EQUIPMENT (INCLUDING STOCKPILED MATERIAL) WHEN NOT IN USE SHALL BE PLACED IN APPROVED AREAS WHERE THEY WILL NOT CONSTITUTE A HAZARD TO AIRCRAFT OPERATIONS AND NOT PENETRATE CLEARANCE SURFACES SHOWN ON THE GENERAL CONSTRUCTION AND SAFETY NOTES.
- THE FAR PART 77 APPROACH, PRIMARY, AND TRANSITIONAL SURFACES GOVERN STOCKPILES AND PARKED EQUIPMENT. UNDER NO CIRCUMSTANCES SHALL STOCKPILES, PARKED EQUIPMENT, OR OTHER CONSTRUCTION ITEMS PENETRATE THESE SURFACES ADJACENT TO AN ACTIVE RUNWAY.
- EQUIPMENT SHALL BE PARKED AT THE CONTRACTOR'S STAGING AREA WHEN NOT IN USE. TALL EQUIPMENT SUCH AS CRANES SHALL BE LOWERED TO THE GROUND WHEN NOT IN USE. STOCKPILED MATERIAL SHALL BE CONSTRAINED IN A MANNER TO PREVENT MOVEMENT RESULTING FROM WIND CONDITIONS IN EXCESS OF 10 KNOTS.

PROJECT COORDINATION

1. ALL COORDINATION BETWEEN THE CONTRACTOR AND MAA OFFICES SHALL BE DONE THROUGH THE ENGINEER EXCEPT AS NOTED UNDER EMERGENCY COORDINATION.
2. THE CONTRACTOR SHALL PROVIDE THE ENGINEER WITH A CURRENT LIST OF ALL EMPLOYEES WORKING ON THE AIRPORT INCLUDING SUBCONTRACTORS. THE LIST SHALL BE MAINTAINED CURRENT BY THE CONTRACTOR.
3. CONTRACTOR COORDINATION - CONSTRUCTION AND MAINTENANCE OPERATIONS BY OTHERS MAY OCCUR CONCURRENTLY AND IN THE VICINITY OF CONSTRUCTION ASSOCIATED WITH THIS PROJECT. THE CONTRACTOR SHALL COORDINATE OPERATIONS AND COOPERATE WITH MAINTENANCE CREWS AND OTHER CONTRACTORS WORKING ON THE AIRPORT.
4. COORDINATION WITH BWI AIRPORT FIRE RESCUE SERVICE (VIA THE ENGINEER):
- a. THE CONTRACTOR SHALL COMPLY WITH MARYLAND FIRE LAWS, NFPA 1 - UNIFORM FIRE CODE, ; CHAPTER 16, 'SAFETY DURING CONSTRUCTION AND DEMOLITION OPERATIONS' (CURRENT EDITIONS) AND CHAPTER 21, 'AIRPORTS'.
- b. OPEN FLAME, WELDING OR TORCH CUTTING OPERATIONS ARE PROHIBITED WITHOUT FIRST OBTAINING A BWI AIRPORT WELDING AND BURNING PERMIT. THE PERMIT IS AVAILABLE AT THE BWI FIRE MARSHAL'S OFFICE, 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 518 STANDARD FOR FIRE PREVENTION DURING WELDING, CUTTING, AND OTHER HOT WORK. ADEQUATE FIRE AND SAFETY PRECAUTIONS MUST BE TAKEN AND THE PROCEDURE APPROVED PRIOR TO COMMENCEMENT OF WORK. A FIRE WATCH IS REQUIRED.
- c. A HYDRANT USE PERMIT IS REQUIRED PRIOR TO CONNECTION TO ANY AIRPORT FIRE HYDRANT.
5. PORTABLE FLOODLIGHTING - USE OF PORTABLE FLOODLIGHTING SHALL BE COORDINATED WITH AIRPORT OPERATIONS AND THE ENGINEER TO ENSURE THAT THE LIGHTING DOES NOT COMPROMISE THE CONTROL TOWER'S VISIBILITY OR THAT IT IS NOT POSITIONED SUCH THAT IT FACES INTO ANY RUNWAY APPROACH WHERE IT MIGHT CAUSE CONFUSION TO PILOTS. THE CONTRACTOR SHALL PROVIDE PORTABLE FLOODLIGHTING AS REQUIRED FOR NIGHT CONSTRUCTION OPERATIONS.
6. FLAGMEN AND VEHICLE ESCORTS - THE CONTRACTOR SHALL FURNISH FLAGMEN AS NECESSARY TO CONTROL CONSTRUCTION TRAFFIC UNLESS OTHERWISE DIRECTED BY THE ENGINEER OR AIRPORT OPERATIONS.
7. UTILITIES:
- a. UNDERGROUND UTILITIES - LOCATIONS OF KNOWN UNDERGROUND UTILITIES SHOWN ON THE PLANS ARE APPROXIMATE. ALL UTILITY LOCATIONS SHALL BE FIELD VERIFIED BY THE CONTRACTOR PRIOR TO COMMENCING CONSTRUCTION. THE CONTRACTOR IS REQUIRED TO COMPLETE A DIGGING AUTHORIZATION FORM, AS SUPPLIED BY THE ENGINEER, PRIOR TO INITIATION OF EXCAVATION OPERATIONS.
- b. REPAIR OF UTILITIES DAMAGED DURING CONSTRUCTION MUST BE STARTED IMMEDIATELY AND CONTINUE UNTIL COMPLETED.
- i. ALL SUCH REPAIRS SHALL BE IN ACCORDANCE WITH THE CONTRACT SPECIFICATIONS OR AS DIRECTED BY THE ENGINEER AND SHALL BE AT THE CONTRACTOR'S EXPENSE.
- ii. IF FAA CABLES ARE DAMAGED, REPAIRS SHALL BE DONE IN ACCORDANCE WITH FAA REQUIREMENTS AND IN THE PRESENCE OF AN FAA REPRESENTATIVE. THE FAA MAY ELECT TO HAVE THE REPAIR PERFORMED BY OTHERS IN WHICH CASE THE CONTRACTOR SHALL BE RESPONSIBLE FOR PAYING THE INCURRED COSTS OF REPAIRS.
- c. UTILITIES NOTIFICATION - AT LEAST TWO WORKING DAYS PRIOR TO COMMENCING CONSTRUCTION OPERATIONS IN AN AREA WHICH MAY INVOLVE UNDERGROUND UTILITIES, THE CONTRACTOR SHALL NOTIFY THE ENGINEER AND THE OWNER OF EACH UNDERGROUND UTILITY AFFECTED.

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

UTILITY OWNERSHIP:

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

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

EMERGENCY CONTACT INFORMATION

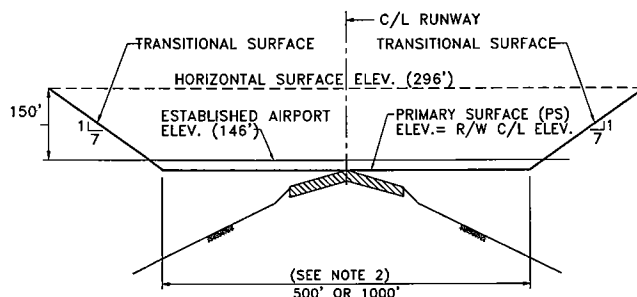
1. EXCEPT FOR EMERGENCIES, ALL CONTACT WITH AIRPORT PERSONNEL SHALL BE MADE THROUGH THE ENGINEER. FOR EMERGENCIES INVOLVING SAFETY (INJURIES, FIRES, SECURITY BREACHES, ETC.) THE CONTRACTOR SHALL MAKE DIRECT CONTACT WITH AIRPORT OPERATIONS FOLLOWED BY NOTIFICATION TO THE ENGINEER AS SOON AS POSSIBLE.
2. THE PROJECT SUPERVISORS SHALL HAVE THE FOLLOWING TELEPHONE NUMBERS WITH THEM AT ALL TIMES:
- i. MAA FIRE MARSHAL (410) 859-7815/7511  
ii. BWI FIRE/RESCUE/MEDICAL EMERGENCY (410) 859-7222  
iii. BWI POLICE EMERGENCY (410) 859-7040  
iv. BWI DUTY AIRPORT OPERATIONS MGR (410) 859-7018  
v. CONSOLIDATED DISPATCH CENTER (410) 859-7117  
vi. BWI OFFICE OF AIRPORT SECURITY (410) 859-7162  
vii. FAA AIR TRAFFIC CONTROL TOWER (410) 859-7636  
viii. MDE OIL CONTROL PROGRAM (COMPLIANCE AND REMEDIATION) (410) 537-3442
3. THE CONTRACTOR SHALL PROVIDE THE PHONE NUMBERS OF THREE PERSONNEL, INCLUDING THE PROJECT SUPERINTENDENT, WHO MAY BE CONTACTED IN AN EMERGENCY.
4. [REDACTED]

RELATED DOCUMENTS

1. FAA ADVISORY CIRCULARS (AC's), ORDERS AND FEDERAL AVIATION REGULATIONS (FAR's) - THE FOLLOWING PUBLICATIONS CONTAIN DEFINITIONS OR DESCRIPTIONS OF CRITICAL AIRPORT OPERATING AREAS. COPIES OF THESE PUBLICATIONS ARE AVAILABLE THROUGH THE FAA AT WWW.FAA.GOV AND CAN BE REVIEWED AT THE OFFICES OF THE MAA.
- THE ITEMS OUTLINED BELOW PERTAIN TO AIRFIELD SAFETY REQUIREMENTS AND ARE REFERENCED THROUGHOUT THE CONTRACT DOCUMENTS.
- a. AC 150/5370-2, 'OPERATIONAL SAFETY ON AIRPORTS DURING CONSTRUCTION', CURRENT EDITION, SETS FORTH GUIDELINES TO ASSIST AIRPORT OPERATORS IN COMPLYING WITH FAR PART 139, 'CERTIFICATION AND OPERATION: LAND AIRPORTS SERVING CERTAIN AIR CARRIERS' AND WITH THE REQUIREMENTS OF FEDERALLY FUNDED AIRPORT CONSTRUCTION PROJECTS.
- b. FAR PART 77 'OBJECTS AFFECTING NAVIGABLE AIRSPACE', CURRENT EDITION:
- i. ESTABLISHES STANDARDS FOR DETERMINING OBSTRUCTIONS TO NAVIGABLE AIRSPACE. IMAGINARY SURFACES ARE DEFINED IN THE PUBLICATION AND ARE SHOWN ON THIS SHEET.
- ii. ESTABLISHES REQUIREMENTS FOR FILING NOTICE TO THE FAA FOR CERTAIN PROPOSED CONSTRUCTION OR ALTERATION PROPOSALS. COMPLETION OF THE 'NOTICE OF PROPOSED CONSTRUCTION OR ALTERATION' FORM (FAA FORM 7460-1) IS DISCUSSED IN AC 70/7460-1 'OBSTRUCTION MARKING AND LIGHTING', CURRENT EDITION.
- c. AC 70/7460-2, 'PROPOSED CONSTRUCTION OF OBJECTS THAT MAY AFFECT THE NAVIGABLE AIRSPACE', CURRENT EDITION, PROVIDES INFORMATION TO PERSONS PROPOSING TO ERECT OR ALTER AN OBJECT THAT MAY AFFECT NAVIGABLE AIRSPACE. THE AC EXPLAINS THE REQUIREMENT TO NOTIFY THE FAA BEFORE CONSTRUCTION BEGINS AND THE FAA'S RESPONSIBILITY TO RESPOND TO THESE NOTICES.

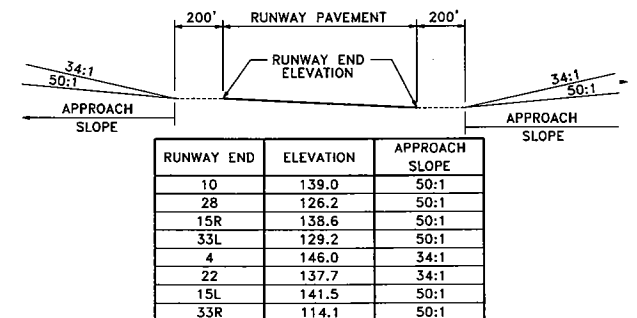
d. AC 150/5300-13, 'AIRPORT DESIGN', CURRENT EDITION, ESTABLISHES DESIGN, OPERATIONAL, AND MAINTENANCE STANDARDS FOR AIRPORTS. STANDARD TERMS USED IN THE CONTRACT PLANS AND SPECIFICATIONS ARE DEFINED BELOW.

- i. OBSTACLE FREE ZONE (OFZ) - A VOLUME OF SPACE WHICH IS FREE OF ALL FIXED OBJECTS AND CLEAR OF VEHICLES IN THE PROXIMITY OF AN AIRPLANE CONDUCTING AN APPROACH, MISSED APPROACH, LANDING, TAKEOFF, OR DEPARTURE. AN OFZ TYPICAL SECTION IS SHOWN ON THIS SHEET.
- ii. OBJECT FREE AREA (OFA) - A TWO DIMENSIONAL GROUND AREA SURROUNDING RUNWAYS, TAXIWAYS, AND TAXILANES WHICH IS CLEAR OF OBJECTS EXCEPT FOR OBJECTS WHOSE LOCATION IS FIXED BY FUNCTION.
- iii. SAFETY AREA - THE SURFACE ADJACENT TO RUNWAYS, TAXIWAYS, AND TAXILANES OVER WHICH AIRCRAFT SHOULD, IN DRY WEATHER, BE ABLE TO CROSS AT NORMAL SPEEDS WITHOUT INCURRING ANY SIGNIFICANT DAMAGE. A SAFETY AREA IS GRADED, DRAINED AND COMPACTED. IT IS FREE OF ANY HOLES, TRENCHES, BUMPS OR OTHER SIGNIFICANT SURFACE VARIATIONS OR OBJECTS OTHER THAN THOSE WHICH MUST BE THERE BECAUSE OF THEIR ESSENTIAL AERONAUTICAL FUNCTION. THE SAFETY AREA REQUIRES THE CAPABILITY OF SUPPORTING MAINTENANCE VEHICLES AND AIRCRAFT RESCUE AND FIRE FIGHTING VEHICLES UNDER NORMAL (DRY) CONDITIONS.



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

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



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

CLIENT LOGO HERE.	DESIGNED:		 BALTIMORE/WASHINGTON INTERNATIONAL AIRPORT	MARYLAND DEPARTMENT OF TRANSPORTATION MARYLAND AVIATION ADMINISTRATION OFFICE OF ENGINEERING AND CONSTRUCTION MANAGEMENT  BALTIMORE/WASHINGTON INTERNATIONAL AIRPORT	PROJECT TITLE:	-	CONTRACT NO.:			
	DRAWN:				SHEET TITLE:	GENERAL CONSTRUCTION AND SAFETY NOTES - NON SECURE AREAS		SHEET NO.:		
	CHECKED:				SCALE:	AS SHOWN			DATE:	-
	APPROVED:				REVISION NO.:				REVISION DATE:	



GENERAL NOTES

1. DESCRIPTION

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

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

2. TEMPORARY CONTROLS

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

3. STANDARDS & SPECIFICATIONS

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

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

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

4. DEFINITIONS

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

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

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

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

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

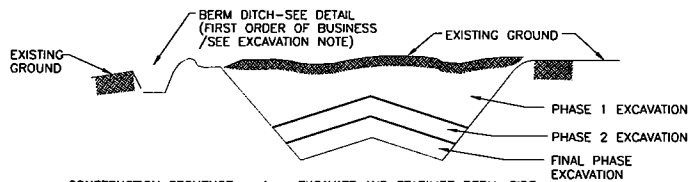
5. CLEARING AND GRUBBING

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

6. EXCAVATION

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

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



- CONSTRUCTION SEQUENCE:
1. EXCAVATE AND STABILIZE BERM, SIDE AND OUTLET DITCHES.
  2. PERFORM PHASE 1 EXCAVATION, DRESS, SEED & MULCH SLOPES WITH PERMANENT SEED & MULCH.
  3. PERFORM PHASE 2 EXCAVATION, DRESS, SEED & MULCH SLOPES WITH PERMANENT SEED & MULCH.

OVERSEED PHASE 1 SLOPES, IF REQUIRED.

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

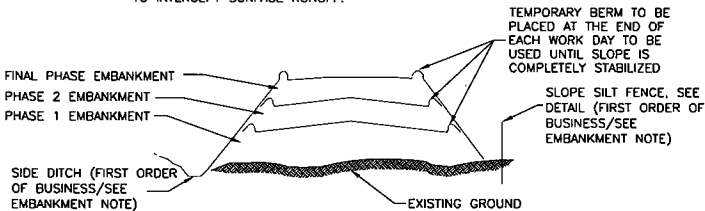
PHASING PLAN-CUT SECTION

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

7. EMBANKMENT

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

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



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

PHASING PLAN-FILL SECTION

8. STABILIZATION / LIMITS OF DISTURBANCE

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

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

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

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

9. MAINTENANCE

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

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

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

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

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

10. EROSION AND SEDIMENT CONTROL EXCAVATION

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

11. STOCKPILED MATERIAL

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

12. EXCAVATED MATERIAL

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

13. DEWATERING DISCHARGE

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

14. TEMPORARY SLOPE DRAINS

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

15. GEOTEXTILE

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

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

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

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

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

GEOTEXTILES SHALL MEET THE CLASS SPECIFIED IN THE SPECIAL PROVISIONS, PLANS OR STANDARDS, AND SHALL BE MANUFACTURED FROM

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

ALL VALUES SPECIFIED ARE MINIMUM OR MAXIMUM ROLL VALUES.

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

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

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

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

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

16. NOTE TO CONTRACTOR

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

(NOT APPLICABLE TO THIS PROJECT)

17. CONTRACTOR PAYMENT

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

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

FOR EROSION AND SEDIMENT CONTROL ONLY.

COMPANY NAME

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

DESIGNED: ---

DRAWN: ---

CHECKED: ---

APPROVED: ---

REVISION NO.

REVISION DATE

DESCRIPTIONS

BWI THURGOOD  
MARSHALL  
OR  
MARTIN STATE  
LOGO

MARYLAND DEPARTMENT OF TRANSPORTATION  
MARYLAND AVIATION ADMINISTRATION

OFFICE OF ENGINEERING AND CONSTRUCTION MANAGEMENT  
DIVISION OF FACILITIES DESIGN

PROJECT TITLE:

SHEET TITLE:

SCALE:

DATE:

DATE

CONTRACT NO.:

SHEET NO.:

STANDARD EROSION AND SEDIMENT CONTROL NOTES

1. THE CONTRACTOR SHALL NOTIFY THE ADMINISTRATION (WMA) AT (410) 537-3510 SEVEN (7) DAYS BEFORE COMMENCING ANY LAND DISTURBING ACTIVITY AND, UNLESS WAIVED BY THE ADMINISTRATION, SHALL BE REQUIRED TO HOLD A PRE-CONSTRUCTION MEETING BETWEEN PROJECT REPRESENTATIVES AND A REPRESENTATIVE OF WMA.
2. THE CONTRACTOR MUST NOTIFY WMA IN WRITING AND BY TELEPHONE AT THE FOLLOWING POINTS:
- A. THE REQUIRED PRE-CONSTRUCTION MEETING.
- B. FOLLOWING INSTALLATION OF SEDIMENT CONTROL MEASURES.
- C. DURING THE INSTALLATION OF SEDIMENT BASINS (TO BE CONVERTED INTO PERMANENT STORMWATER MANAGEMENT STRUCTURES) AT THE REQUIRED INSPECTION POINTS (SEE INSPECTION CHECKLIST ON PLAN), NOTIFICATION PRIOR TO COMMENCING CONSTRUCTION OF EACH STEP IS MANDATORY.
- D. PRIOR TO REMOVAL OR MODIFICATION OF ANY SEDIMENT CONTROL STRUCTURE(S).
- E. PRIOR TO REMOVAL OF ALL SEDIMENT CONTROL DEVICES.
- F. PRIOR TO FINAL ACCEPTANCE.
3. THE CONTRACTOR SHALL CONSTRUCT ALL EROSION AND SEDIMENT CONTROL MEASURES PER THE APPROVED PLAN AND CONSTRUCTION SEQUENCE AND SHALL HAVE THEM INSPECTED AND APPROVED BY THE AGENCY INSPECTOR OR WMA INSPECTOR PRIOR TO BEGINNING ANY OTHER LAND DISTURBANCES. MINOR SEDIMENT CONTROL DEVICE LOCATION ADJUSTMENTS MAY BE MADE IN THE FIELD WITH THE APPROVAL OF THE WMA INSPECTOR. THE CONTRACTOR SHALL ENSURE THAT ALL RUNOFF FROM DISTURBED AREAS IS DIRECTED TO THE SEDIMENT CONTROL DEVICES, AND SHALL NOT REMOVE ANY EROSION OR SEDIMENT CONTROL MEASURE WITHOUT PRIOR PERMISSION FROM WMA INSPECTOR AND AGENCY INSPECTOR. THE CONTRACTOR MUST OBTAIN PRIOR AGENCY AND WMA APPROVAL FOR CHANGES TO THE SEDIMENT CONTROL PLAN AND/OR SEQUENCE OF CONSTRUCTION.
4. THE CONTRACTOR SHALL PROTECT ALL POINTS OF CONSTRUCTION INGRESS AND EGRESS TO PREVENT THE DEPOSITION OF MATERIALS ONTO PUBLIC ROADS. ALL MATERIALS DEPOSITED ONTO PUBLIC ROADS SHALL BE REMOVED IMMEDIATELY.
5. THE CONTRACTOR SHALL INSPECT DAILY AND MAINTAIN CONTINUOUSLY IN AN EFFECTIVE OPERATING CONDITION ALL EROSION AND SEDIMENT CONTROL MEASURES UNTIL SUCH TIMES AS THEY ARE REMOVED WITH PRIOR PERMISSION FROM WMA INSPECTOR AND AGENCY INSPECTOR.
6. ALL SEDIMENT BASINS, TRAP EMBANKMENTS AND SLOPES, PERIMETER DIKES, SWALES, AND ALL DISTURBED SLOPES STEEPER OR EQUAL TO 3:1 SHALL BE STABILIZED WITH SOD OR SEED AND ANCHORED STRAW MULCH, OR OTHER APPROVED STABILIZATION MEASURES, AS SOON AS POSSIBLE BUT NO LATER THAN SEVEN (7) CALENDAR DAYS AFTER ESTABLISHMENT. ALL AREAS DISTURBED OUTSIDE OF THE PERIMETER SEDIMENT CONTROL SYSTEM MUST BE MINIMIZED. MAINTENANCE MUST BE PERFORMED AS NECESSARY TO ENSURE CONTINUED STABILIZATION. (REQUIREMENT FOR STABILIZATION MAY BE REDUCED TO THREE (3) DAYS FOR SENSITIVE AREAS.)
7. THE CONTRACTOR SHALL APPLY SOD OR SEED AND ANCHORED STRAW MULCH, OR OTHER APPROVED STABILIZATION MEASURES TO ALL DISTURBED AREAS AND STOCKPILES WITHIN FOURTEEN (14) CALENDAR DAYS AFTER STRIPPING AND GRADING ACTIVITIES HAVE CEASED IN THE AREA. MAINTENANCE SHALL BE PERFORMED AS NECESSARY TO ENSURE CONTINUED STABILIZATION. (REQUIREMENT MAY BE REDUCED TO SEVEN (7) DAYS FOR SENSITIVE AREAS.)
8. PRIOR TO REMOVAL OF SEDIMENT CONTROL MEASURES, THE CONTRACTOR SHALL STABILIZE AND HAVE ESTABLISHED PERMANENT STABILIZATION FOR ALL CONTRIBUTORY DISTURBED AREAS USING SOD OR AN APPROVED PERMANENT SEED MIXTURE WITH REQUIRED SOIL AMENDMENTS AND AN APPROVED ANCHOR MULCH. WOOD FIBER MULCH MAY ONLY BE USED IN SEEDING SEASON WHERE THE SLOPE DOES NOT EXCEED 10% AND GRADING HAS BEEN DONE TO PROMOTE SHEET FLOW DRAINAGE. AREAS BROUGHT TO FINISHED GRADE DURING THE SEEDING SEASON SHALL BE PERMANENTLY STABILIZED AS SOON AS POSSIBLE, BUT NO LATER THAN FOURTEEN (14) CALENDAR DAYS AFTER ESTABLISHMENT. WHEN PROPERTY IS BROUGHT TO FINISHED GRADE DURING THE MONTHS OF NOVEMBER THROUGH FEBRUARY, AND PERMANENT STABILIZATION IS FOUND TO BE IMPRACTICAL, TEMPORARY SEED AND ANCHORED STRAW MULCH SHALL BE APPLIED TO DISTURBED AREAS. THE FINAL PERMANENT STABILIZATION OF SUCH PROPERTY SHALL BE APPLIED BY MARCH 15 OR EARLIER IF GROUND AND WEATHER CONDITIONS ALLOW.
9. THE SITE'S APPROVAL LETTER, APPROVED EROSION AND SEDIMENT CONTROL PLANS, DAILY LOG BOOKS, AND TEST REPORTS SHALL BE AVAILABLE AT THE SITE FOR INSPECTION BY DULY AUTHORIZED OFFICIALS OF WMA AND AGENCY RESPONSIBLE FOR PROJECT.
10. SURFACE DRAINAGE FLOWS OVER UNSTABILIZED CUT AND FILL SLOPES SHALL BE CONTROLLED BY EITHER PREVENTING DRAINAGE FLOWS FROM TRAVERSING THE SLOPES OR BY INSTALLING PROTECTIVE DEVICES TO LOWER THE WATER DOWNSLOPE WITHOUT CAUSING EROSION. DIKES SHALL BE INSTALLED AND MAINTAINED AT THE TOP OF A CUT OR FILL SLOPE UNTIL THE SLOPE AND DRAINAGE AREA TO IT ARE FULLY STABILIZED, AT WHICH TIME THEY MUST BE REMOVED AND FINAL GRADING DONE TO PROMOTE SHEET FLOW DRAINAGE. PROTECTIVE METHODS MUST BE PROVIDED AT POINTS OF CONCENTRATED FLOW WHERE EROSION IS LIKELY TO OCCUR.
11. PERMANENT SWALES OR OTHER POINTS OF CONCENTRATED WATER FLOW SHALL BE STABILIZED WITH SOD OR SEED WITH AN APPROVED EROSION CONTROL MATTING, RIPRAP OR OTHER APPROVED STABILIZATION MEASURES.
12. TEMPORARY SEDIMENT CONTROL DEVICES MAY BE REMOVED, WITH PERMISSION OF WMA INSPECTOR AND AGENCY INSPECTORS, WITHIN THIRTY (30) CALENDAR DAYS FOLLOWING ESTABLISHMENT OF PERMANENT STABILIZATION IN ALL CONTRIBUTORY DRAINAGE AREAS. STORMWATER MANAGEMENT STRUCTURES USED TEMPORARILY FOR SEDIMENT CONTROL SHALL BE CONVERTED TO THE PERMANENT CONFIGURATION WITHIN THIS TIME PERIOD AS WELL.
13. NO PERMANENT CUT OR FILL SLOPE WITH A GRADIENT STEEPER THAN 3:1 WILL BE PERMITTED IN LAWN MAINTENANCE AREAS. A SLOPE GRADIENT OF UP TO 2:1 WILL BE PERMITTED IN NON-MAINTENANCE AREAS PROVIDED THAT THOSE AREAS ARE INDICATED ON THE EROSION AND SEDIMENT CONTROL PLAN WITH A LOW-MAINTENANCE GROUND COVER SPECIFIED FOR PERMANENT STABILIZATION. SLOPE GRADIENT STEEPER THAN 2:1 WILL NOT BE PERMITTED WITH VEGETATIVE STABILIZATION.
14. FOR FINISHED GRADING, THE CONTRACTOR SHALL PROVIDE ADEQUATE GRADIENTS TO PREVENT THE WATER FROM PONDING FOR MORE THAN TWENTY-FOUR (24) HOURS AFTER THE END OF A RAINFALL EVENT. DRAINAGE COURSES AND SWALE FLOW AREAS, MAY TAKE AS LONG AS FOURTY-EIGHT (48) HOURS AFTER THE END OF A RAINFALL EVENT TO DRAIN. AREAS DESIGNED TO HAVE STANDING WATER SHALL NOT BE REQUIRED TO MEET THIS REQUIREMENT.
15. SEDIMENT TRAPS OR BASINS ARE NOT PERMITTED WITHIN 20 FEET OF A FOUNDATION WHICH IS EXISTING OR UNDER CONSTRUCTION. NO STRUCTURE MAY BE CONSTRUCTED WITHIN 20 FEET OF AN ACTIVE SEDIMENT TRAP OR BASIN.
16. THE WMA INSPECTOR HAS THE OPTION OF REQUIRING ADDITIONAL SAFETY OR SEDIMENT CONTROL MEASURES, IF DEEMED NECESSARY.
17. ALL TRAP DEPTH DIMENSIONS ARE RELATIVE TO THE OUTLET ELEVATION. ALL TRAPS MUST HAVE A STABLE OUTFALL. ALL TRAPS AND BASINS SHALL HAVE STABLE INFLOW POINTS.
18. VEGETATIVE STABILIZATION SHALL BE PERFORMED IN ACCORDANCE WITH THE STANDARDS AND SPECIFICATIONS FOR SOIL EROSION AND SEDIMENT CONTROL. REFER TO APPROPRIATE SPECIFICATIONS FOR TEMPORARY SEEDING, PERMANENT SEEDING, MULCHING, SODDING, AND GROUND COVERS.
19. SEDIMENT SHALL BE REMOVED AND THE TRAP OR BASIN RESTORED TO ITS ORIGINAL DIMENSIONS WHEN SEDIMENT HAS ACCUMULATED TO ONE QUARTER OF THE TOTAL DEPTH OF THE TRAP OR BASIN. TOTAL DEPTH SHALL BE MEASURED FROM THE TRAP OR BASIN BOTTOM TO THE CREST OF THE OUTLET.
20. SEDIMENT REMOVED FROM TRAPS (AND BASINS) SHALL BE PLACED AND STABILIZED IN APPROVED AREAS, BUT NOT WITHIN A FLOODPLAIN, WETLAND OR TREE-SAVE AREA. WHEN PUMPING SEDIMENT LADEN WATER, THE DISCHARGE MUST BE DIRECTED TO A SEDIMENT TRAPPING DEVICE PRIOR TO RELEASE FROM THE SITE. A SUMP PIT MAY BE USED IF SEDIMENT TRAPS THEMSELVES ARE BEING PUMPED OUT.
21. ALL WATER REMOVED FROM EXCAVATED AREAS (E.G. UTILITY TRENCHES) SHALL BE PASSED THROUGH AN APPROVED DEFERRING PRACTICE OR PUMPED TO A SEDIMENT TRAP OR BASIN PRIOR TO DISCHARGE FROM THE SITE (I.E. VIA FUNCTIONAL STORM DRAIN SYSTEM OR TO STABLE GROUND SURFACE).
22. SEDIMENT CONTROL FOR UTILITY CONSTRUCTION FOR AREAS OUTSIDE OF DESIGNED CONTROLS OR AS DIRECTED BY ENGINEER OR WMA INSPECTOR:
- A. CALL "MISS UTILITY" AT 1-800-257-7777 48 HOURS PRIOR TO THE START OF WORK.
- B. EXCAVATED TRENCH MATERIAL SHALL BE PLACED ON THE HIGH SIDE OF THE TRENCH.
- C. TRENCHES FOR UTILITY INSTALLATION SHALL BE 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 WELDED WIRE AND AT LEAST 42 INCHES HIGH, HAVE POSTS SPACED NO FURTHER APART THAN 8 FEET, HAVE MESH OPENINGS NO GREATER THAN 2 INCHES IN WIDTH AND 4 INCHES IN HEIGHT WITH A MINIMUM OF 14 GAUGE WIRE. SAFETY FENCE MUST BE MAINTAINED AND IN GOOD CONDITION AT ALL TIMES.
24. OFF-SITE SPOIL OR BORROW AREAS ON STATE OF FEDERAL PROPERTY MUST HAVE PRIOR APPROVAL BY WMA AND OTHER APPLICABLE STATE, FEDERAL, AND LOCAL AGENCIES; OTHERWISE APPROVAL MUST BE GRANTED BY THE LOCAL AUTHORITIES. ALL WASTE AND BORROW AREAS OFF-SITE MUST BE PROTECTED BY SEDIMENT CONTROL MEASURES AND STABILIZED.
25. SITES WHERE INFILTRATION DEVICES ARE USED FOR THE CONTROL OF STORMWATER, EXTREME CARE MUST BE TAKEN TO PREVENT RUNOFF FROM UNSTABILIZED AREAS FROM ENTERING THE STRUCTURE DURING CONSTRUCTION. SEDIMENT CONTROL DEVICES PLACED IN INFILTRATION AREAS MUST HAVE BOTTOM ELEVATIONS AT LEAST TWO (2) FEET HIGHER THAN THE FINISH GRADE BOTTOM ELEVATION OF THE INFILTRATION PRACTICE. WHEN CONVERTING A SEDIMENT TRAP TO AN INFILTRATION DEVICE, ALL ACCUMULATED SEDIMENT MUST BE REMOVED AND DISPOSED OF PRIOR TO FINAL GRADING OF INFILTRATION DEVICE.
26. WHEN A STORM DRAIN SYSTEM OUTFALL IS DIRECTED TO A SEDIMENT TRAP OR SEDIMENT BASIN AND THE SYSTEM IS TO BE USED FOR TEMPORARILY CONVERTING SEDIMENT LADEN WATER, ALL STORM DRAIN INLETS IN NON-SUMP AREAS SHALL HAVE TEMPORARY ASPHALT BERMS CONSTRUCTED AT THE TIME OF BASE PAVING TO DIRECT GUTTER FLOW INTO THE INLETS TO AVOID SURCHARGING AND OVERFLOW OF INLETS IN SUMP AREAS.
27. SITE INFORMATION:
- A. TOTAL AREA OF FACILITY (CONSULTANT TO FILL IN)
- B. TOTAL AREA OF PROJECT SITE (CONSULTANT TO FILL IN)
- C. AREA DISTURBED (CONSULTANT TO FILL IN)
- D. AREA TO BE ROOFED OR PAVED (CONSULTANT TO FILL IN)
- E. TOTAL CUT (CONSULTANT TO FILL IN)
- F. TOTAL FILL (CONSULTANT TO FILL IN)
- G. OFF-SITE WASTE/BORROW AREA LOCATION (CONSULTANT TO FILL IN OR QUOTE TO BE DETERMINED)

DESIGN CERTIFICATION

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

Date Designer's Signature

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

STANDARD STABILIZATION NOTE

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

OWNER'S/DEVELOPER'S CERTIFICATION

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

Date Owner/Developer Signature

Card No. Printed Name and Title

EROSION AND SEDIMENT CONTROL SEQUENCE OF CONSTRUCTION

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

- 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.
- 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

- CLEAR AND GRADE FOR INSTALLATION OF SEDIMENT CONTROL DEVICES.
- 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.
- (CONSULTANT TO ESTABLISH SEQUENCING HERE)
- 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.

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.
- 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 MDE INSPECTOR, CLEAR AND GRADE FOR INSTALLATION OF SEDIMENT CONTROL DEVICES.
- 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.
- (CONSULTANT TO ESTABLISH SEQUENCING HERE)
- 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.

COMPANY NAME		DESIGNED: ---	REVISION NO.	REVISION DATE	DESCRIPTIONS	BWI THURGOOD MARSHALL OR MARTIN STATE LOGO	MARYLAND DEPARTMENT OF TRANSPORTATION MARYLAND AVIATION ADMINISTRATION OFFICE OF ENGINEERING AND CONSTRUCTION MANAGEMENT DIVISION OF FACILITIES DESIGN	PROJECT TITLE:	CONTRACT NO.:
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COMPANY FAX NO.		CHECKED: ---						SCALE:	DATE: DATE
		APPROVED: ---							

SEDIMENT CONTROL LEGEND

(CONSULTANT CAN MODIFY PER PROJECT SPECIFIC)

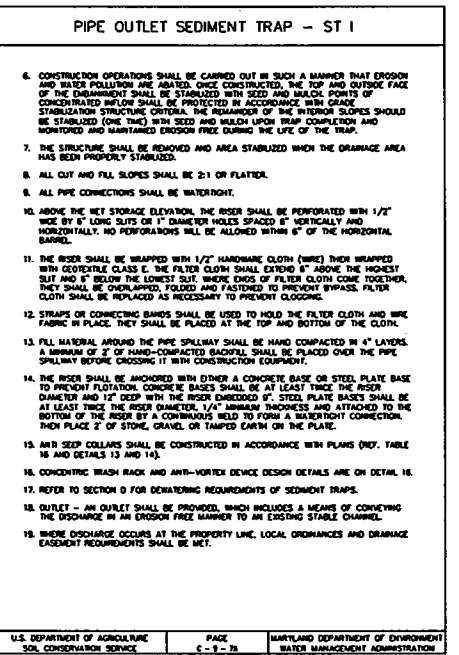
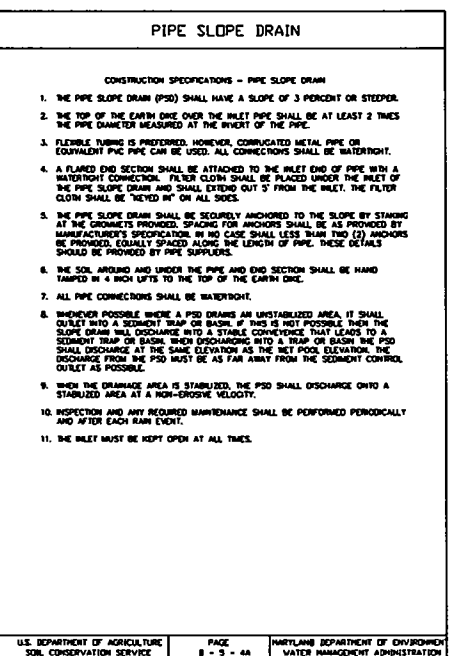
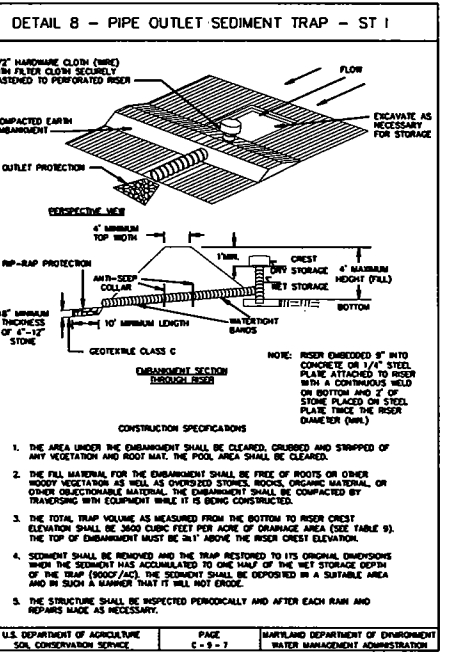
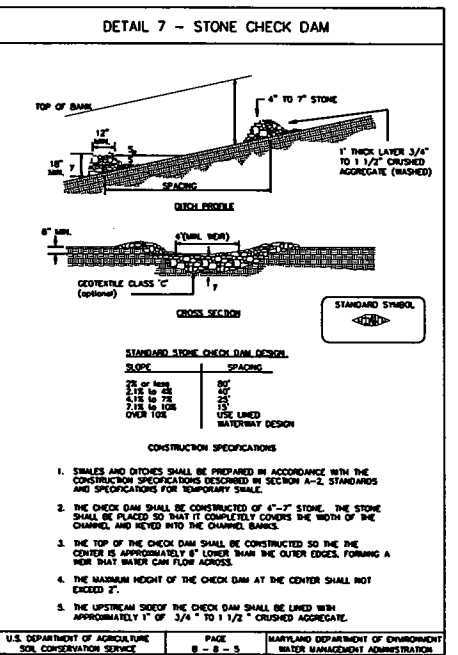
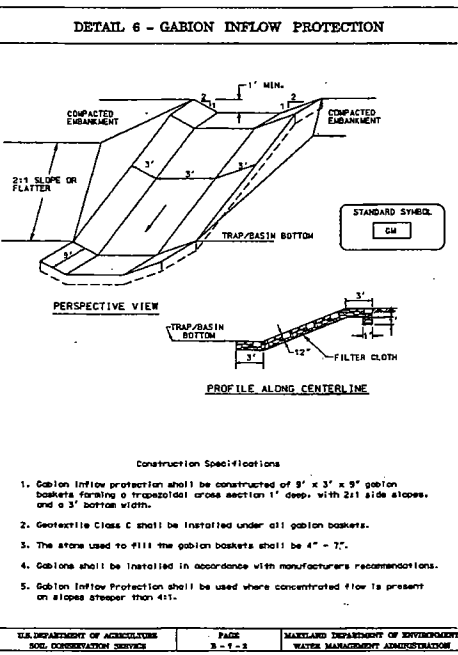
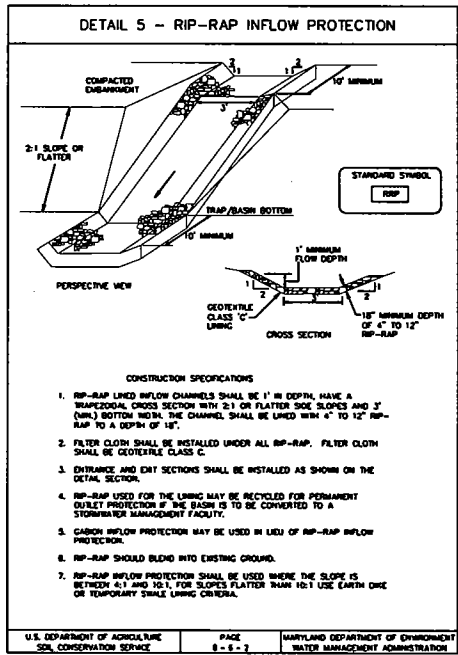
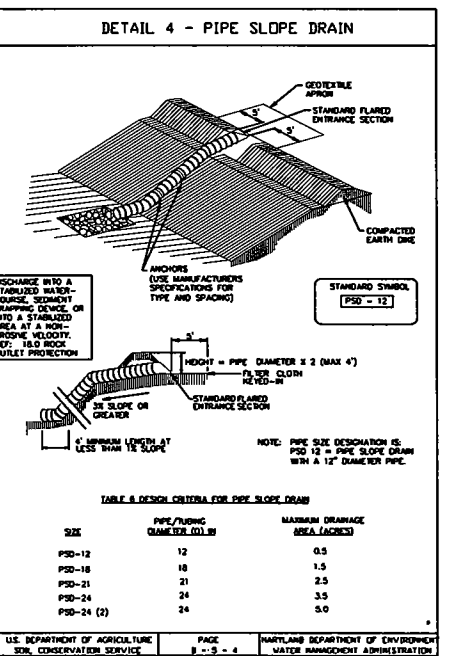
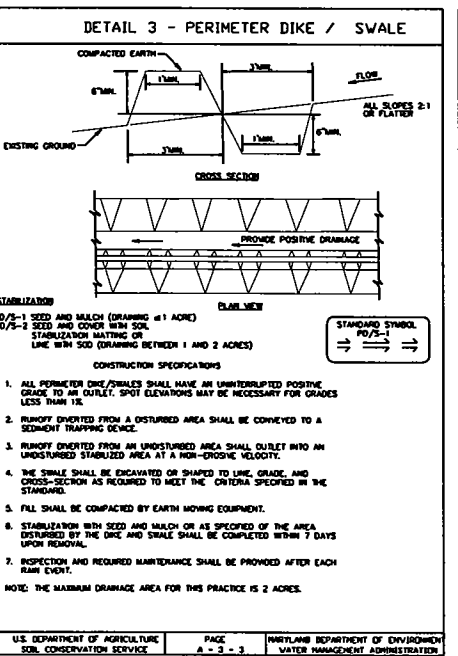
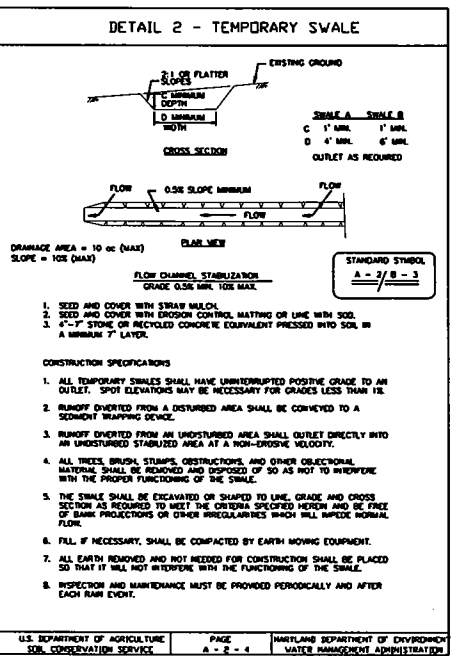
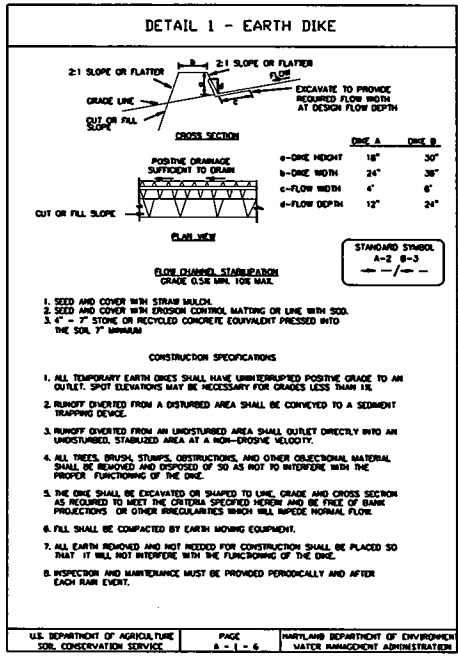
EARTH DIKE	
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PERIMETER DIKE/SWALE	
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ROCK OUTLET PROTECTION	
STONE CHECK DAM	
STONE OUTLET STRUCTURE	
SILT FENCE	
SUPER SILT FENCE	
STRAW BALE DIKE	
STANDARD INLET PROTECTION	
AT GRADE INLET PROTECTION	
CURB INLET PROTECTION	
MEDIAN INLET PROTECTION	
GABION INFLOW PROTECTION	
RIP-RAP INFLOW PROTECTION	
SUMP PIT	
STABILIZED CONSTRUCTION ENTRANCE	
REMOVABLE PUMPING STATION	
LIMIT OF DISTURBANCE	
DRAINAGE BOUNDARY	
TREE PROTECTION FENCE	
ROOT PRUNING	

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OR  
MARTIN STATE  
LOGO

MARYLAND DEPARTMENT OF TRANSPORTATION  
MARYLAND AVIATION ADMINISTRATION  
OFFICE OF ENGINEERING AND CONSTRUCTION MANAGEMENT  
DIVISION OF FACILITIES DESIGN

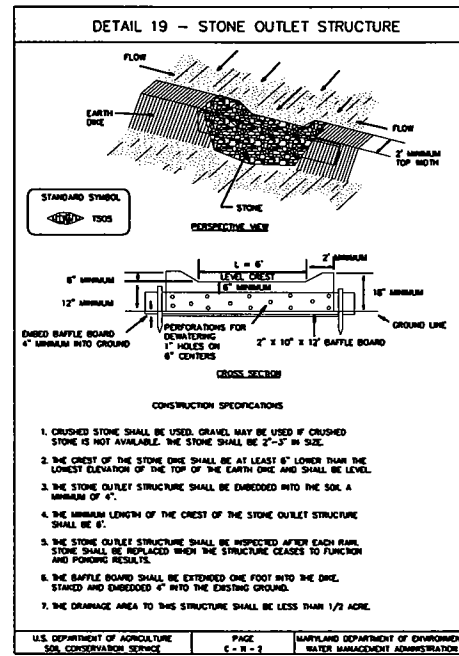
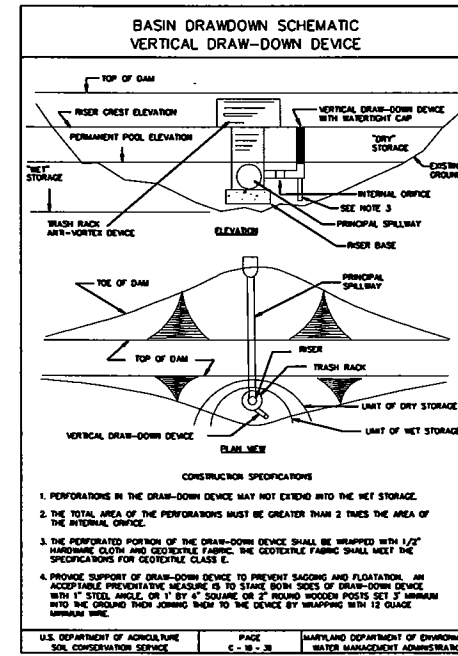
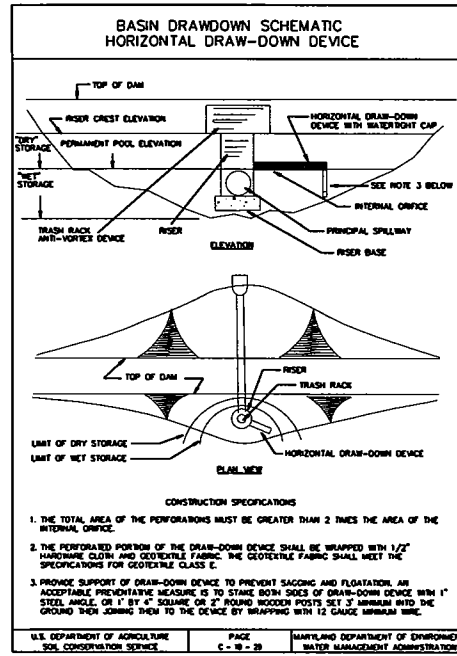
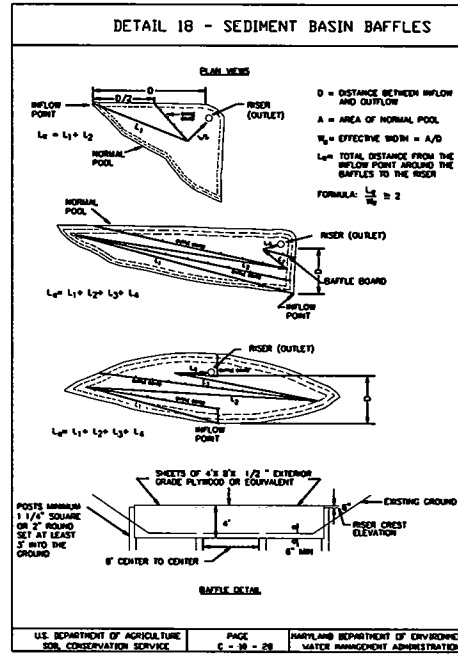
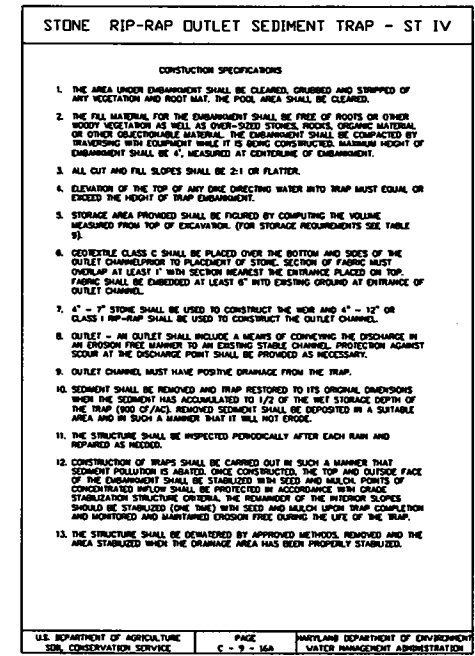
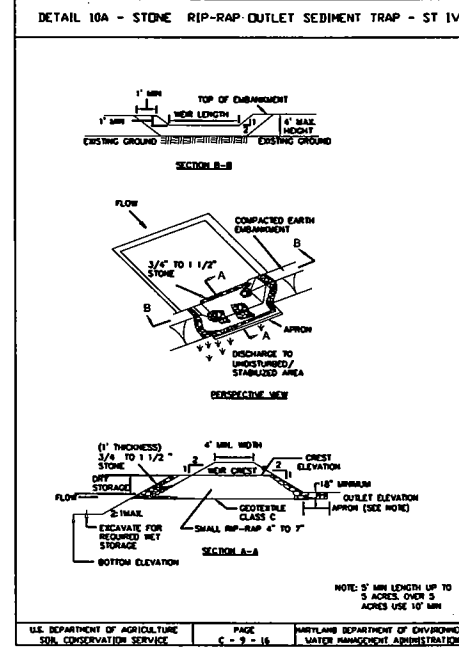
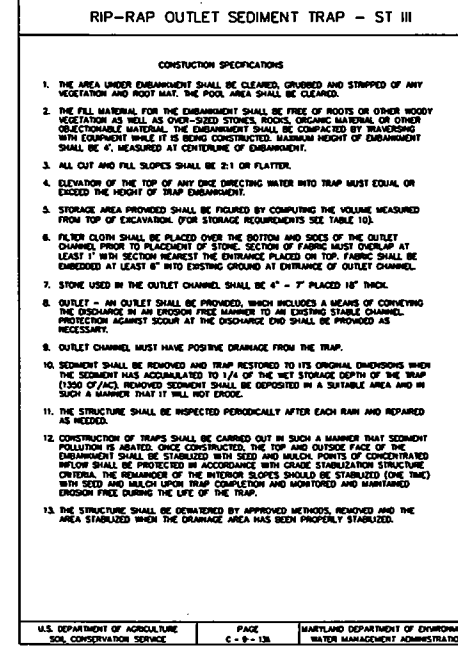
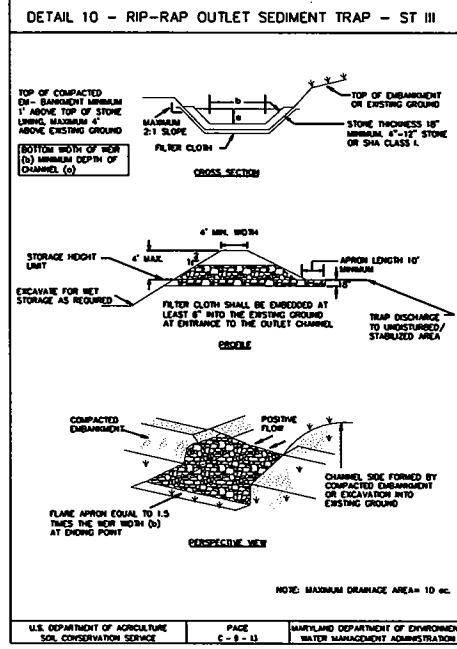
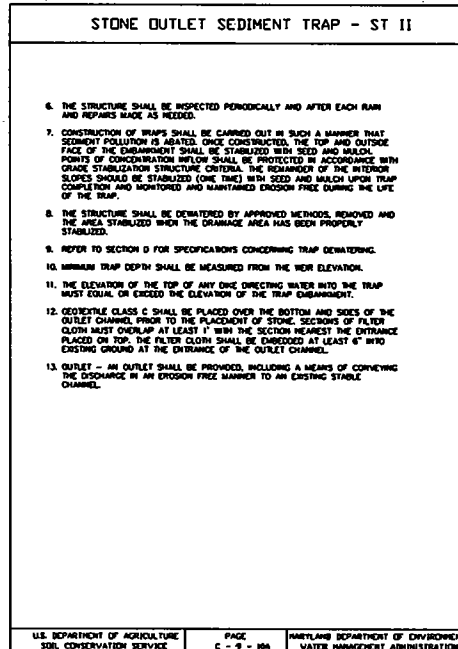
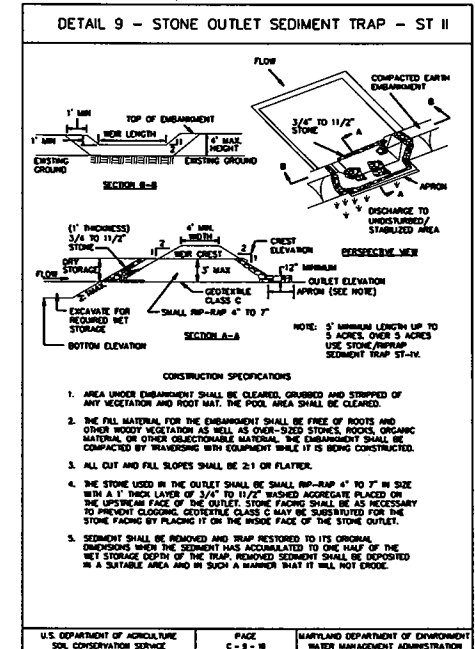
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CONTROL DETAILS I

DATE: DATE

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OR  
MARTIN STATE  
LOGO

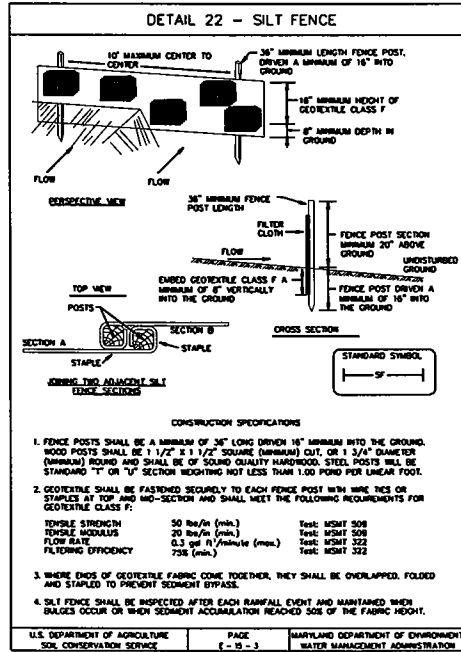
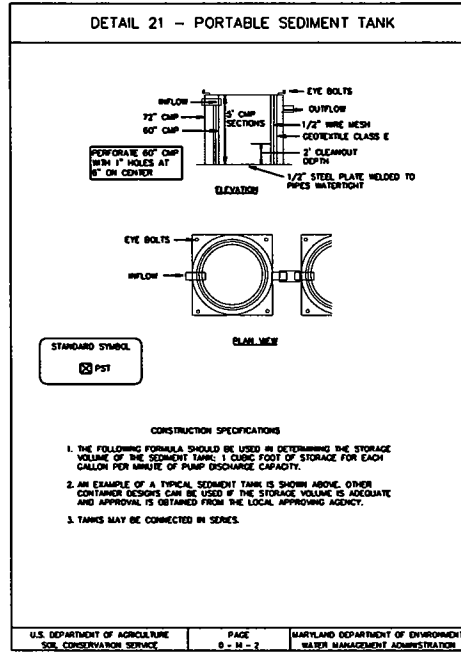
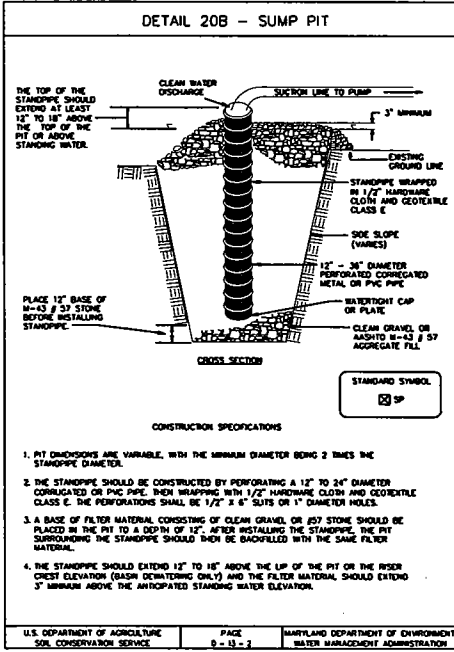
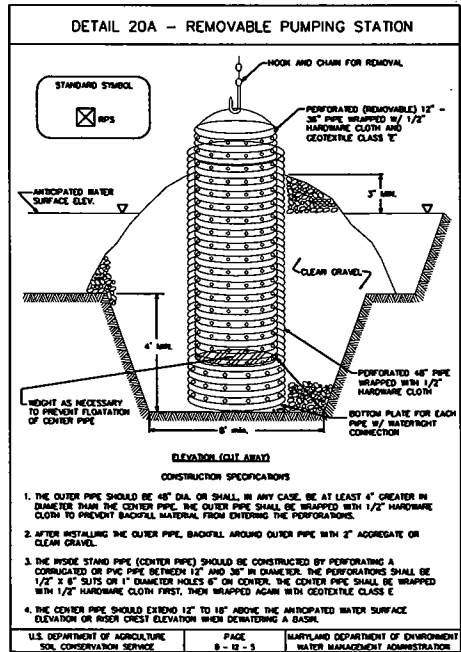
MARYLAND DEPARTMENT OF TRANSPORTATION  
MARYLAND AVIATION ADMINISTRATION  
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SHEET NO.:

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FOR EROSION AND SEDIMENT CONTROL ONLY.



### SILT FENCE

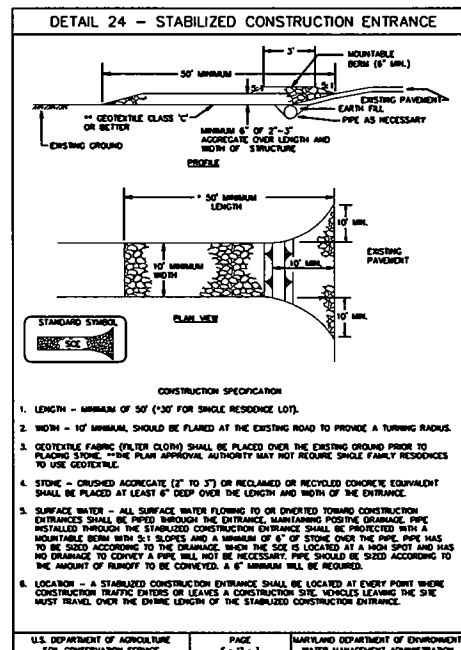
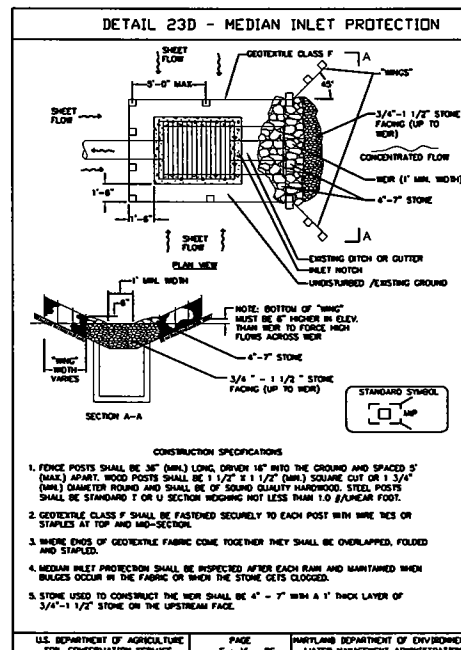
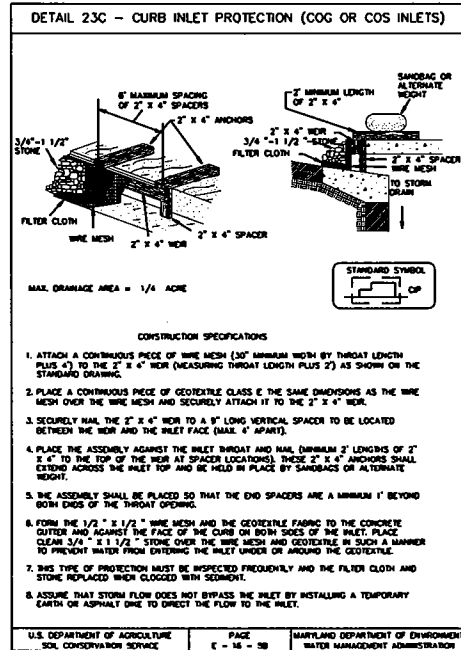
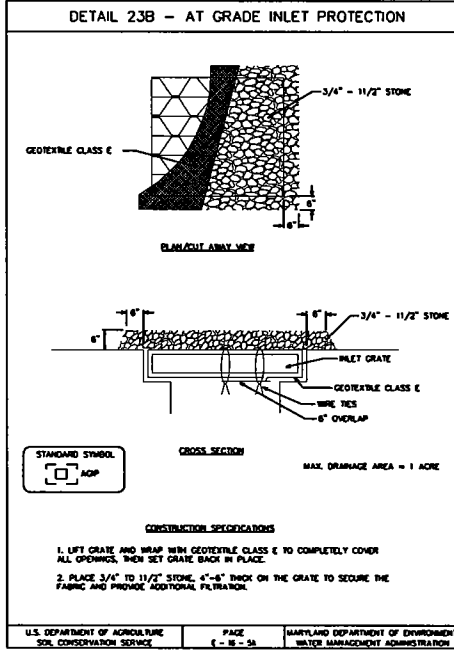
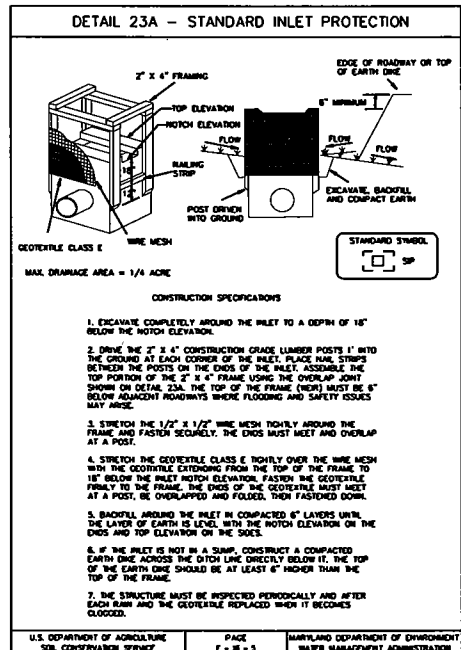
SLOPE STEEPNESS	SILT FENCE DESIGN CRITERIA	
	(MINIMUM) SLOPE LENGTH	(MAXIMUM) SILT FENCE LENGTH
FLATTER THAN 50:1	UNLIMITED	UNLIMITED
50:1 TO 10:1	125 FEET	1,000 FEET
10:1 TO 5:1	100 FEET	750 FEET
5:1 TO 3:1	60 FEET	500 FEET
3:1 TO 2:1	40 FEET	250 FEET
2:1 AND STEEPER	20 FEET	125 FEET

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

U.S. DEPARTMENT OF AGRICULTURE  
SOIL CONSERVATION SERVICE

PAGE  
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MARYLAND DEPARTMENT OF ENVIRONMENT  
WATER MANAGEMENT ADMINISTRATION



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

FOR EROSION AND SEDIMENT CONTROL ONLY.

COMPANY NAME

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

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

REVISION NO.	REVISION DATE	DESCRIPTIONS

BWI THURGOOD  
MARSHALL  
OR  
MARTIN STATE  
LOGO

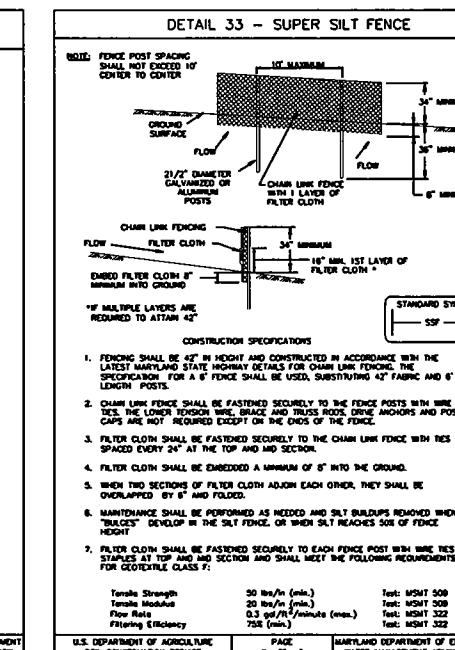
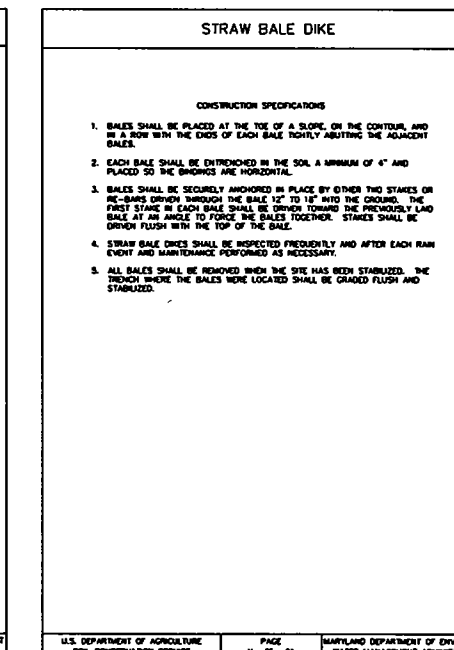
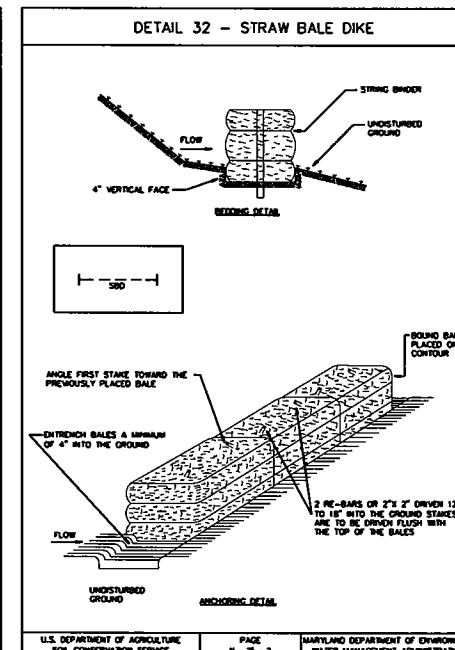
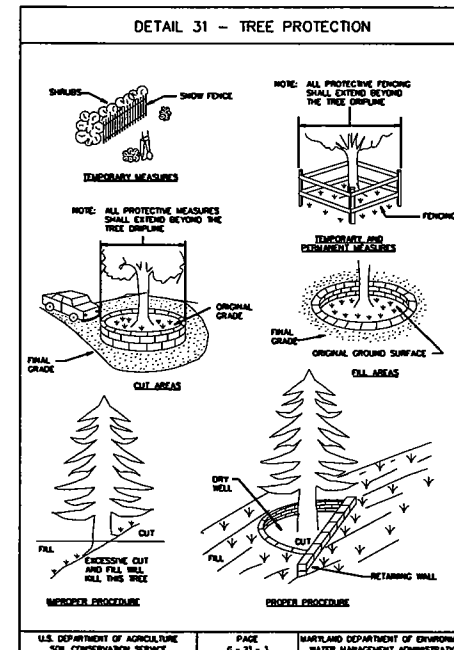
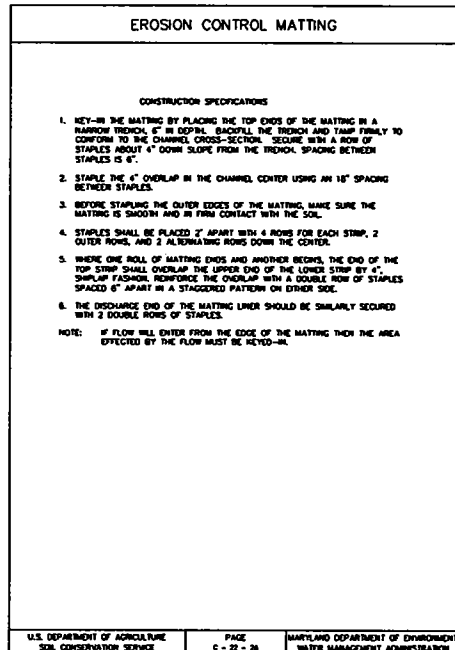
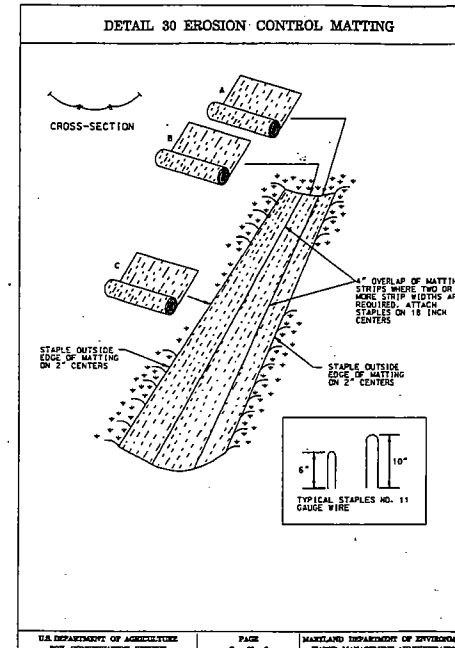
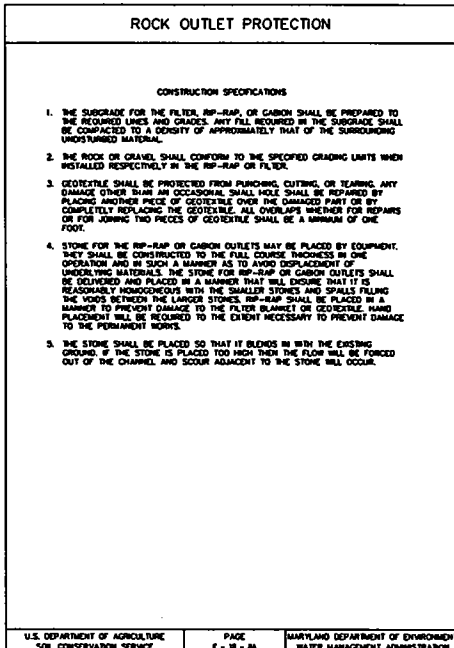
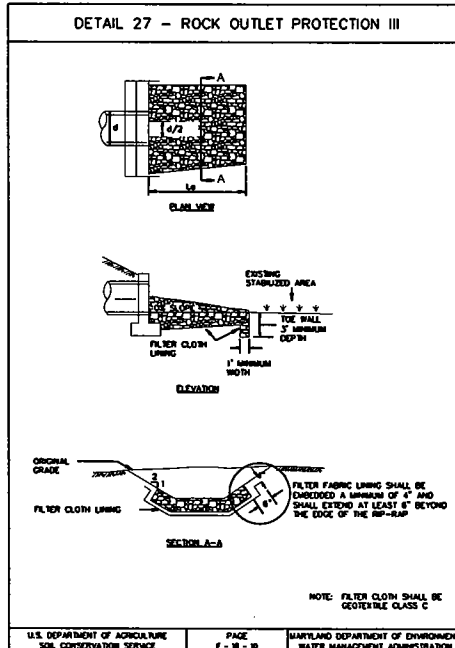
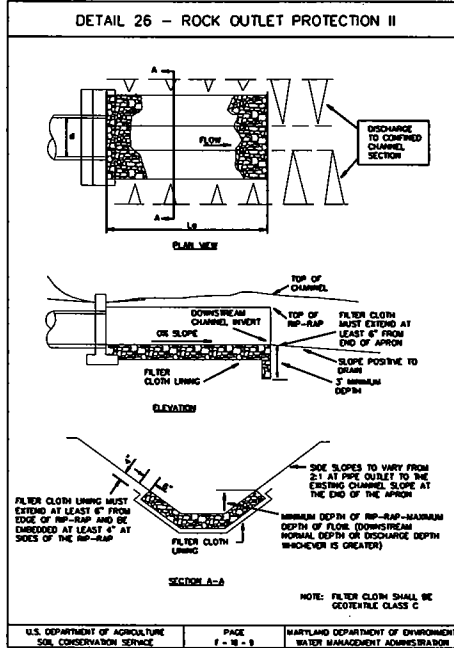
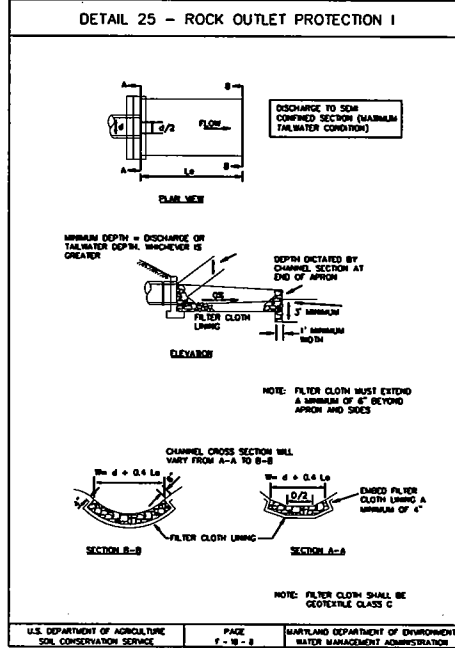
MARYLAND DEPARTMENT OF TRANSPORTATION  
MARYLAND AVIATION ADMINISTRATION  
OFFICE OF ENGINEERING AND CONSTRUCTION MANAGEMENT  
DIVISION OF FACILITIES DESIGN

PROJECT TITLE:  
SHEET TITLE:  
SCALE:

EROSION AND SEDIMENT  
CONTROL DETAILS III

DATE: DATE

CONTRACT NO.:  
SHEET NO.:



MDE NO. XX-SF-XXXX  
NOTE TO CONTRACTOR:  
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REVISION NO.	REVISION DATE	DESCRIPTIONS

BW THURGOOD  
MARSHALL  
OR  
MARTIN STATE  
LOGO

MARYLAND DEPARTMENT OF TRANSPORTATION  
MARYLAND AVIATION ADMINISTRATION  
OFFICE OF ENGINEERING AND CONSTRUCTION MANAGEMENT  
DIVISION OF FACILITIES DESIGN

PROJECT TITLE:

SHEET TITLE:

SCALE:

EROSION AND SEDIMENT  
CONTROL DETAILS IV

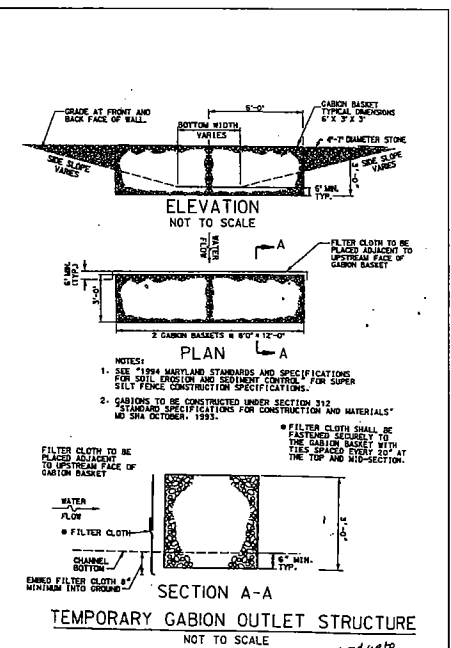
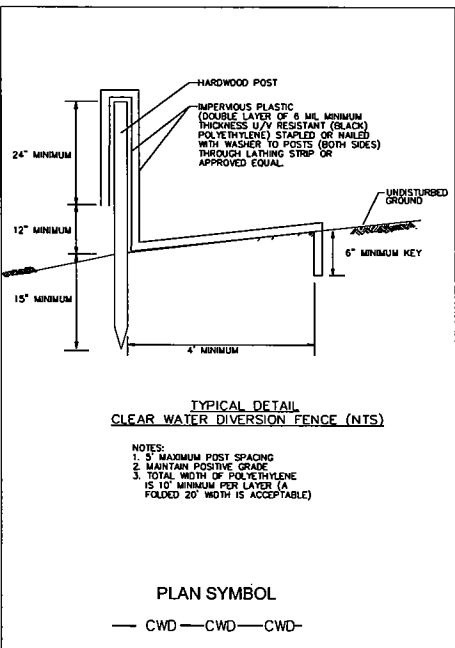
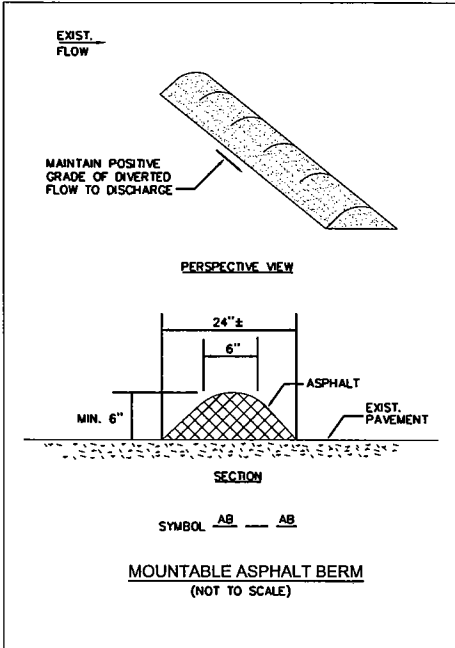
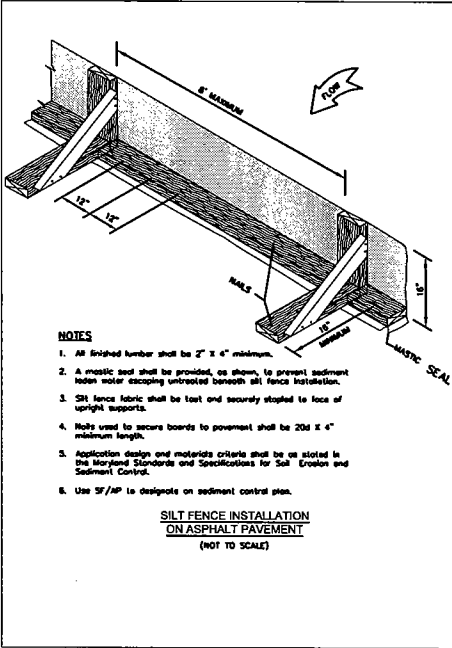
DATE: DATE

CONTRACT NO.:

SHEET NO.:

PART/PLANE

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



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

FOR EROSION AND SEDIMENT CONTROL ONLY.

COMPANY NAME  COMPANY NAME COMPANY ADDRESS CITY, STATE ZIP CODE COMPANY PHONE NO.      COMPANY FAX NO.	DESIGNED: ---	<table> <tr> <th>REVISION NO.</th> <th>REVISION DATE</th> <th>DESCRIPTIONS</th> </tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> </table>	REVISION NO.	REVISION DATE	DESCRIPTIONS																						BWI THURGOOD MARSHALL OR MARTIN STATE LOGO	MARYLAND DEPARTMENT OF TRANSPORTATION MARYLAND AVIATION ADMINISTRATION  OFFICE OF ENGINEERING AND CONSTRUCTION MANAGEMENT DIVISION OF FACILITIES DESIGN	PROJECT TITLE:	CONTRACT NO.:
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# APPENDIX E

## STANDARD 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 long-term landscaping shall be from the MAA approved plant materials list (see Draft List of Recommended Species for Construction Plantings).

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

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

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

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

## ITEM 901 TOPSOIL

### DESCRIPTION

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

### MATERIALS

**901-2.1 TOPSOIL.** Topsoil is a component of soil, composed of the surface layer of soil containing organic matter and free from any admixture of refuse or other materials toxic to plant growth. Topsoil shall be reasonably free from subsoils as well as all stumps, roots, brush, stones (1 inch or more in diameter), clay lumps, or similar objects. Brush and other vegetation that will not be incorporated with the topsoil during handling operations shall be removed. Topsoil shall be free from any parts of Johnson grass (*Sorghum halepense*), Canada thistle (*Cirsium 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, briars, stumps and large roots, rubbish, and stones that might interfere with subsequent operations shall be removed using methods approved by the Engineer. Heavy sods or other cover shall be removed.

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

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

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

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

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

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

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

### **METHOD OF MEASUREMENT**

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

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

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

### **BASIS OF PAYMENT**

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

Payment will be made under:

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

**END OF ITEM 901**

## ITEM 902 PLANT INSTALLATION

### DESCRIPTION

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

### MATERIALS

#### 902-2.1 PLANTS.

**902-2.1.1 SPECIES.** Preferred species that appear in Appendix A “Approved Landscape Plant Material” shall be used unless otherwise approved by the MAA Engineer. The authority for all plant names shall be the current printing of *Hortus Third*<sup>1</sup>. 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*<sup>2</sup> 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*<sup>3</sup>, 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 (*Sorghum 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

<sup>1</sup> 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.

<sup>2</sup> American Nursery and Landscape Association, 1990. *American Standard for Nursery Stock*.

<sup>3</sup> 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.)<sup>4</sup>,  
redtop (*Agrostis gigantea*)<sup>1</sup>  
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*)<sup>1</sup>  
meadow fescue (*Festuca pratensis*)<sup>1</sup>,  
velvetgrass (*Holcus lanatus*),  
annual bluegrass (*Poa annua*),  
rough bluegrass (*Poa trivialis*)<sup>1</sup>,  
timothy (*Phleum pratense*), and  
Johnson grass (*Sorghum 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

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<sup>4</sup> 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 <sup>a</sup> Not Less than %	Minimum % Germination <sup>b</sup>	Pure Live Seed Factor
Certified Turf-Type Tall Fescue ( <i>Festuca arundinacea</i> )	98	90	1.13
Certified Kentucky Bluegrass ( <i>Poa pratensis</i> )	90	80	1.39
Fowl Bluegrass ( <i>Poa palustris</i> )	90	80	1.39
Hard Fescue ( <i>Festuca longifolia</i> )	98	90	1.13
Chewings Red Fescue ( <i>Festuca rubra commutata</i> )	98	90	1.13
Annual Ryegrass ( <i>Lolium multiflorum</i> )	95	85	1.24
Perennial Ryegrass ( <i>Lolium perenne</i> )	90	80	1.39
Creeping Bentgrass ( <i>Agrostis stolonifera</i> )	90	80	1.39
Switchgrass ( <i>Panicum virgatum</i> )	90	80	1.39
Little Bluestem ( <i>Andropogon scoparius</i> )	62	94	1.71
<sup>a</sup> The percentage weight of pure seed present shall be free of any agriculture seeds, inert matter, and other seeds distinguishable by their appearance.			
<sup>b</sup> 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:

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

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

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

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

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

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

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

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

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

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

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

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

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

The fertilizers may be supplied in the following forms:

- a. A dry, free-flowing fertilizer suitable for application by a common fertilizer spreader;
- b. A finely ground fertilizer soluble in water, suitable for application by power sprayers; or
- c. A granular or pellet form suitable for application by blower equipment.

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

## **CONSTRUCTION METHODS AND EQUIPMENT**

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

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

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

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

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



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

**903-3.3.1 DRY APPLICATION METHOD**

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

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

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

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

**903-3.3.2 WET APPLICATION METHOD/HYDROSEEDING**

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

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

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

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

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

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

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

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

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

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

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

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

### **METHOD OF MEASUREMENT**

**903-4** The quantity of seeding to be paid for shall be the numbers of acres (or square yard) or portions thereof, measured on the ground surface, completed, and accepted. Separate measurements will be made of the areas seeded with the several seed mixtures specified. No distinction will be made between "graded" areas and "undisturbed" areas in arriving at the total acreage (or square yard) for each area seeded with specified seed mixes. No separate measurements will be made of graded and undisturbed areas for purposes of separate payments.

### **BASIS OF PAYMENT**

**903-5.1** The quantity, determined as provided above, will be paid for at the contract unit price per acre (or square yard), or fraction thereof, for seeding, which price and payment shall be full compensation for furnishing and placing all material, including fertilizers, and for all labor, equipment, tools, and incidentals necessary to complete the work prescribed in the item.

Payment will be made under:

- Item 903-5.1 Seeding Mixture No. 1 -- per acre
- Item 903-5.2 Seeding Mixture No. 1 -- per square yard
- Item 903-5.3 Seeding Mixture No. 2 -- per acre
- Item 903-5.4 Seeding Mixture No. 2 -- per square yard

- Item 903-5.5 Seeding Mixture No. 3 -- per acre
- Item 903-5.6 Seeding Mixture No. 3 -- per square yard
- Item 903-5.7 Amendments – per acre
- Item 903-5.8 Amendments – per square yard
- Item 903-5.9 Fertilizer – per acre
- Item 903-5.10 Fertilizer – per square yard

**END OF ITEM 903**

## ITEM 904 SODDING

### DESCRIPTION

**904-1** This item provides standards for furnishing, hauling, and placing approved live sod on prepared areas as indicated on site plans. Sod will only be applied to landscape areas and shall be mowed frequently. All sodding activities shall conform to these specifications at the locations shown on site plans or as directed by the MAA Engineer.

### MATERIALS

**904-2.1 SOD.** Sod furnished by the Contractor shall have a good cover of living or growing grass. This includes grass that is seasonally dormant during the cold or dry seasons and capable of renewing growth after the dormant period. All sod shall be obtained from areas in which the soil is reasonably fertile and contains a high percentage of loamy topsoil. Sod shall be cut or stripped from living, thickly matted turf relatively free of weeds or other undesirable foreign plants, large stones, roots, or other materials that might be detrimental to the development of the sod or to future maintenance. Grass sod shall be Maryland-certified or approved and shall comply with the Maryland Sod Law of the Annotated Code of Maryland (Agricultural Article Sections 9-101 through 9-110). Each load of sod shall bear a Maryland State Approved or Certified label at the time of delivery on the job. Sod shall be either: (1) Bluegrass sod containing not less than 80 percent Kentucky bluegrass (*Poa pratensis*) and not more than 20 percent Red Fescue (*Festuca rubra*); or (2) certified turf type-tall fescue (*Festuca arundinacea*) sod containing not less than 80 percent certified turf type-tall fescue (*Festuca arundinacea*) grass and not more than 20 percent Kentucky Bluegrass (*Poa pratensis*) and Red Fescue (*Festuca rubra*). Any vegetation more than 6 inches in height shall be mowed to a height of 3 inches or less before sod is lifted. Sod, including the soil containing the roots and the emergent plant growth, shall be cut uniformly to a thickness not less than that specified in Section 904-3.4.

**904-2.2 LIME.** Lime shall conform to standards described in Section 903, "Seeding."

**904-2.3 FERTILIZER.** Fertilizers and application methods shall conform to the standards previously described in Section 903, "Seeding."

**904-2.4 WATER.** All water shall conform to the standards previously described in Paragraph 902-2.4, "Water."

**904-2.5 SOILS FOR REPAIR.** All soils for repairs shall conform to the standards previously described in Paragraph 901-2.3, "Soils for Repair."

## CONSTRUCTION REQUIREMENTS

**904-3.1 GENERAL.** Areas to be sodded shall be clearly indicated by site plans. Areas requiring special ground surface preparation, such as tilling, and those areas in a satisfactory condition that are to remain undisturbed shall also be shown on the plans.

Suitable equipment necessary for proper preparation of the ground surface and for the handling and placing of all required materials shall be on hand, in good condition, and shall be approved by the MAA Engineer before sodding operations begin. The Contractor shall demonstrate to the MAA Engineer, before starting the various operations, that the application of required materials, such as fertilizer and limestone, will be made at the specified rates.

**904-3.2 ADVANCE PREPARATION.** If the area to be sodded is sparsely vegetated, weedy, barren and unworked, or packed and hard, all existing herbaceous vegetation shall be removed. The soil shall then be scarified or otherwise loosened to a depth of at least 5 inches (125 mm). Clods shall be pulverized, and the top 3 inches (75 mm) of soil shall be worked into a satisfactory bed by discing or use of cultipackers, rollers, drags, harrows, or other equipment approved by the MAA Engineer. The area shall then be properly graded as indicated by site plans.

After grading of areas is complete and prior to the application of fertilizer and limestone, areas to be sodded shall be raked or otherwise cleared of stones larger than 1 inch in diameter, sticks, stumps, and other debris which might interfere with sodding, growth of grasses, or subsequent maintenance of grass-covered areas. If any damage by erosion or other causes has occurred after grading of areas and before beginning the application of fertilizer and ground limestone, the Contractor shall repair such damage. This may include filling gullies, smoothing irregularities, and repairing other incidental damage.

An area to be sodded will be considered a satisfactory seedbed without requiring additional treatment if it recently has been thoroughly loosened and worked to a depth of at least 5 inches as a result of grading operations and, if immediately prior to sodding, the top 3 inches of soil is loose, friable, reasonably free from large clods, rocks, large roots, or other undesirable matter, and is shaped to the required grade. For slope areas steeper than 3:1 (three horizontal to one vertical) the subsoil shall be loosened to a depth of 1 inch. Lime and fertilizer shall be applied within 48 hours after tilling as described in 903-3.3 and 3.4. The sod shall be applied immediately after the lime and fertilizer have been worked into the soil.

**904-3.3 APPLICATION OF FERTILIZER AND LIME.** Following ground surface preparation, fertilizer shall be uniformly spread as described in Section 903-3.3 at a rate that will provide at least the minimum quantity of fertilizer required. If the use of ground limestone is specified, it shall be spread as described in Section 903-3.3, "Methods of Application"; at a rate that will provide at least the minimum quantity of lime required. These materials shall be incorporated into the soil to a depth of at least 2 inches by discing, raking, or other methods

approved by the MAA Engineer. Any stones larger than 1 inch in diameter, large clods, roots, and other litter brought to the surface by this operation shall be removed.

**904-3.4 OBTAINING AND DELIVERING SOD.** The sod shall be well rooted, grown in the State of Maryland, and field grown for a minimum of 12 months. After inspection and approval of the sod by the MAA Engineer, the sod shall be cut with approved sod cutters to such a thickness that after placement on the prepared bed, but before compaction, it shall have a uniform attached soil thickness of at least 0.75 inch. Sod sections or strips shall be cut in uniform widths of at least 14 inches and in lengths of at least 18 inches, but not to lengths that might inhibit placement without breaking, tearing, or loss of soil. Where strips are required, the sod shall be rolled or folded undamaged, with the grass facing inward. The Contractor may be required to mow high grass before cutting sod.

Sod shall be transplanted within 24 hours from the time of harvest unless circumstances beyond the Contractor's control make storage necessary. In such cases, sod shall be stacked, kept moist, protected from exposure to the air and sun, and shall be kept from freezing. Sod shall only be harvested and moved when soil moisture conditions are such that favorable results can be expected. Where soil is too dry, permission to cut sod may be granted only after it has been sufficiently watered to moisten the soil to the depth at which the sod will be cut.

**904-3.5 PLACING SOD.** Sodding shall only be performed during seasons when satisfactory results can be expected. Frozen sod shall not be used and sod shall not be placed upon frozen soil. Sod may be transplanted during periods of drought with the approval of the MAA Engineer, provided the sod bed is watered to moisten the soil to a depth of at least 4 inches immediately prior to laying the sod.

The sod shall be moist and shall be placed on a bed, prepared according to Paragraphs 904-3.2 "Advance Preparation", and 904-3.3, "Application of Fertilizer and Lime" by hand. Pitchforks shall not be used to handle sod, and dumping from vehicles shall not be permitted. The sod shall be placed carefully by hand, edge to edge and with staggered joints, in rows at right angles to the slopes, starting at the base of the area to be sodded and working upward. The sod shall immediately be pressed firmly into contact with the sod bed by tamping or rolling with approved equipment to provide a true and even surface, and ensure knitting without displacement of the sod or deformation of the surfaces of sodded areas. Where the sod has been displaced during sodding operations, the workmen replacing it shall work from ladders or treaded planks to prevent further displacement. Where the grades are such that the flow of water will be from paved surfaces across sodded areas, the surface of the soil in the sod after compaction shall be set approximately 1.5 inches below the pavement edge. Where the flow will be over the sodded areas and onto the paved surfaces around manholes and inlets, the surface of the soil in the sod after compaction shall be placed flush with pavement edges.

On slopes steeper than 1:2.5 and in V-shaped or flat-bottom ditches or gutters, the sod shall be secured with wooden pegs at least 18 inches long and a cross-sectional area of at least 0.75-square inch, or by other methods of securing sod approved by the MAA Engineer. The pegs shall be driven flush with the surface of the sod. The pegs shall be of sufficient number and at

adequate spacing to secure sod from displacement. The use of sod staples or other means of securing the sod from displacement may be approved by the MAA Engineer provided satisfactory results are expected.

**904-3.6 WATERING.** Adequate water and watering equipment shall be on hand before sodding begins, and sod shall be kept moist until it has become established and its continued growth assured. In all cases, watering shall be done in a manner that will avoid erosion from the application of excessive quantities and will avoid damage to the finished surface.

#### **904-3.7 ESTABLISHING TURF.**

**904-3.7.1 GENERAL.** The Contractor shall provide general care for the sodded areas as soon as the sod has been laid and shall continue to provide such care until final inspection and acceptance of the work.

**904-3.7.2 PROTECTION.** All sodded areas shall be protected against traffic or other use by warning signs and barricades approved by the MAA Engineer.

**904-3.7.3 MOWING.** The Contractor shall mow the sodded areas with approved mowing equipment, depending upon climatic and growth conditions and the needs for mowing of specific areas. In the event that weeds or other undesirable vegetation establishes to such an extent that, either cut or uncut, they threaten to smother the sodded species, the weeds shall be mowed and the clippings raked and removed from the area. Spot applications of an appropriate herbicide by a licensed applicator shall be approved by the MAA Engineer to remove invasive species. The appropriate herbicide shall be determined on a case-by-case basis, depending on the location and type of weed.

**904-3.7.4 REPAIR.** When the surface has become gullied or otherwise damaged during the period covered by this contract, the affected areas shall be repaired to re-establish the grade and the condition of the soil and shall then be re-sodded as specified in Paragraph 904-3.5, "Placing Sod", at the Contractor's expense.

### **METHOD OF MEASUREMENT**

**904-4** This item will be measured on the basis of the area in square yards of the surface covered with sod and accepted.



## **BASIS OF PAYMENT**

**904-5** This item will be paid for on the basis of the contract unit price per square yard for sodding. The price will provide full compensation for all labor, equipment, material, staking, and incidentals necessary to satisfactorily complete the items as specified.

Payment will be made under:

Item 904-5.1 Sodding—per square yard.

Item 904-5.2 Amendments – per square yard

Item 904-5.3 Fertilizer – per square yard

**END OF ITEM 904**

## ITEM 905 MULCHING

### DESCRIPTION

**905-1.1 GENERAL.** This item provides the Contractor with MAA-approved specifications for mulch and the application of mulch including distribution of mulch and securing of mulched areas. Areas to be mulched will be clearly shown on site plans or otherwise designated by the MAA Engineer.

### MATERIALS

**905-2.1 TYPES OF MULCH.** Acceptable mulch shall be composed of the materials listed below or composed of any locally available materials that are similar to those specified and approved by the MAA Engineer. Low-grade, shaley, soiled, partially rotted hay, straw, or other materials unfit for animal consumption will not be acceptable for use as mulch. Straw or other material that is fresh, excessively brittle, or is in such an advanced stage of decomposition as to smother or retard the planted grass, is not acceptable. Clean, weed-free straw may be used. Mulch materials containing matured seed with the potential to establish and be detrimental to the project or the surrounding area is not acceptable.

**a. Shredded Hardwood Bark.** Shredded hardwood bark shall consist of hardwood tree bark that has been milled and screened to ensure a maximum 4-inch (100-mm) particle size, provide a uniform texture, and be free from sawdust, toxic substances, and other foreign materials.

**b. Wood Chips.** Wood chips shall be produced by a chipping machine to a size specified by the MAA Engineer. Chips may not have been subjected to any conditions that would shorten their useful life or cause them to lose any of their value as mulch. Wood chips shall be free from bark, leaves, twigs, wood shavings, sawdust, toxic substances, and other foreign material.

**c. Wood Cellulose Fiber.** Wood cellulose fiber shall consist of a processed wood product with uniform fiber characteristics. The fiber shall be capable of remaining in a uniform suspension under agitation in water and blending with seed, fertilizer, and other additives to form a homogeneous slurry. The fiber shall perform satisfactorily in hydraulic seeding equipment without clogging or damaging the system. The slurry shall contain a green dye to provide easy visual inspection for uniformity of application.

Certification showing that the fiber material conforms to the following specifications shall be provided by the manufacturer:

Wood Cellulose Fiber Requirements	
Particle Length, in. (mm)	Approximately 1/2 (13)
Particle Thickness, in. (mm)	Approximately 1/16 (1.5)
Net dry Weight Content	Minimum as stated on bag
TAPPI* T 509, pH	4.0 to 8.5
Ash Content, TAPPI* Standard T 413, % max	7.0
Water Holding Capacity, % min	90

\*Technical Association of Pulp and Paper Industry

The material shall be delivered in packages of uniform net weight of 75 lbs (34 kg) or less and shall be clearly labeled with the name of the manufacturer, net weight, and a supplemental statement of the net weight content.

**905-2.2 INSPECTION.** Within five days after acceptance of the bid, the Contractor shall provide representative samples of mulch material to be used to the MAA Engineer and identify the source of the material and quantities of mulch materials available. The samples provided may be used as standards with the approval of the MAA Engineer and any materials brought on the site that do not meet these standards may be rejected.

## CONSTRUCTION REQUIREMENTS

**905-3.1 ADVANCE PREPARATION.** Before spreading mulch, all large clods, stumps, stones, brush, roots, and other foreign material shall be removed from the area to be mulched. Mulch shall be applied immediately after seeding unless otherwise specified. The application and spreading of mulch may be by hand methods, blower, or other mechanical methods, provided a uniform covering is obtained.

**905-3.2 APPLICATION OF MULCH.** The Contractor shall evenly apply mulch materials to areas indicated by site plans or otherwise designated by the MAA Engineer. Cellulose-fiber or wood-pulp mulch shall be applied at the rate of 1,500 pounds (dry weight) per acre. Mulch may be blown on the slopes and use of cutters in the equipment for this purpose will be permitted to the extent that at least 95 percent of the mulch in place on the slope is 6 inches or more in length. When mulch applied by the blowing methods is cut, the loose depth in place shall be 1 to 2 inches. Cellulose fiber or wood-pulp mulch shall be applied as an aqueous mixture by spraying at the rate of 1,500 pounds (dry weight) per acre using spraying equipment approved by the MAA Engineer.

**905-3.3 SECURING MULCH.** Mulch shall be held in place by light discing, a thin coating of topsoil, pins, stakes, wire mesh, or other methods approved by the MAA Engineer. If the "peg and string" method is used, the mulch shall be secured with stakes or wire pins driven into the ground on 5-foot centers or less. Binder twine shall be strung between adjacent stakes in straight

lines and crossed diagonally over the mulch. The stakes shall be firmly driven nearly flush to the ground to draw the twine down tightly onto the mulch.

**905-3.4 MAINTENANCE OF MULCHED AREAS.** The Contractor shall care for mulched areas until final acceptance of the project. Care required may consist of providing protection against traffic or other disturbances by placement of warning signs and/or barricades before or immediately after mulching has been completed.

The Contractor may be required to repair or replace any mulching that is defective or becomes damaged before the project is finished and deemed satisfactory by the MAA Engineer. When, in the judgment of the MAA Engineer, defects or damage result from poor workmanship or failure to meet the requirements of the specifications, the cost of the necessary repairs or replacement will be borne by the Contractor. However, once the Contractor has completed the mulching of an area in accordance with the provisions of the specifications and to the satisfaction of the Engineer, no additional work at his expense will be required. Any subsequent repairs and/or replacements deemed necessary by the Engineer may be made by the Contractor and will be paid for as additional or extra work.

#### **METHOD OF MEASUREMENT**

**905-4** Mulching will be measured in square yards on the basis of the actual surface area acceptably mulched to depths of 1-, 2-, or 4-inch depths.

#### **BASIS OF PAYMENT**

**905-5** Payment will be made at the contract unit price per square yard for mulching. This price will provide full compensation for furnishing all materials, for placing and anchoring the materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

- Item 905-5.1 Mulching – per square yard at 1-inch depth
- Item 905-5.2 Mulching – per square yard at 2-inch depth
- Item 905-5.3 Mulching – per square yard at 3-inch depth

#### **END OF ITEM 905**

**APPENDIX A**  
**APPROVED SPECIES LIST**

## Perennials, Ground Covers, Annuals & Bulbs

Scientific name	Common name
<i>Alchemilla mollis</i>	Lady's Mantle
<i>Astilbe x arendsii</i>	Hybrid Astilbe
<i>Carex grayi</i>	Morningstar Sedge
<i>Carex stricta</i>	Tussock Sedge
<i>Ceratostigma plumbaginoides</i>	Leadwort/Plumbago
<i>Chrysanthemum x superbum</i>	Shasta Daisy
<i>Convallaria majalis</i>	Lily-of-the-Valley
<i>Coreopsis rosea</i>	Rosy Coreopsis
<i>Coreopsis verticillata</i>	Threadleaf Coreopsis
<i>Dryopteris erythrosora</i>	Autumn Fern
<i>Dryopteris marginalis</i>	Leatherleaf Wood Fern
<i>Echinacea purpurea</i> 'Magnus'	Magnus Coneflower
<i>Epigea repens</i>	Trailing Arbutus
<i>Eupatorium coelestinum</i>	Hardy Ageratum
<i>Eupatorium hyssopifolium</i>	Hyssopleaf Thoroughwort
<i>Eupatorium maculatum</i>	Joe-Pye Weed
<i>Eupatorium purpureum</i>	Sweet Joe-Pye Weed
<i>Geranium maculatum</i>	Wild Geranium
<i>Hedera helix</i>	English Ivy
<i>Hemerocallis</i> spp.	Daylily
<i>Hibiscus moscheutos</i>	Rose Mallow
<i>Hosta</i> spp.	Plantain Lily
<i>Hydrangea quercifolia</i>	Oakleaf Hydrangea
<i>Iris sibirica</i>	Siberian Iris
<i>Iris versicolor</i>	Blue Flag Iris
<i>Lantana camara</i>	Yellow Sage
<i>Liatris spicata</i>	Gay-feather
<i>Liriope muscari</i>	Blue Lily-turf
<i>Liriope variegata</i>	Variegated Liriope
<i>Lobelia siphilitica</i>	Blue Cardinal Flower
<i>Lonicera sempervirens</i>	Coral Honeysuckle
<i>Lythrum salicaria</i>	Purple Loosestrife
<i>Narcissus</i> (all species and cultivars)	Daffodil
<i>Nepeta x faassenii</i>	Catmint
<i>Onoclea sensibilis</i>	Sensitive Fern
<i>Osmunda cinnamomea</i>	Cinnamon Fern
<i>Pelargonium x domesticum</i>	Mary Washington Geranium
<i>Perovskia abrotanoides</i>	Caspian/Russian Blue Sage
<i>Phlox stolonifera</i>	Creeping Phlox
<i>Polygonum aubertii</i>	Silver Lace Vine
<i>Polystichum acrostichoides</i>	Christmas Fern
<i>Rudbeckia fulgida</i>	Blackeyed Susan
<i>Salvia nemorosa</i>	May Night Salvia
<i>Schizachyrium scoparium</i>	Little Bluestem
<i>Sedum spectabile</i>	Stonecrop
<i>Solidago rugosa</i>	Goldenrod
<i>Thelypteris noveboracensis</i>	New York Fern
<i>Tiarella cordifolia</i>	Foam Flower
<i>Tulipa</i> spp.	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

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

<b>Scientific Name</b>	<b>Common Name</b>
<i>Abies concolor</i>	White Fir
<i>Abies nordmanniana</i>	Nordman Fir
<i>Acer campestre</i>	Hedge Maple
<i>Acer rubrum</i>	Red Maple (seedless cultivars such as 'Celzam', 'Karpick', and 'Somerset' only)
<i>Acer x freemanii</i>	Freeman Maple (seedless cultivars such as 'Autumn Blaze', 'Celebration', 'Marmo' and 'Scarlet Sentinel' only)
<i>Betula nigra</i>	River Birch
<i>Carpinus betulus 'Fastigiata'</i>	Upright European Hornbeam
<i>Carpinus caroliniana</i>	American Hornbeam
<i>Cedrus atlantica</i>	Blue Atlas Cedar
<i>Cedrus deodora</i>	Deodor Cedar
<i>Cercidiphyllum japonicum</i>	Katsura tree
<i>Cercis canadensis</i>	Eastern Redbud
<i>Chionanthus virginicus</i>	White Fringetree (male only)
<i>Cryptomeria japonica</i>	Japanese Cedar
<i>Cupressocyparis x leylandii</i>	Leyland Cypress
<i>Fraxinus americana</i>	White Ash (seedless cultivars such as 'Autumn Applause', 'Autumn Purple', Champaign County', 'Rosehill' and 'Skyline' only)
<i>Fraxinus pennsylvanica</i>	Green Ash (seedless cultivars such as 'Aerial', 'Bergeson', 'Honeyshade', 'Marshalls Seedless', 'Patmore' and 'Robinhood' only)
<i>Ginkgo biloba</i>	Ginkgo (male cultivars only)
<i>Gleditsia triacanthos var. inermis</i>	Thornless Common Honeylocust (seedless cultivars such as 'Imperial', 'Shademaster', 'Skyline', and 'Sunburst' only)
<i>Ilex opaca</i>	American Holly (male cultivars such as 'Jersey Knight' only)
<i>Koelreutarea paniculata</i>	Golden Raintree
<i>Lagerstroemia indica</i>	Crape Myrtle
<i>Liriodendron tulipifera</i>	Yellow Poplar
<i>Liquidambar styraciflua</i>	Sweetgum
<i>Magnolia x loebneri</i>	Loebneri Magnolia
<i>Magnolia x soulangiana</i>	Saucer Magnolia
<i>Magnolia stellata</i>	Star Magnolia
<i>Magnolia virginiana</i>	Sweetbay Magnolia
<i>Malus spp.</i>	Flowering Crabapple (non-fruiting cultivars such as 'American Beauty', 'Prince Georges', and 'Spring Snow' only)
<i>Ostrya virginiana</i>	American Hophornbeam
<i>Oxydendrum arboreum</i>	Sourwood
<i>Picea abies</i>	Norway Spruce
<i>Picea glauca</i>	White Spruce
<i>Picea omorika</i>	Serbian Spruce
<i>Picea pungens</i>	Colorado Spruce
<i>Pinus echinata</i>	Shortleaf Pine
<i>Pinus mugo</i>	Mugo Pine



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

<b>Scientific Name</b>	<b>Common Name</b>
<i>Pinus rigida</i>	Pitch Pine
<i>Pinus strobus</i>	Eastern White Pine
<i>Pinus taeda</i>	Loblolly Pine
<i>Pinus thunbergii</i>	Japanese Black Pine
<i>Pinus virginiana</i>	Virginia Pine
<i>Platanus occidentalis</i>	American Sycamore
<i>Populus deltoides</i>	Eastern Cottonwood
<i>Populus grandidentata</i>	Bigtooth Aspen
<i>Prunus spp.</i>	Flowering Cherry (non-fruiting cultivars only)
	Japanese Flowering Cherry (non-fruiting cultivars such as 'Kwanzan' only)
<i>Prunus serrulata</i>	Yoshino Cherry (non-fruiting cultivars only)
<i>Prunus x yedoensis</i>	Black Willow
<i>Salix nigra</i>	Japanese Scholartree
<i>Sophora japonica</i>	Japanese Stewartia
<i>Stewartia pseudocamellia</i>	Japanese Snowbell
<i>Styrax japonicus</i>	Japanese Tree Lilac
<i>Syringa reticulata</i>	Bald Cypress
<i>Taxodium distichum</i>	American Arborvitae
<i>Thuja occidentalis</i>	American Linden
<i>Tilia americana</i>	Littleleaf Linden
<i>Tilia cordata</i>	Silver Linden
<i>Tilia tomentosa</i>	Canadian Hemlock
<i>Tsuga canadensis</i>	Carolina Hemlock
<i>Tsuga caroliniana</i>	American Elm
<i>Ulmus americana</i>	Chinese Elm
<i>Ulmus parvifolia</i>	Siberian Elm
<i>Ulmus pumila</i>	Japanese Zelkova
<i>Zelkova serrata</i>	

## 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*

*Ilex spp.*

*Ilex x attenuata "Fosteri"*

*Ilex crenata*

*Ilex x "Edward J Stevens"*

*Ilex glabra*

*Ilex x meserveae*

*Ilex opaca*

*Itea virginica*

*Jasminum nudiflorum*

*Juniperis conferta*

*Juniperis chinensis*

*Juniperis horizontalis*

*Juniperis procumbens*

*Juniperis sabina*

*Juniperis scopulorum*

*Kalmia latifolia*

*Lavandula angustifolia*

*Leucothoe axillaris*

*Ligustrum japonicum*

*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)

Japargarden Juniper (male cultivars only)

Savin Juniper (male cultivars only)

Rocky Mountain Juniper (male cultivars such as 'Gray Glean', '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*

*Myrica 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*

**Common name**

Sweetbay Magnolia

Russian Arborvitae

Northern Bayberry (male cultivars such as 'Myrican' 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 Weigelia

## 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*

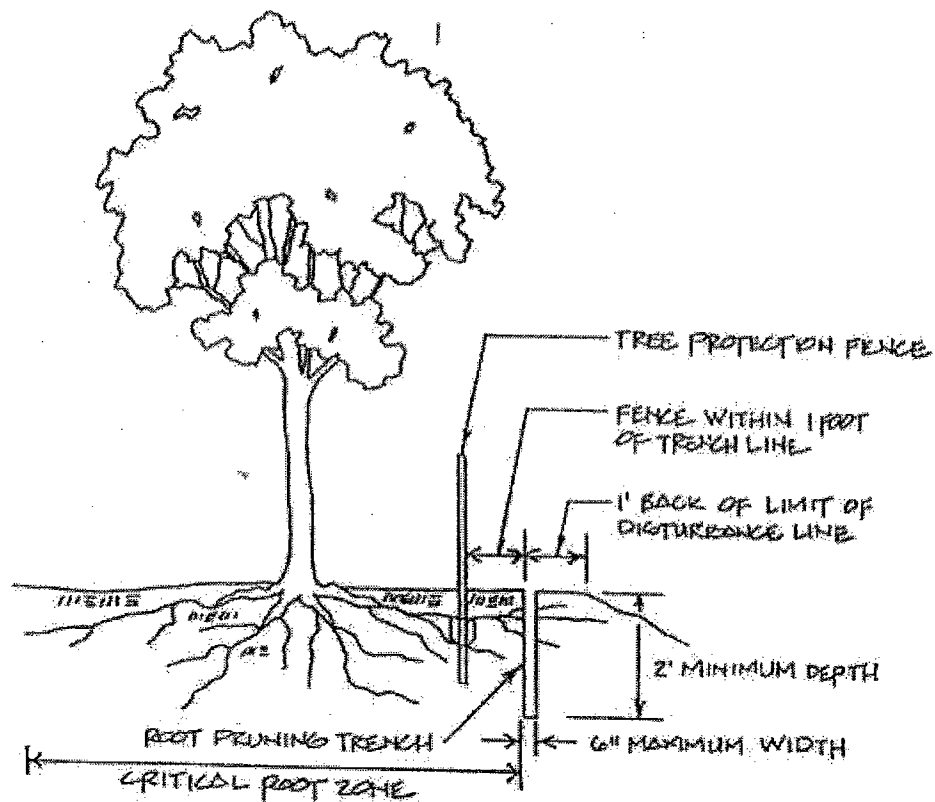
### Common name

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**

Figure J-1

## Root Pruning



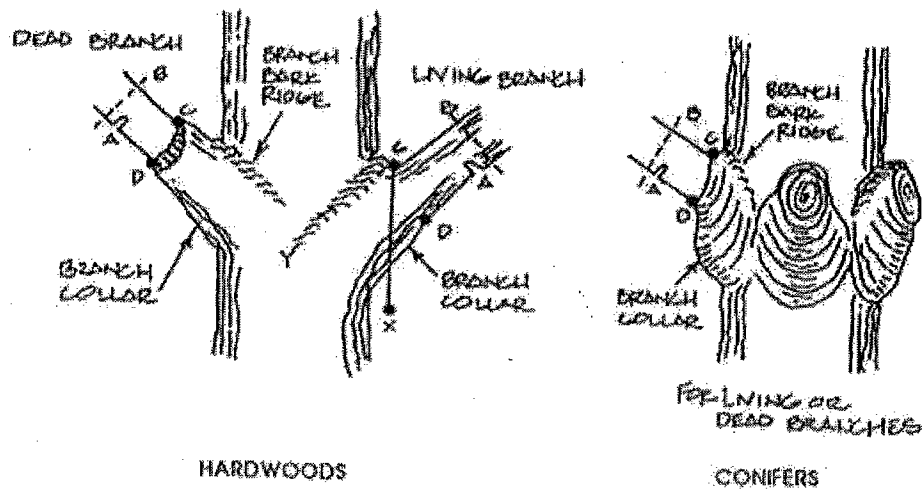
### Notes:

1. Retention Areas will be set as part of the review process
2. Boundaries of Retention Areas should be staked flagged prior to trenching
3. Exact location of trench should be identified
4. Trench should be immediately backfilled with soil removed or other high organic soil
5. Roots should be cleanly cut using vibratory knife or other acceptable equipment

Source: City of Gaithersburg, Maryland: City Tree Manual

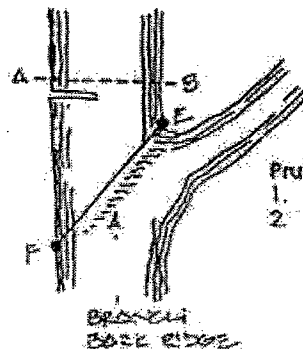
Figure J-2

## Crown Reduction



### Pruning a Branch

1. Remove branch weight by undercutting at A and remove limb by cutting through at B.
2. Remove stub at CD (line between branch bark ridge and outer edge of branch collar).
3. If D is difficult to find on hardwoods, drop vertical from C (line CX). Angle  $XCX = XCD$ .



### Pruning a Leader or To Reduce Size

1. Remove top weight by cutting at A&E.
2. Remove stub at EF parallel to the Branch Bark Ridge.

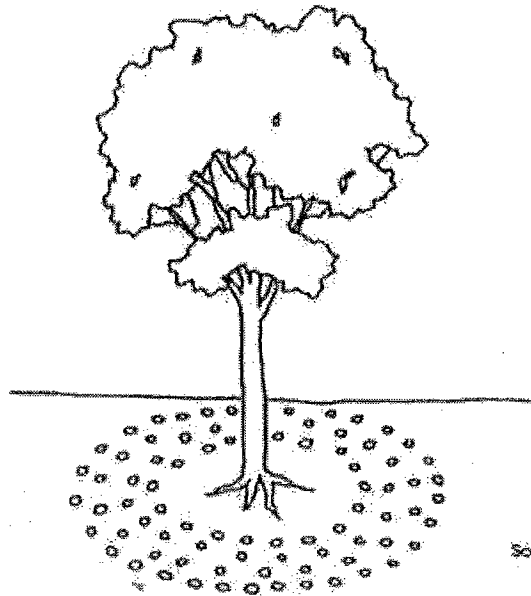
Source: Fairfax County, Virginia  
Vegetation Preservation & Planting

### Notes:

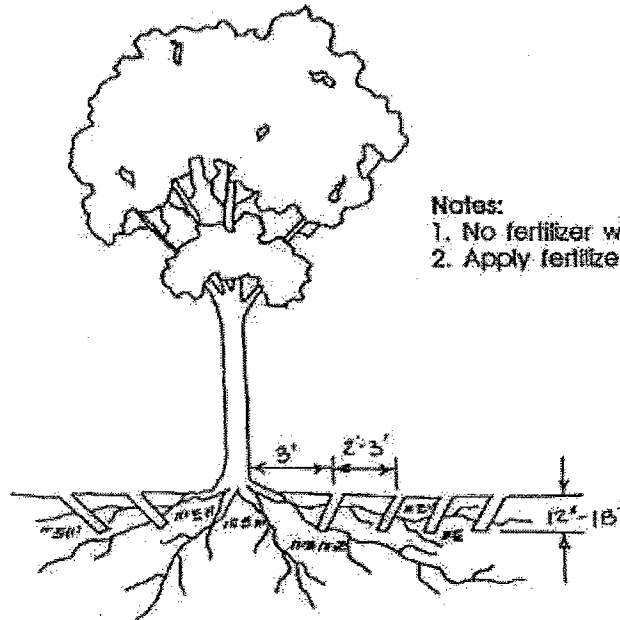
1. Only prune at specified times.
2. No more than 30% of crown to be removed at one time.

Figure J-3

### Application of Fertilizers by Injection



Source: Pione, 1978



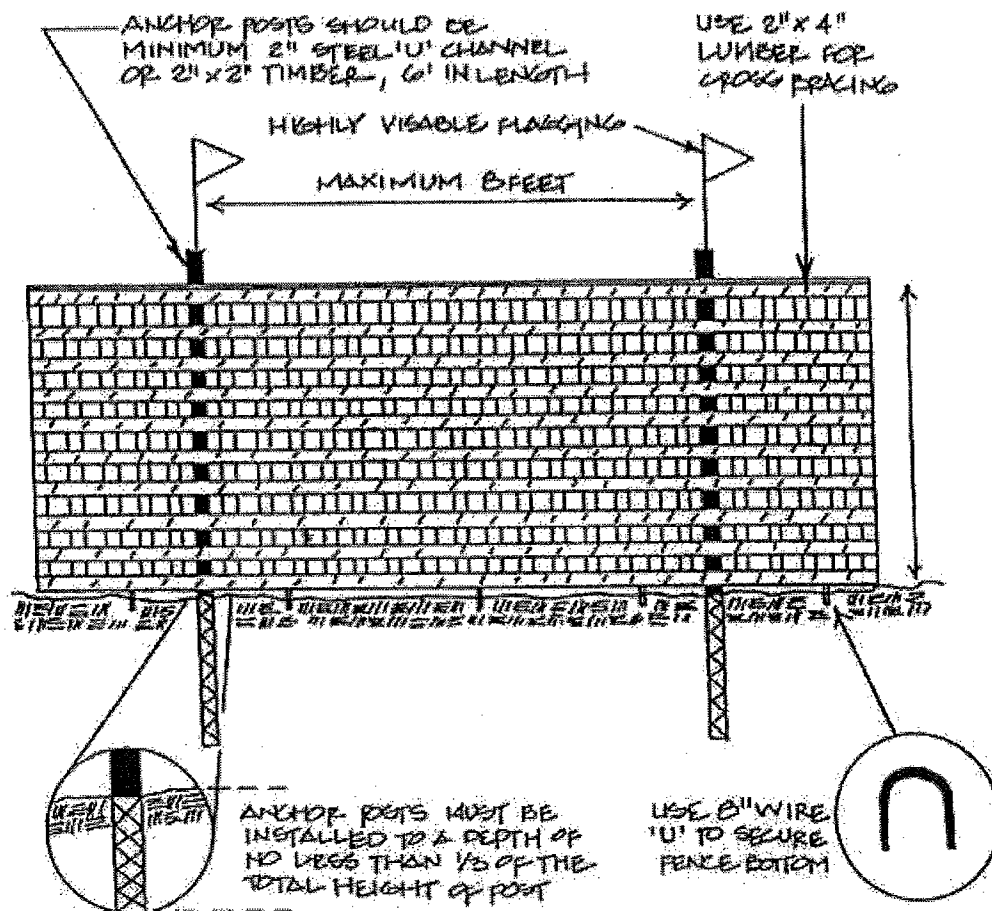
Notes:

1. No fertilizer within 3 feet of trunk
2. Apply fertilizer to entire critical root zone



Figure J-4

# Blaze Orange Plastic Mesh

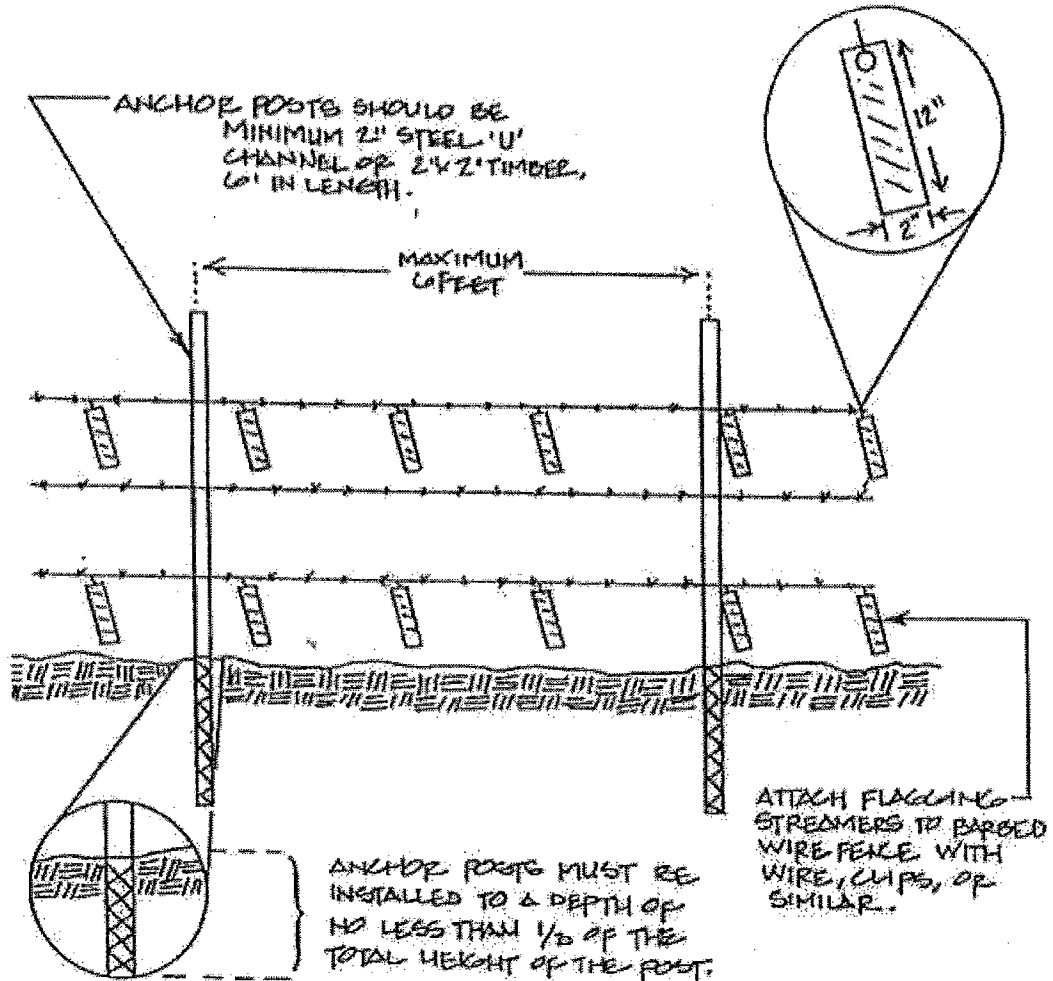


## Notes

1. Forest protection device only.
2. Retention Area will be set as part of the review process.
3. Boundaries of Retention Area should be staked and flagged prior to installing device.
4. Root damage should be avoided.
5. Protective signage may also be used.
6. Device should be maintained throughout construction.

Figure J-5

# Three Strand Barbed Wire

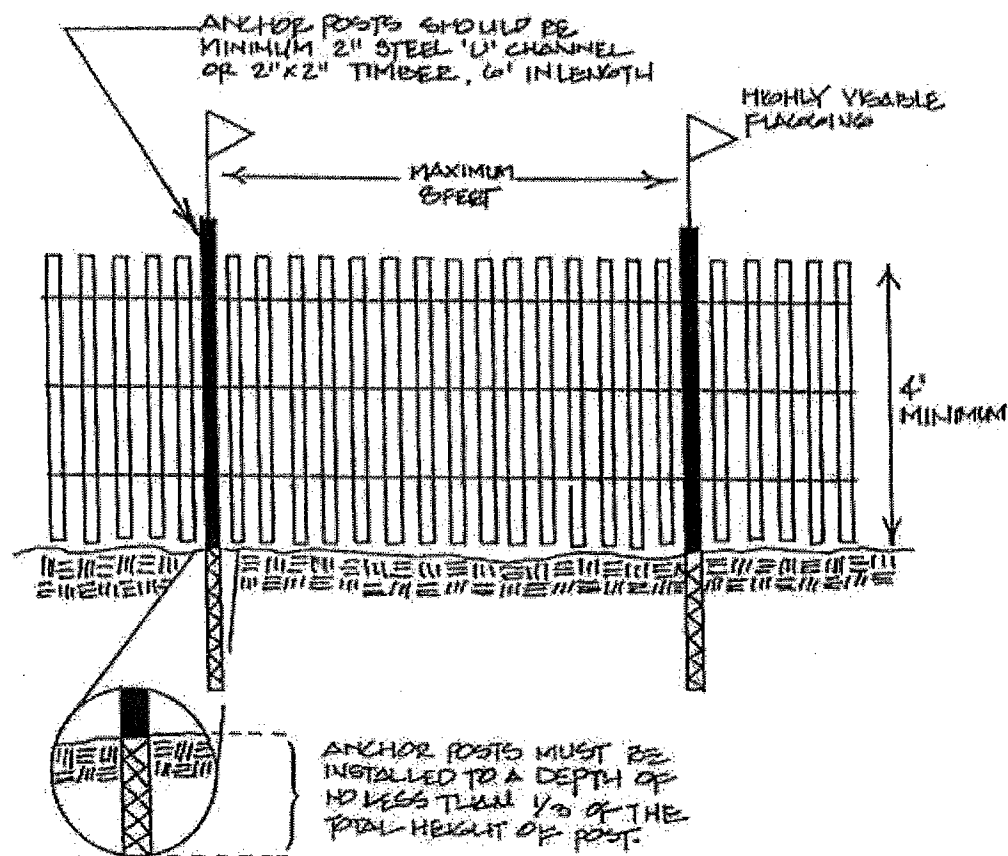


## Notes

1. Forest protection device only.
2. Retention Area will be set as part of the review process.
3. Boundaries of Retention Area should be staked and flagged prior to installing device.
4. Avoid root damage when placing anchor posts.
5. Barbed wire should be securely attached to posts.
6. Device should be properly maintained during construction.
7. Protective signage is also recommended.

Figure J-6

# Snow Fence



## Notes:

1. Forest protection device only
2. Retention area will be set as part of the review process
3. Boundaries of Retention Area should be staked prior to installing protective device
4. Avoid root damage when placing anchor posts
5. Device should be properly maintained during construction
6. Protective signage is also recommended

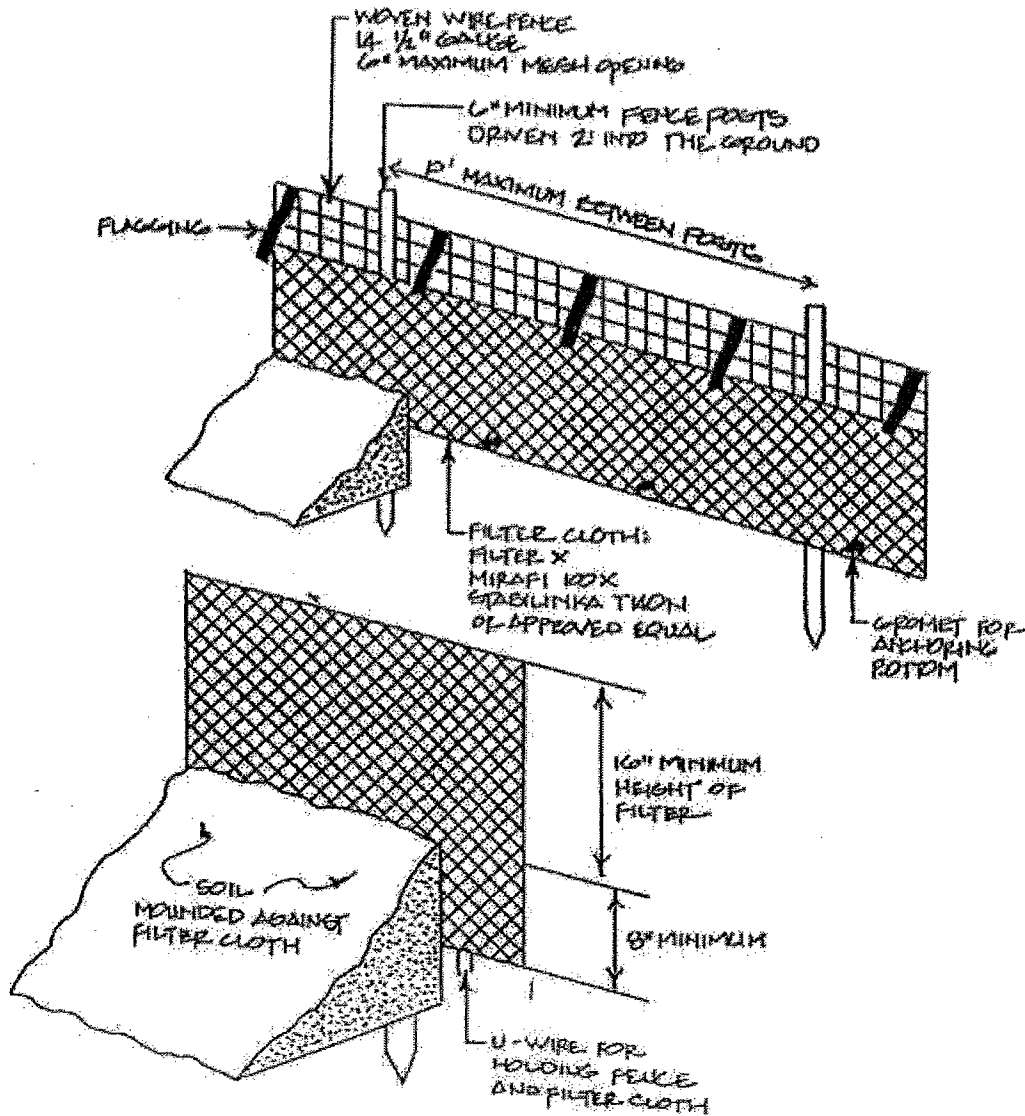
Figure J-7

Signage



Figure J-8

# Filter Cloth on Wire Mesh



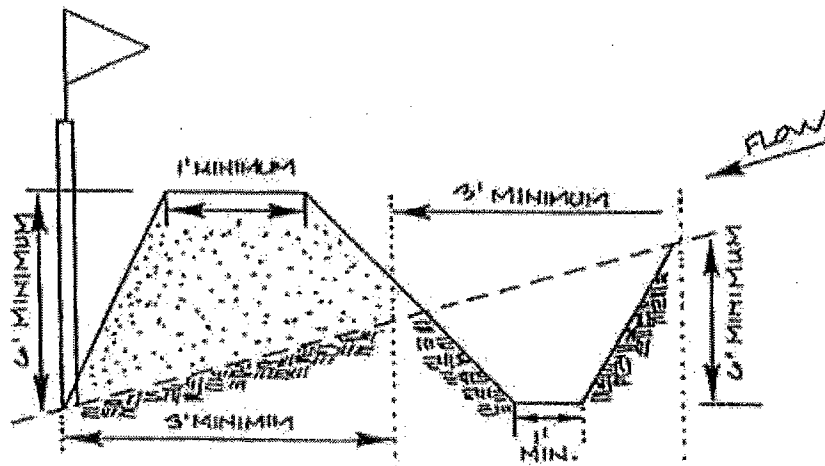
Source: Prince George's County, Maryland:  
Woodland Conservation Manual

## Notes:

1. Combination sediment control and protective device
2. Retention area will be set as part of the review process
3. Boundaries of Retention Area should be staked prior to installing protective device
4. Root damage should be avoided
5. Mound soil only within the limits of disturbance
6. Protective signage is also recommended
7. All standard maintenance for sediment control devices apply to these details

Figure J-10

# Earthen Dike and Swale



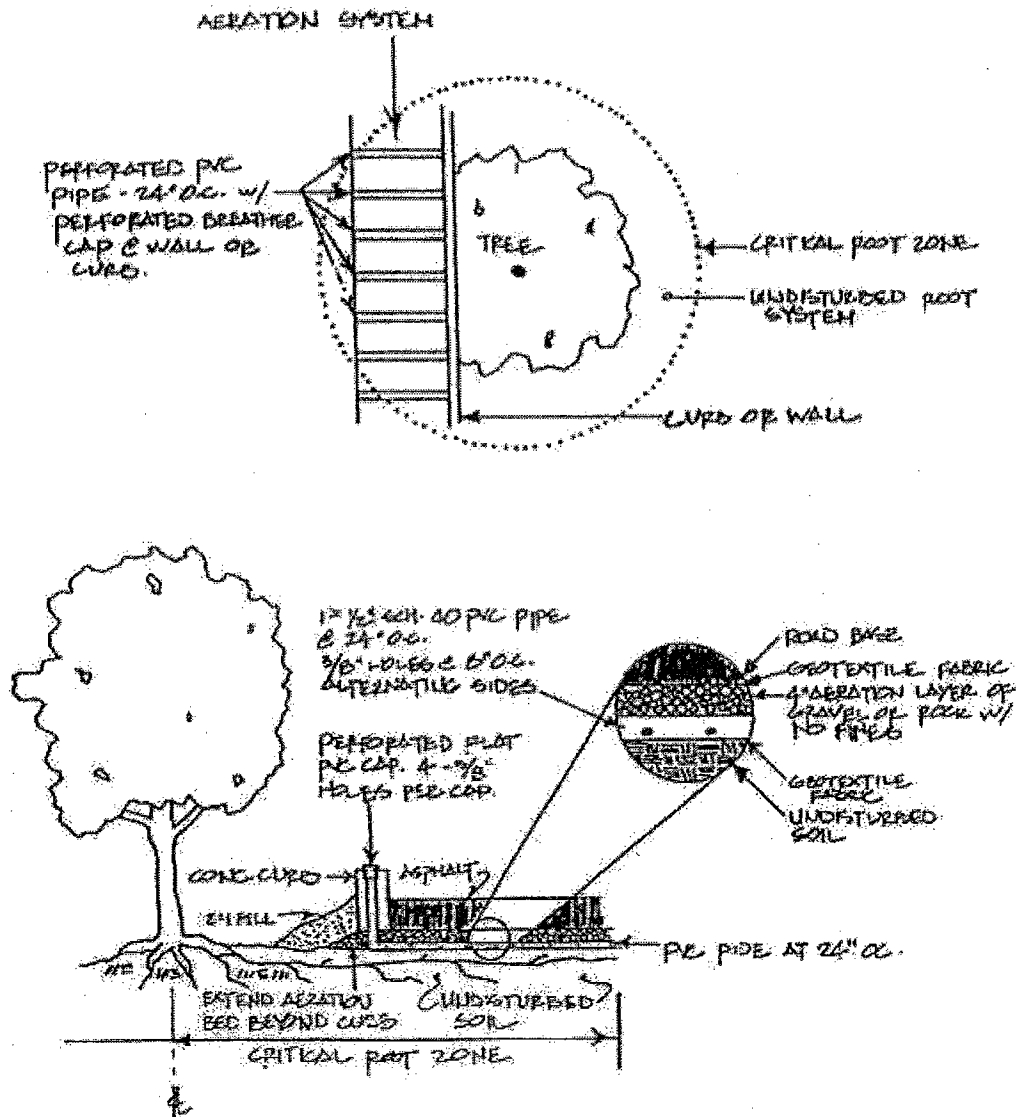
## Notes:

1. Combination sediment control and protective device
2. Retention area will be set as part of the review process
3. Boundaries of Retention Area should be staked prior to installing protective device
4. Root damage should be avoided
5. The top or toe of slope should be within the limit of disturbance
6. Equipment is prohibited within critical root zone of retention area; place dike accordingly
7. All standard maintenance for earthen dikes and swales apply to these details
8. All standard reclamation practices for earthen dikes and swales shall apply to these details

Source: Prince George's County, Maryland: Woodland Conservation Manual

Figure J- 11

# Aeration System

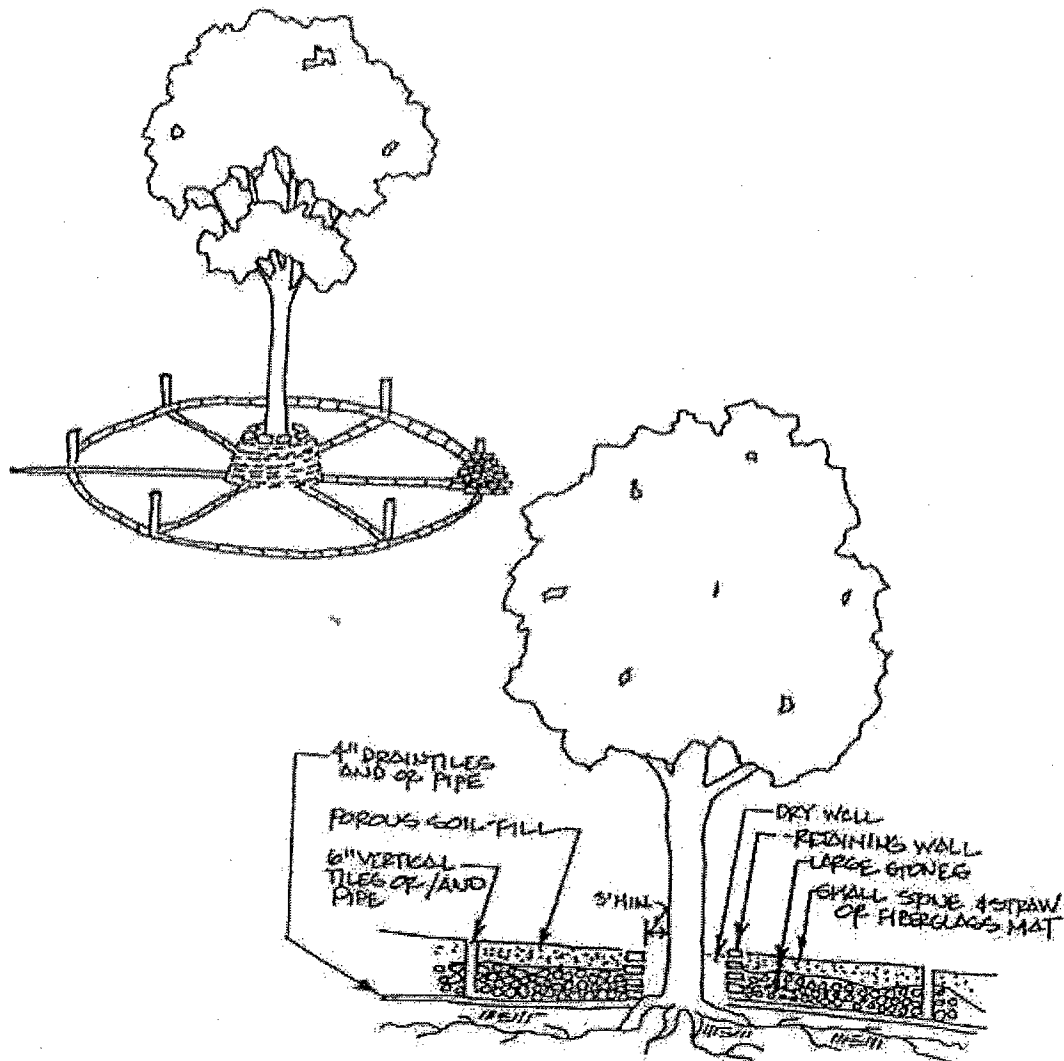


## Notes:

1. Bed preparation should not exceed two inches.
2. Vertical pipe should be capped with a perforated cap with 4-3/8 inch holes per cap.
3. Gravel or rock should contain no fines.
4. Can also be used when critical root zone is covered by fill instead of asphalt.

Figure J -12

# Tree Well



## Notes:

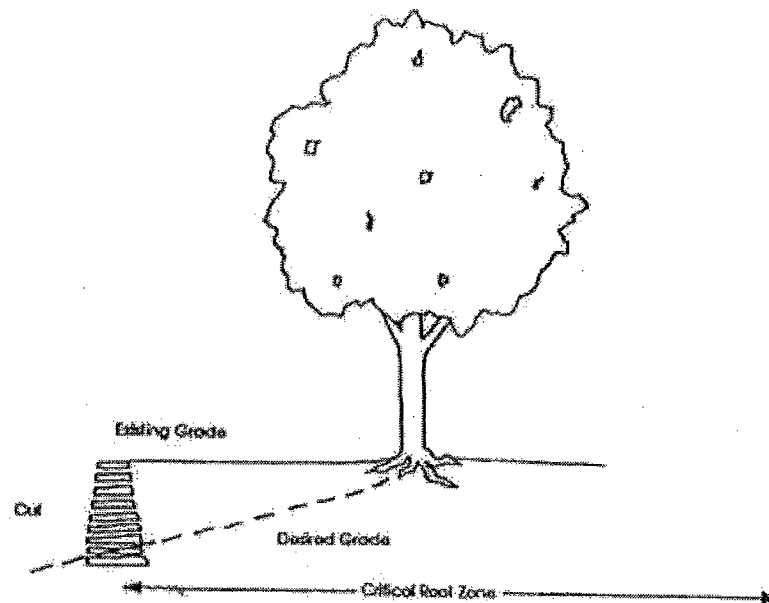
1. Well wall should be no closer than 3 feet from tree trunk or more for smaller trees.
2. Drainage pipe layout should extend beyond the critical root zone
3. Vertical pipes shall be capped with a perforated flat cap with 4-3/8 inch holes per cap
4. Radiating spokes should be on 3 foot centers at the well wall

Source: Fairfax County, Virginia: Vegetation Preservation & Planting

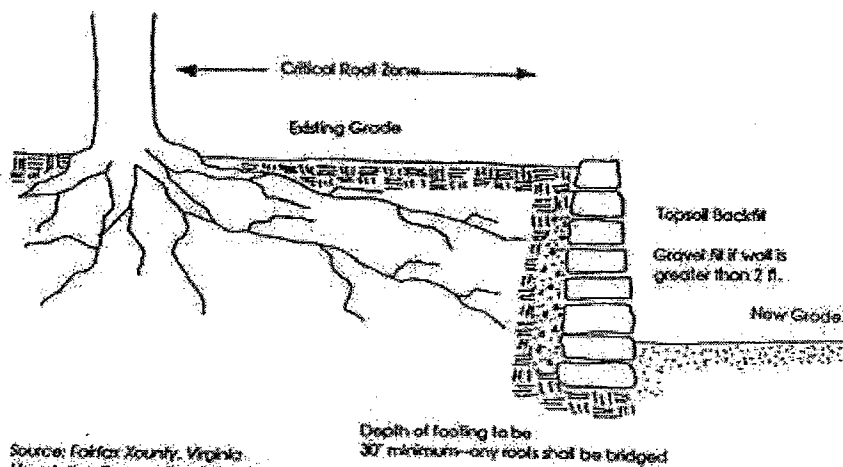


Figure J- 13

## Retaining Walls



Source: Fulton County, Georgia  
Tree Preservation Ordinance

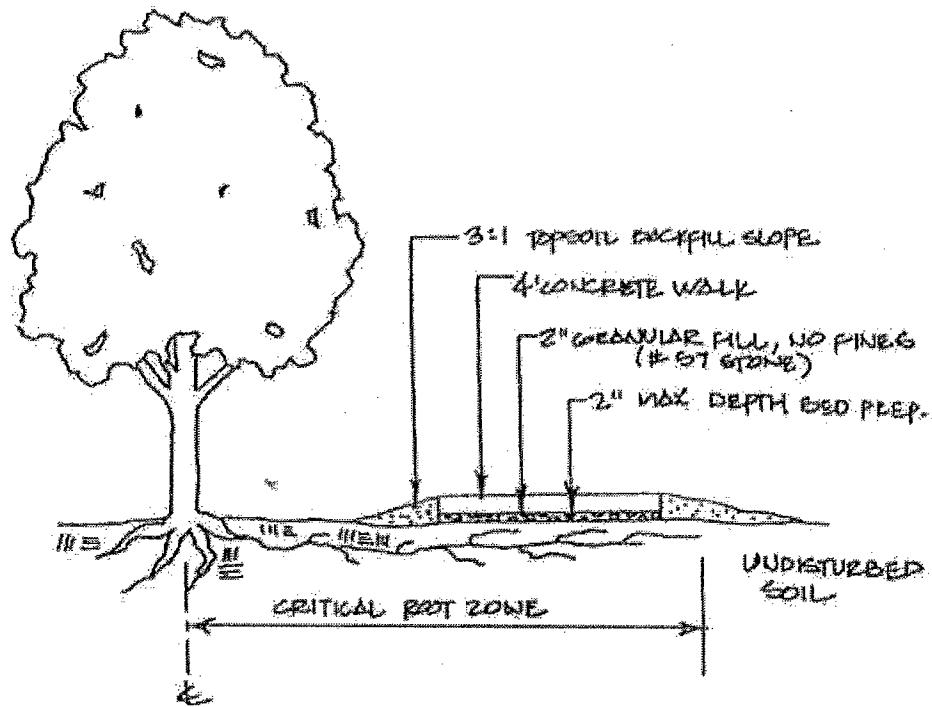


Source: Fairfax County, Virginia  
Vegetation Preservation & Planting

Note:  
1. Wall should be constructed outside the critical root zone.

Figure J-14

## Raised Sidewalk

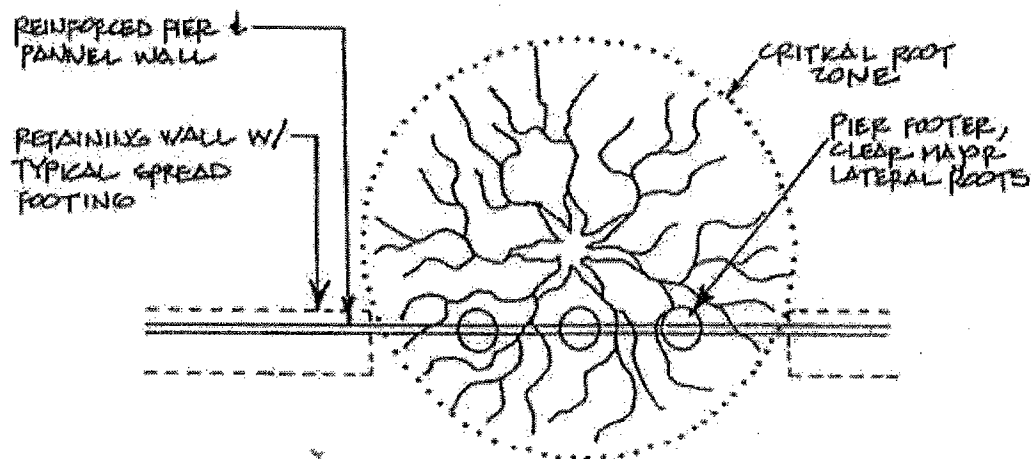


**Notes:**

1. Bed preparation should not exceed 2 inches
2. Granular fill should contain no fines
3. Minimize width of sidewalk; should be no wider than 4 feet

Figure J-15

## Reinforced Pier and Panel Wall

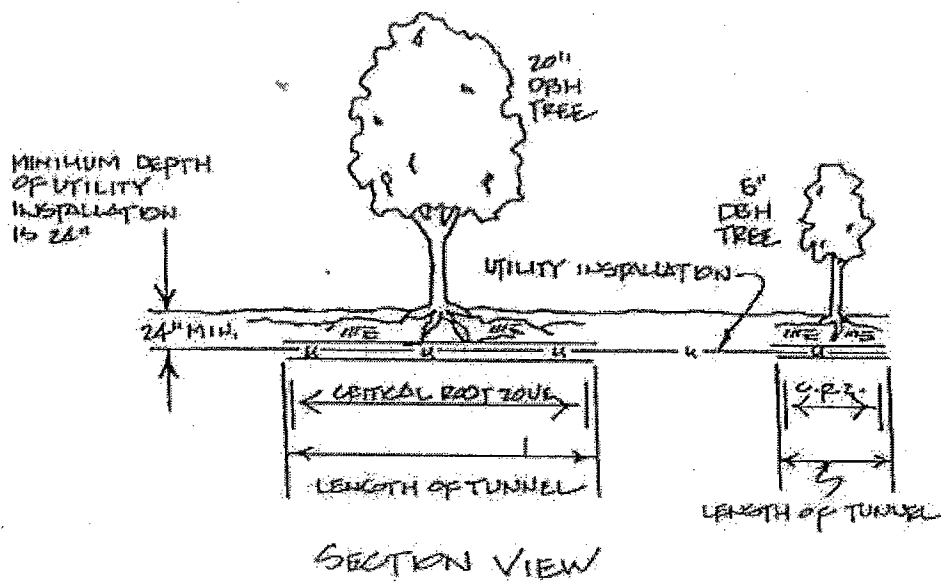
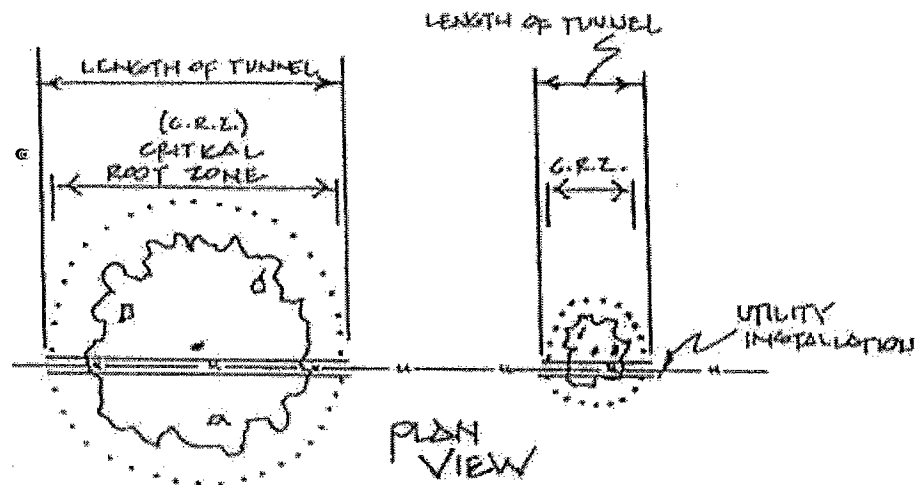


### Notes:

1. Area of disturbance should be minimized
2. Care should be taken to avoid major lateral roots
3. Roots should be cleanly cut using a vibratory knife or other similar equipment

Figure J- 16

# Tunnelling



## Notes:

1. Tunnel under critical root zone
2. Tunnel should be 24 inches deep at a minimum
3. When tunnelling, aim for the trunk of the tree
4. When trenching, tunnel through the critical root zone

Adapted from: Fairfax County, Virginia: Vegetation Preservation & Planting

## **ITEM U-15 FIRE HYDRANTS**

### **DESCRIPTION**

**15-1.1 GENERAL.** The work to be performed under this Section includes, but is not limited to, the furnishing of all materials, labor, tools, and equipment required for the construction and relocation of fire hydrants in accordance with the Contract Documents, including all excavation, backfilling, furnishing and installation of all equipment, piping, fittings, valves, fire hydrants, and other accessories and incidentals necessary to complete the work as indicated on the Plans and/or specified herein.

All work shall be accomplished in accordance with the laws, ordinances, and codes of the State of Maryland, Anne Arundel County, Baltimore/Washington International Airport Fire Department, and any other local, County, or State government body having jurisdiction.

### **15-1.2 RELATED WORK**

- a. Section (INSERT #) for trench excavation, backfill, and compaction.
- b. Section (INSERT #) for water piping, fittings, and appurtenance installation.

### **15-1.3 REFERENCES**

- a. NFPA – National Fire Protection Association
  - (1) 24 – Installation of Private Fire Service Mains and Their Appurtenances
  - (2) 291 – Flow Testing and Marking of Hydrants
  - (3) 1963 – Fire Hose Connections
- b. ASTM – American Society for Testing and Materials
- c. AWWA – American Water Works Association
- d. AASHTO – American Association of State Highway and Transportation Officials
- e. OSHA – Occupational Safety and Health Administration

## **15-1.4 QUALITY ASSURANCE**

a. **Materials.** The Contractor will inspect all materials before and after installation to insure compliance with the Contract Documents.

b. **Field Tests**

(1) Fire hydrants installed at the same time as new water main shall be tested, after installation, by the Contractor, along with the water main, in accordance with the following standards that apply: NFPA 24 and NFPA 291.

(2) Fire hydrants installed on existing water main will be visually inspected for leakage by the Contractor at the existing water main's line pressure before the excavation is backfilled. The hydrant valve and connection branch pipe shall be leak free under line pressure.

(3) All fire hydrants, valves, piping, and appurtenances shall be visually inspected by the BWI Airport Fire Marshal's Office after installation and before backfilling.

(4) All flow testing shall be conducted by the Contractor and witnessed by the BWI Airport Fire Marshal's Office. The "Contractor's Material and Test Certificate for Private Fire Service Mains" shall be completed by the BWI Airport Fire Marshal's Office or Representative.

## **15-1.5 SUBMITTALS**

a. **General.** Submit each item in this Article according to the Conditions of the Contract and the "Maryland Aviation Administration Standard Provisions for Construction Contracts".

b. **Provide data on the following:**

- (1) Fire Hydrants.
- (2) Parts List.
- (3) Valve and Hose Connection Sizes.
- (4) Operating Nut Style.
- (5) Direction of Opening.

- (6) Thrust Blocks and Accessories.
- (7) Piping, Fittings, and Accessories.
- (8) Valves, Roadway Boxes, and Accessories.
- (9) Vault details for the Underground Fire Hydrants, including accessories.

c. All submittals related to the fire hydrants subject to the BWI Fire Department's approval.

### 15-1.6 PROJECT CONDITIONS

- a. **Site Information:** Perform site survey, and verify existing utility locations.
- b. **Existing Utilities:** Do not interrupt existing utilities serving facilities occupied by the Owner or others except when permitted under the following conditions and then only after arranging to provide acceptable temporary utility services.
  - (1) Notify Engineer not less than 48 hours in advance of proposed utility interruptions.
  - (2) Do not proceed with utility interruptions without receiving Engineer's written permission.

### 15-1.7 SEQUENCING AND SCHEDULING

- a. Coordinate with all other utility work.
- b. Provide minimum 48-hour notice to BWI Fire Department prior to relocation of any existing fire hydrants.
- c. Provide minimum 48-hour notice to BWI Fire Department prior to any tests on new or relocated fire hydrants.

## MATERIALS

### 15-2.1 ABOVEGROUND FIRE HYDRANTS

- a. The Contractor shall furnish fire hydrants manufactured by American Darling, Model B-62-B; Kennedy Valve, Model K-81-A; or Mueller, Model Super Centurion 250.

b. Hydrant valve opening shall be at least 5-inch diameter net. Inlet connection shall be 6-inch mechanical joint with accessories (glands, plain rubber gaskets, bolts and nuts).

c. Hose connections shall consist of two 2 ½-inch diameter hose connections and one 4 ½-inch diameter steamer or pumper connection threaded as follows: the 2 ½-inch diameter nozzles shall have National Standard threads and the 4 ½-inch diameter nozzle shall have Baltimore City threads.

d. Operating nut shall be 5 sided, 1 5/16 inches from point to flat, and shall turn left (counterclockwise) to open.

e. Outer casing shall be one-piece cast iron, designed to permit extension without excavating.

f. Hydrant design shall be such that when the barrel is broken, it may be repaired without excavating or breaking adjacent pavement; that the entire barrel, including all working parts, along with the main and waste valve seats, may be removed for inspection, or repair without excavating or disturbing the ground; and that the underground flanges with bolts and nuts are eliminated.

g. Main valve seal shall be compression type sealing against a bronze seat and the valve shall open against pressure.

h. Between elbow and top cap, the barrel shall be made in two parts connected by a swivel segment to permit facing the nozzles in any direction.

i. Bonnet shall be bolted to the standpipe and shall have an arrow cast on the top and the word "Open" indicating the direction for opening.

j. A self-opening draining valve shall be provided.

k. All hydrant caps shall be provided with chains that will not rust.

## **15-2.2 UNDERGROUND FIRE HYDRANTS (NON-AIRCRAFT LOADING AREAS)**

a. The Contractor shall furnish 5-1/4" flush type fire hydrants by Mueller or approved equal.

b. Hose connections shall consist of one 2 ½ inch diameter hose connection and one 4 ½ inch diameter steamer or pumper connection threaded as follows: the 2 ½ inch diameter



nozzle shall have National Standard threads and the 4 ½ inch diameter nozzle shall have Baltimore City threads.

c. Bronze operating nut shall be 5-sided 1-5/16 inches from point to flat, and shall turn left (counterclockwise) to open.

d. Flush box shall be constructed of ASTM A126 Class B cast iron, with "Fire Hydrant" wording cast in cover.

e. Hydrant operating wrenches shall be provided with hydrant. Provide minimum one wrench per underground hydrant and another two wrenches to be turned over to the BWI Fire Department.

f. All hydrant caps shall be provided with chains that will not rust.

### **15-2.3 UNDEGROUND FIRE HYDRANTS (AIRCRAFT LOADING AREAS)**

a. Provide similar to underground fire hydrant described in Section 15-2.2, except without the cast iron flush box and cover.

b. Provide reinforced concrete structure around the underground fire hydrant as detailed on the plans. Access cover to the fire hydrant shall be 36" x 36" Model HLC-4 by Bilco or equal, suitable for aircraft loading. Access cover shall be painted with one primer coat and two coats of red epoxy paint. The cover shall be constructed of steel capable to withstand a live load of 200 psi plus 30% impact. Provide door with flush mounted hinges and stainless steel hardware, spring cushion operators, and hold open arm.

c. Verify that wrenches provided with the fire hydrant will operate inside the vault.

### **15-2.4 ANCHORS/BUTTRESSES**

a. Thrust blocking or concrete buttressing: Portland cement concrete mix, 3,000 psi.

b. Cement: ASTM C 150, Type 1.

c. Fine aggregate: ASTM C 33, sand.

d. Coarse aggregate: ASTM C 33, crushed stone.

e. Water: potable.

- f. Clamps, straps and washers: ASTM A 506, steel.
- g. Rods: ASTM A 575, steel.
- h. Rod couplings: ASTM A 197, malleable iron.
- i. Bolts: ASTM A 307, steel.
- j. Cast iron washers: ASTM A 126, gray iron.

#### **15-2.5 PIPING**

- a. 6-inch ductile iron piping: AWWA C151, Class 52.
- b. Lining: AWWA C104, cement mortar, seal coated.
- c. Gaskets, glands, bolts and nuts: AWWA C111.
- d. Ductile-iron and cast-iron pipe fittings: AWWA C110.
- e. Ductile-iron or cast iron mechanical joint with retainer glands, AWWA C 110, 250 psig rating or ductile-iron compact fittings with retainer glands, AWWA C 153, 350 psig rating.

#### **15-2.6 VALVES**

- a. Non-rising Stem Gate Valves 3-inch or larger: AWWA C 500, cast-iron double disc, bronze disc and seat rings, bronze stem, cast-iron or ductile-iron body and bonnet, stem nut, 200 psig working pressure, mechanical joint ends.
- b. Valve boxes: Cast-iron box having top section and cover with lettering "Water", bottom section with base of size to fit over valve and barrel approximately 5-inches in diameter, and adjustable cast-iron extension of length required for depth of bury of valve.
- c. Provide three (3) steel tee-handle operating wrenches. Wrenches shall have tee handles with one pointed end, stem of length to operate valve, and socket-fitting valve-operating nut. This only pertains to the installation of six (6) or more hydrants.
- d. Provide ductile iron "aircraft landing" lid and frame for areas designated. Cover shall be provided with "Water" lettering.

## **INSTALLATION**

### **15-3.1 GENERAL**

a. It is the Contractor's responsibility to inspect the site and to perform any test pit investigations as might be required to verify location and depth of existing utilities and/or subsurface structures within the areas of proposed work.

b. The Contractor shall furnish all materials, perform all excavation and backfill, construct all necessary joints and connections, construct all appurtenances, dispose of all surplus excavation, and discard materials as may be necessary to complete each fire hydrant installation. All materials and equipment shall be installed complete in a first-class manner and in accordance with modern methods and practice. Any material or equipment installed which does not present an orderly and reasonably neat or workmanlike appearance shall be removed and replaced when directed by the Engineer. The removal and replacement of this work shall be done at the Contractor's expense.

c. The Contractor shall assume all risk and bear any loss or injury to property or persons occasioned by neglect or accident during the progress of the work. The Contractor shall exercise special care during the work so as not to damage any existing utility lines or appurtenances.

d. **Removal of Water.** The Contractor shall at all times during construction provide proper and satisfactory means and devices for the removal of all water entering the excavated area, and he shall remove all such water as fast as it may collect to avoid interference with the prosecution of the work of the proper placing of cleanouts, pipe, pavement, or other materials.

e. For construction methods of excavation and backfillings, see item D-751. There will be no separate measurement or payment of excavation and backfilling but this work will be incidental.

### **15-3.2 FIRE HYDRANT INSTALLATION**

a. Gravel or crushed stone for hydrant foundation shall meet gradation requirements of AASHTO M 43, Size Number 57.

b. Fire hydrants shall be installed and restrained in accordance with the Standard Details, at locations shown, and to elevations directed by the Engineer. Hydrants shall be set within a gravel or crushed stone drainage well extending the full width of the trench.

c. Hydrant leads shall be laid level on a firm foundation to insure that it is set plumb. Backfill around hydrant shall be compacted so as to obtain a density of at least 95% of maximum when measured in accordance with AASHTO T 180, Method D.

d. Where hydrants are to be relocated, the Contractor shall ascertain whether or not the hydrant valve has been restrained before removing the hydrant to be relocated. The lead shall be capped and blocked so that service can be restored to the parent main pending the removal or plugging of the mainline tee.

e. The outside of all fire hydrants above the breakaway flange shall be painted with two coats of OSHA orange industrial enamel paint. The riser pipe from ground to breakaway flange shall be painted with two coats of gloss black industrial enamel paint. Hydrant bonnet shall be painted the appropriate color to indicate its GPM flow per NFPA 291.

f. All installations shall follow the manufacturer's recommended installation procedures.

g. All flush type (underground) hydrants shall be enclosed in a vault. See plans for details.

h. Test fire hydrant piping concurrent with testing and installation of new water main. See water main specification section for details.

## **METHOD OF MEASUREMENT**

**15-4.1** Fire hydrants and gate valves shall be measured by the unit. Pipe shall be measured by the linear foot.

## **BASIS OF PAYMENT**

**15-5.1** The accepted quantities of piping, fire hydrants, and valves will be paid for at the contract unit price for each, or per linear foot, as applicable complete in place. This price shall be full compensation for finishing all materials and for all preparation, excavation, backfilling, and placing of materials, furnishing and installation of such specials and connections to pipes and structures as may be required to complete the item as shown on the plans; and for all labor, equipment tools and incidentals necessary to complete, disinfect, and test the water distribution system. Price for valves shall include the roadway boxes and aircraft loaded covers as necessary. Underground fire hydrants shall include the vault enclosure and accessories.

**Payment will be made under:**

- |                      |  |
|----------------------|--|
| <b>Item U-15-5.1</b> | <b>Aboveground Fire Hydrants--per each</b> |
| <b>Item U-15-5.2</b> | <b>Underground Fire Hydrants--per each</b> |
| <b>Item U-15-5.3</b> | <b>6-inch Valves--per each</b>             |
| <b>Item U-15-5.4</b> | <b>6-inch Piping--per linear foot</b>      |

**END OF ITEM U-15**

<Project Title>  
<Airport>  
<AIP Project No.>

**Technical Specifications**  
**<Date>**

**U-15-9**

## **SECTION 02505 - FIRE HYDRANTS**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

- A. Drawings and provisions of the Contract, including Standard Provisions for Construction Contracts - Volume 1, and Technical Provisions, apply to the Work of this Section.**

#### **1.2 SUMMARY**

- A. The work to be performed under this Section includes, but is not limited to, the furnishing of all materials, labor, tools, and equipment required for the construction and relocation of fire hydrants in accordance with the Contract Documents, including all excavation, backfilling, furnishing and installation of all equipment, piping, fittings, valves, fire hydrants, and other accessories and incidentals necessary to complete the work as indicated on the Plans and/or specified herein.**
- B. All work shall be accomplished in accordance with the laws, ordinances, and codes of the State of Maryland, Anne Arundel County, Baltimore/Washington International Airport Fire Department, and any other local, County, or State government body having jurisdiction.**

#### **1.3 RELATED WORK**

- A. Section (INSERT #) for trench excavation, backfill, and compaction.**
- B. Section (INSERT #) for water piping, fittings, and appurtenance installation.**

#### **1.4 REFERENCES**

- A. NFPA – National Fire Protection Association**
  - 1. 24 – Installation of Private Fire Service Mains and Their Appurtenances**
  - 2. 291 – Flow Testing and Marking of Hydrants**

### **3. 1963 – Fire Hose Connections**

- B. ASTM – American Society for Testing and Materials**
- C. AWWA – American Water Works Association**
- D. AASHTO – American Association of State Highway and Transportation Officials**
- E. OSHA – Occupational Safety and Health Administration**

## **1.5 QUALITY ASSURANCE**

- A. Materials:** The Contractor will inspect all materials before and after installation to insure compliance with the Contract Documents.
- B. Field Tests**
  - 1.** Fire hydrants installed at the same time as new water main shall be tested, after installation, by the Contractor, along with the water main, in accordance with the following standards that apply: NFPA 24 and NFPA 291.
  - 2.** Fire hydrants installed on existing water main will be visually inspected for leakage by the Contractor at the existing water main's line pressure before the excavation is backfilled. The hydrant valve and connection branch pipe shall be leak free under line pressure.
  - 3.** All fire hydrants, valves, piping, and appurtenances shall be visually inspected by the BWI Airport Fire Marshal's Office after installation and before backfilling.
  - 4.** All flow testing shall be conducted by the Contractor and witnessed by the BWI Airport Fire Marshal's Office. The "Contractor's Material and Test Certificate for Private Fire Service Mains" shall be completed by the BWI Airport Fire Marshal's Office or Representative.

## **1.6 SUBMITTALS**

- A. General:** Submit each item in this Article according to the Conditions of the Contract and the "Maryland Aviation Administration Standard Provisions for Construction Contracts."

**B. Provide data on the following:**

1. Fire Hydrants.
2. Parts List.
3. Valve and Hose Connection Sizes.
4. Operating Nut Style.
5. Direction of Opening.
6. Thrust Blocks and Accessories.
7. Piping, Fittings, and Accessories.
8. Valves, Roadway Boxes, and Accessories.
9. Vault details for the Underground Fire Hydrants, including accessories.

**C. All submittals related to the fire hydrants subject to the BWI Fire Department's approval.**

**1.7 PROJECT CONDITIONS**

- A. Site Information: Perform site survey, and verify existing utility locations.**
- B. Existing Utilities: Do not interrupt existing utilities serving facilities occupied by the Owner or others except when permitted under the following conditions and then only after arranging to provide acceptable temporary utility services.**
1. Notify Engineer not less than 48 hours in advance of proposed utility interruptions.
  2. Do not proceed with utility interruptions without receiving Engineer's written permission.

**1.8 SEQUENCING AND SCHEDULING**

- A. Coordinate with all other utility work.**



- B. Provide minimum 48-hour notice to BWI Fire Department prior to relocation of any existing fire hydrants.
- C. Provide minimum 48-hour notice to BWI Fire Department prior to any tests on new or relocated fire hydrants.

## **PART 2 - PRODUCTS**

### **2.1 ABOVEGROUND FIRE HYDRANTS**

- A. The Contractor shall furnish fire hydrants manufactured by American Darling, Model B-62-B; Kennedy Valve, Model K-81-A; or Mueller, Model Super Centurion 250.
- B. Hydrant valve opening shall be at least 5-inch diameter net. Inlet connection shall be 6-inch mechanical joint with accessories (glands, plain rubber gaskets, bolts and nuts).
- C. Hose connections shall consist of two 2½-inch diameter hose connections and one 4½-inch diameter steamer or pumper connection threaded as follows: the 2½-inch diameter nozzles shall have National Standard threads and the 4½-inch diameter nozzle shall have Baltimore City threads.
- D. Operating nut shall be five sided, 1-5/16 inches from point to flat, and shall turn left (counterclockwise) to open.
- E. Outer casing shall be one-piece cast iron, designed to permit extension without excavating.
- F. Hydrant design shall be such that when the barrel is broken, it may be repaired without excavating or breaking adjacent pavement; that the entire barrel, including all working parts, along with the main and waste valve seats, may be removed for inspection, or repair without excavating or disturbing the ground; and that the underground flanges with bolts and nuts are eliminated.
- G. Main valve seal shall be compression type sealing against a bronze seat and the valve shall open against pressure.
- H. Between elbow and top cap, the barrel shall be made in two parts connected by a swivel segment to permit facing the nozzles in any direction.
- I. Bonnet shall be bolted to the standpipe and shall have an arrow cast on the top and the word "Open" indicating the direction for opening.
- J. A self-opening draining valve shall be provided.

- K. All hydrant caps shall be provided with chains that will not rust.

## 2.2 UNDERGROUND FIRE HYDRANTS (NON-AIRCRAFT LOADING AREAS)

- A. The Contractor shall furnish 5¼" flush type fire hydrants by Mueller or approved equal.
- B. Hose connections shall consist of one 2½ inch diameter hose connection and one 4½ inch diameter steamer or pumper connection threaded as follows: the 2½ inch diameter nozzle shall have National Standard threads and the 4½ inch diameter nozzle shall have Baltimore City threads.
- C. Bronze operating nut shall be 5-sided 1-5/16 inches from point to flat, and shall turn left (counterclockwise) to open.
- D. Flush box shall be constructed of ASTM A 126 Class B cast iron, with "Fire Hydrant" wording cast in cover.
- E. Hydrant operating wrenches shall be provided with hydrant. Provide minimum one wrench per underground hydrant and another two wrenches to be turned over to the BWI Fire Department.
- F. All hydrant caps shall be provided with chains that will not rust.

## 2.3 UNDERGROUND FIRE HYDRANTS (AIRCRAFT LOADING AREAS)

- A. Provide similar to underground fire hydrant described in Section 15-2.2, except without the cast iron flush box and cover.
- B. Provide reinforced concrete structure around the underground fire hydrant as detailed on the plans. Access cover to the fire hydrant shall be 36" x 36" Model HLC-4 by Bilco or equal, suitable for aircraft loading. Access cover shall be painted with one primer coat and two coats of red epoxy paint. The cover shall be constructed of steel capable to withstand a live load of 200 psi plus 30 percent impact. Provide door with flush mounted hinges and stainless steel hardware, spring cushion operators, and hold open arm.
- C. Verify that wrenches provided with the fire hydrant will operate inside the vault.

## **2.4 ANCHORS/BUTTRESSES**

- A. Thrust blocking or concrete buttressing: Portland cement concrete mix, 3,000 psi.**
- B. Cement: ASTM C 150, Type 1.**
- C. Fine aggregate: ASTM C 33, sand.**
- D. Coarse aggregate: ASTM C 33, crushed stone.**
- E. Water: potable.**
- F. Clamps, straps and washers: ASTM A 506, steel.**
- G. Rods: ASTM A 575, steel.**
- H. Rod couplings: ASTM A 197, malleable iron.**
- I. Bolts: ASTM A 307, steel.**
- J. Cast iron washers: ASTM A 126, gray iron.**

## **2.5 PIPING**

- A. 6-inch ductile iron piping: AWWA C151, Class 52.**
- B. Lining: AWWA C104, cement mortar, seal coated.**
- C. Gaskets, glands, bolts and nuts: AWWA C111.**
- D. Ductile-iron and cast-iron pipe fittings: AWWA C110.**
- E. Ductile-iron or cast iron mechanical joint with retainer glands, AWWA C 110, 250 psig rating or ductile-iron compact fittings with retainer glands, AWWA C 153, 350 psig rating.**

## **2.6 VALVES**

- A. Non-rising Stem Gate Valves 3-inch or larger: AWWA C 500, cast-iron double disc, bronze disc and seat rings, bronze stem, cast-iron or ductile-iron body and bonnet, stem nut, 200 psig working pressure, mechanical joint ends.**

- B. Valve boxes: Cast-iron box having top section and cover with lettering "Water," bottom section with base of size to fit over valve and barrel approximately 5 inches in diameter, and adjustable cast-iron extension of length required for depth of bury of valve.
- C. Provide three (3) steel tee-handle operating wrenches. Wrenches shall have tee handles with one pointed end, stem of length to operate valve, and socket-fitting valve-operating nut. This only pertains to the installation of six (6) or more hydrants.
- D. Provide ductile iron "aircraft loading" lid and frame for areas designated. Cover shall be provided with "Water" lettering.

## **PART 3 - EXECUTION**

### **3.1 GENERAL**

- A. It is the Contractor's responsibility to inspect the site and to perform any test pit investigations as might be required to verify location and depth of existing utilities and/or subsurface structures within the areas of proposed work.
- B. The Contractor shall furnish all materials, perform all excavation and backfill, construct all necessary joints and connections, construct all appurtenances, dispose of all surplus excavation, and discard materials as may be necessary to complete each fire hydrant installation. All materials and equipment shall be installed complete in a first-class manner and in accordance with modern methods and practice. Any material or equipment installed which does not present an orderly and reasonably neat or workmanlike appearance shall be removed and replaced when directed by the Engineer. The removal and replacement of this work shall be done at the Contractor's expense.
- C. The Contractor shall assume all risk and bear any loss or injury to property or persons occasioned by neglect or accident during the progress of the work. The Contractor shall exercise special care during the work so as not to damage any existing utility lines or appurtenances.
- D. Removal of Water: The Contractor shall at all times during construction provide proper and satisfactory means and devices for the removal of all water entering the excavated area, and he shall remove all such water as fast as it may collect to avoid interference with the prosecution of the work of the proper placing of cleanouts, pipe, pavement, or other materials.
- E. For construction methods of excavation and backfillings, see Section "INSERT SECTION #". There will be no separate measurement or payment of excavation and backfilling but this work will be incidental.

### **3.2 FIRE HYDRANT INSTALLATION**

- A. Gravel or crushed stone for hydrant foundation shall meet gradation requirements of AASHTO M 43, Size No. 57.**
- B. Fire hydrants shall be installed and restrained in accordance with the Standard Details, at locations shown, and to elevations directed by the Engineer. Hydrants shall be set within a gravel or crushed stone drainage well extending the full width of the trench.**
- C. Hydrant leads shall be laid level on a firm foundation to insure that it is set plumb. Backfill around hydrant shall be compacted so as to obtain a density of at least 95 percent of maximum when measured in accordance with AASHTO T 180, Method D.**
- D. Where hydrants are to be relocated, the Contractor shall ascertain whether or not the hydrant valve has been restrained before removing the hydrant to be relocated. The lead shall be capped and blocked so that service can be restored to the parent main pending the removal or plugging of the mainline tee.**
- E. The outside of all fire hydrants above the breakaway flange shall be painted with two coats of OSHA orange industrial enamel paint. The riser pipe from ground to breakaway flange shall be painted with two coats of gloss black industrial enamel paint. Hydrant bonnet shall be painted the appropriate color to indicate its GPM flow per NFPA 291.**
- F. All installations shall follow the manufacturer's recommended installation procedures.**
- G. All flush type (underground) hydrants shall be enclosed in a vault. See plans for details.**
- H. Test fire hydrant piping concurrent with testing and installation of new water main. See water main specification section for details.**

## **PART 4 - MEASUREMENT**

### **4.1 METHOD OF MEASUREMENT**

- A. Fire hydrants and gate valves shall be measured by the unit. Pipe shall be measured by the linear foot.**

## **PART 5 - PAYMENT**

### **5.1 BASIS OF PAYMENT**

A. The accepted quantities of piping, fire hydrants, and valves will be paid for at the contract unit price for each, or per linear foot, as applicable complete in place. This price shall be full compensation for finishing all materials and for all preparation, excavation, backfilling, and placing of materials, furnishing and installation of such specials and connections to pipes and structures as may be required to complete the item as shown on the plans; and for all labor, equipment tools and incidentals necessary to complete, disinfect, and test the water distribution system. Price for valves shall include the roadway boxes and aircraft loaded covers as necessary. Underground fire hydrants shall include the vault enclosure and accessories.

B. Payment will be made under:

Item 02505-5.1 Aboveground Fire Hydrants--per each

Item 02505-5.2 Underground Fire Hydrants--per each

Item 02505-5.3 6-Inch Valves--per each

Item 02505-5.4 6-Inch Piping--per linear foot

**END OF SECTION 02505**

**AIRPORT WIDE STANDARD**

**FOR**

**SOLE SOURCE SYSTEMS AND EQUIPMENT**

**REVISED OCTOBER 15, 2004**



**Prepared By**

**URS Corporation  
Airport Square 19  
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Linthicum, Maryland 21090**

**Prepared for:**

**Maryland Aviation Administration  
Agreement No. MAA-AE-96-003  
Task 1167.3 Design Standard -  
Sole Source Systems**

## **SECTION 02553 - NATURAL GAS DISTRIBUTION**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including Standard Provisions/Interim Standard Provisions for Construction Contracts - Volume 1, December 1993, and Technical Provisions apply to the Work of this Section.**

#### **1.2 SCOPE**

- A. The work covered by this section includes the furnishing of all materials and equipment and the performing of all labor to complete the Natural Gas Distribution as shown on the Contract Drawings and as herein specified or directed by the Engineer.**
- B. The Engineer is responsible for contacting the Baltimore Gas and Electric Company (BGE) prior to development of plans to verify availability of natural gas supply for this project. The Engineer shall also provide BGE with estimated gas load calculations and minimum service pressures required.**
- C. BGE will provide and install new natural gas service main, meter with pressure regulator assembly on site and connection to existing gas main.**
- D. Contractor shall be responsible for pavement removal and repair, maintenance of traffic and for all coordination between BGE and the Project.**

#### **1.3 RELATED SECTIONS**

- A. The following sections in this document contain requirements that relate to this Section:**

- 1. Section 02310 - "Excavation and Backfill"**

#### **1.4 SEQUENCING AND SCHEDULING**

- A. Coordinate gas main installation on-site and connection to existing gas main with BGE.**
- B. Coordinate with other utility work.**
- C. BGE estimates it will take approximately \_\_\_\_ working days to complete the gas main installation.**



## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Materials for natural gas piping system including pipe, valves, meter, pressure regulators, and specialties will be provided by BGE.**
- B. Bedding material meeting requirements of AASHTO M6-81 shall be furnished by BGE.**
- C. Concrete pad for meter station at building will be constructed by the Contractor after verifying dimensions required with BGE.**

## **PART 3 - EXECUTION**

### **3.1 GENERAL**

- A. The Contractor shall notify BGE three months prior to start of work in area around the proposed building gas service mains. Contact with BGE shall be made through:**

**Mr. Kevin Kline  
Baltimore Gas and Electric Company  
(410) 597-6516**

- B. The Contractor shall coordinate all necessary pavement removal and repairs.**
- C. The Contractor shall provide a secure area near the construction site for BGE to store materials and equipment.**

### **3.2 INSTALLATION**

- A. See Division 2 Section 02310 for requirements of excavation, backfill, and pavement repair.**
- B. The Contractor shall be responsible for pedestrian and traffic control during installation of the new gas main piping by BGE.**
- C. Drawings indicate general alignment for the gas main. The Contractor is responsible for coordination of the new gas main with other utilities and between different construction phases of the project.**

### **3.3 FIELD QUALITY CONTROL**

- A.** BGE shall verify that entire gas distribution system has been inspected, tested, and purged by BGE according to NFPA 54, Part 4 "Gas Piping Inspection, Testing, and Purging" and local gas utility company requirements.
- B.** Report test results in writing to the Engineer and the authorities having jurisdiction.
  - 1.** Verify that specified piping tests are complete.
- C.** Refer to Section 01400 - Construction Quality Control Plan.

## **PART 4 - MEASUREMENT**

### **4.1 METHOD OF MEASUREMENT**

- A.** No direct measurement will be made for Pay Item "BGE Gas Service Cost Allowance" and Pay Item "Contractor Gas Service Support Work Allowance" as payment will be made on actual cost basis. Measurement of gas pipe demolition shall be made on a linear foot basis. Demolition of gas pipe shall include excavation and backfill, and other incidental items shown on the plans.

## **PART 5 - PAYMENT**

### **5.1 BASIS OF PAYMENT**

- A.** Payment for the Pay Item "BGE Gas Service Cost Allowance" will be made to the Contractor on the basis of actual costs billed (as shown on utility invoices) by BGE plus Contractor's overhead and profit as defined in Article SP-9.04. Partial payments will be made out of the allowance amount as bills are received from the utilities. The Contractor shall furnish proof to the Engineer that utility payments have been made after he receives payment from MAA. The Contractor shall include the figure indicated in the proposal form in his bid for this item. The Contractor will not be entitled to any unspent or non-approved portion of monies from this allowance.
- B.** Payment for the Pay Item "Contractor Gas Service Support Work Allowance" will be made to the Contractor on the basis of actual costs billed (as shown on invoices submitted by the Contractor and approved by the Engineer) plus Contractor's overhead and profit as defined in Article SP-9.04. Partial payments will be made out of the allowance amount as bills are submitted and approved with each Application for Payment, which shall include all materials and labor for pavement demolition, disposal, and replacement, assisting BGE with pipe installation, coordination, and all incidentals necessary to complete this work. The Contractor shall include the figure indicated in the

proposal form in his bid for this item. The Contractor will not be entitled to any unspent or non-approved portion of monies for this allowance.

C. Payment for the demolition of gas pipe will be made based on the accepted quantities of piping removed at the contract unit price.

D. Payment will be made under:

Item 02553-1      Demolition of Gas Piping--per linear foot

Item 01021-1      BGE Gas Service Cost Allowance

Item 01021-2      Contractor Gas Service Support Work Allowance

**END OF SECTION 02553**

## **SECTION 08711 - DOOR HARDWARE**

### **PART 2 - PRODUCTS**

#### **2.1 INTERCHANGEABLE DOOR HARDWARE CORES AND KEYING**

- A. Manufacturers:** Subject to compliance with requirements, provide products by the following:
  - 1. Cylinders:**
    - a. Best Lock Corporation (BLC).**
- B. Standards:** Comply with the following:
  - 1. Cylinders:** BHMA A156.5.
- C. Cylinder Grade:** BHMA Grade 1.
- D. Cylinders:** Manufacturer's standard tumbler type, constructed from brass or bronze, and complying with the following:
  - 1. Number of Pins:** Seven.
  - 2. Mortise Type:** Threaded cylinders with rings and straight- or clover-type cam.
  - 3. Rim Type:** Cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
  - 4. Bored-Lock Type:** Cylinders with tailpieces to suit locks.
    - a. High-Security Grade:** BHMA Grade 1A, listed and labeled as complying with pick- and drill-resistant testing requirements of UL 437 (Suffix A).
- E. Permanent Cores:** Manufacturer's standard; finish face to match lockset; complying with the following:
  - 1. Interchangeable Cores:** Core insert, removable by use of a special key, and usable with other manufacturers' cylinders.
  - 2. All cores must be recombinatable by removing pin segments of one individual barrel without disturbing the seals or pins of the other barrels of the same core.**

3. The control key shall have no cuts in common with the grand-master key and shall operate with a shear line completely independent from the shear line of the grand-master, master and change keys.

**F. Construction Keying: Comply with the following:**

1. Construction Cores: Provide construction cores that are replaceable by permanent cores. Provide 10 construction master keys.
  - a. Replace construction cores with permanent cores, as directed by MAA.

**G. Keying System: Unless otherwise indicated, provide a factory-registered keying system complying with the following requirements:**

1. Grand Master Key System: Cylinders are operated by a change key, a master key, and a grand master key.
2. Existing System: Master key or grand master key locks to Owner's existing system.
  - a. Cylinders shall be master keyed.

**H. Keys: Provide nickel-silver keys complying with the following:**

1. Stamping: Permanently inscribe each key with a visual key control number and include the following notation:
  - a. Notation: "DO NOT DUPLICATE." or as directed by MAA.
2. Quantity: In addition to one extra blank key for each lock, provide the following:
  - a. Cylinder Change Keys: Three.
  - b. Master Keys: Five.
  - c. Grand Master Keys: Five.

**I. Finishes**

1. Standard: Comply with BHMA A156.18.
2. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
3. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations

in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

4. BHMA Designations: Comply with base material and finish requirements indicated by the following:

- a. BHMA 619: Satin nickel plated, clear coated, over brass or bronze base metal.
- b. BHMA 626: Satin chromium plated over nickel, over brass or bronze base metal.

2.2 ACCESS KEY BOXES (KNOX BOX)

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Access Key Boxes:

- a. Series 3200, Knox Company, Irvine, California.

B. Access Key Boxes:

- 1. Surface-Mounted Cabinet: ¼-inch thick steel plate cabinet with ½-inch thick steel door equipped with interior gasket and
- 2. Door shall be manufactured to accept Best Removable Core.
- 3. Finish: Zinc-phosphate primer with black weather resistant TGIC polyester power-coat finish.

END OF SECTION 08711

## SECTION 13851 - FIRE ALARM SYSTEM

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

**Manufacturers:** The existing Fire Alarm System is manufactured and certified by Honeywell; therefore, Fire Alarm panel, initiating, monitoring and controlling devices shall be exclusively by Honeywell only. Substituted Booster Panels and notification devices shall be submitted and approved by Honeywell. There will be "No Exceptions Allowed".

#### 2.2 FIRE ALARM CONTROL PANEL (FACP)

- A. **General:** Comply with UL 864, "Control Units for Fire-Protective Signaling Systems."
- B. **Cabinet:** Lockable steel enclosure. Arrange panel so all operations required for testing or for normal care and maintenance of the system are performed from the front of the enclosure. If more than a single unit is required to form a complete control panel, provide exactly matching modular unit enclosures. Accommodate all components and allow ample gutter space for interconnection of panels as well as field wiring. Identify each enclosure by an engraved, red-laminated, phenolic resin nameplate. Lettering on the enclosure nameplate shall not be less than 1-inch high. Identify individual components and modules within the cabinets with permanent labels.
- C. **Systems:** Alarm and supervisory systems are separate and independent in the FACP. The alarm-initiating addressable interface circuit boards in the FACP consist of plug-in cards. Installation requiring interconnection of field wiring for module replacement is not acceptable.
- D. **Zones:** Provide for all alarm and supervisory zones indicated.
- E. The fire alarm panel shall tie into the existing Honeywell Graphic Central P.C.s, such that every addressable initiating device will be displayed on its appropriate color graphic floor plan on the Graphic Central P.C. The device symbol, on the color graphic floor plan, shall display a change of state (color of the symbol shall change) wherever the initiating device is in "normal", "alarm", or "trouble", condition. The fire alarm panel shall tie into the existing Honeywell Graphic Central P.C.s. Furnish the required programming to monitor the fire alarm panel providing trouble and alarm relay contacts and display in the appropriate location on the Honeywell P.C.s.
- F. **Alphanumeric Display and System Controls:** Provide the basic interface between human operator at FACP and addressable system components, including annunciation, supervision, and control. A display with a minimum of 32 characters displays alarm,

supervisory, and component status messages and indicates control commands to be entered into the system for control of smoke detector sensitivity and other parameters. Provide keypad for use in entering and executing control commands.

- G. Instructions: Printed or typewritten instruction card mounted behind a lexan plastic or glass cover in a stainless steel or aluminum frame. Install the frame in a location observable from the FACP. Include interpretation and appropriate response for displays and signals, and briefly describe the functional operation of the system under normal, alarm, and trouble conditions.

- H. Acceptable Products:  
Honeywell FS 90 Plus FACP.  
Honeywell 14005680 Series F.O. Interface Board.

## 2.3 UPGRADING EXISTING FIRE ALARM CONTROL PANEL (FACP)

- A. Provide hardware, programming and testing for existing fire alarm panels to interface with new fire alarm panels for fire alarm notification zones for the terminal building.

## 2.4 DATA GATHERING PANELS (DGP)

Honeywell FS 90 Plus FACP.

## 2.5 GATEWAYS

- A. Provide color graphic PC/gateway at CDC, Aircraft Rescue, and Fire Facility for two communication buses to expand Fire Alarm monitoring system's point capacity at existing Honeywell Graphic Central PC at CDC, Aircraft Rescue and Fire Facility.

Acceptable Products:  
Honeywell W 7053 B.

## 2.6 BOOSTER PANELS

- A. Booster panel shall meet UL 864 and ADA requirements. Booster panel shall include 8 Amp, 24 DC volt power supply, battery charger, batteries, synchronizing module, dry contacts for monitoring and interface with Honeywell Fire Alarm Control Panel in red color NEMA 1 enclosure.

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



## 2.7 INITIATING DEVICES

### A. General

1. Each device shall be assigned a unique address via easily understood decade (01 to 99) switch. Address selection via binary switches or by jumpers is not acceptable. Devices which take their address from their position in the circuit are unacceptable because if devices are later added, existing addresses, descriptors and commands must be reprogrammed.
2. Devices shall receive communication signals from the same pair of wires. For fault-tolerant circuits, any separate power wiring shall also be made fault-tolerant.
3. Additional devices shall be capable of being added to the circuit from any point in the circuit and without affecting any existing device address or function.
4. Each device shall contain screw terminals with rising plates for positive termination of up to 12 AWG wire.

### B. Manual Pull Stations

1. Fabricated of metal or plastic, and finished in red with molded, raised-letter operating instructions of contrasting color.
2. Single-action mechanism initiates an alarm.
3. Double-action mechanism requires two actions, such as a push and a pull, to initiate an alarm.
4. Station Reset: Key or wrench operated; double pole, double throw; switch rated for the voltage and current at which it operates.
5. Indoor Protective Shield: Factory-fabricated clear plastic enclosure, hinged at the top to permit lifting for access to initiate an alarm. Lifting the cover actuates an integral battery-powered audible horn intended to discourage false alarm operation.
6. Weatherproof Protective Shield: Factory-fabricated clear plastic enclosure, hinged at the top to permit lifting for access to initiate an alarm.
7. Integral Addressable Module: Arranged to communicate manual-station status (normal, alarm, or trouble) to the FACP.

#### Acceptable Product:

Honeywell S 464G1007.

### C. Sensors

1. All sensors shall mount on a common base to facilitate the changing of sensor type if building conditions change. The base shall be incompatible with conventional detectors to preclude the mounting on a non-intelligent device.
2. Each sensor shall contain a LED which blinks each time it is scanned by the FACP. If the FACP determines that the sensor is in alarm, the FACP shall command the sensor LED to remain on to indicate alarm.
3. Each sensor shall contain a magnetically-actuated test switch such that it can be tested for alarm from the sensor location.
4. Each sensor shall be capable of being tested for alarm via command from the FACP.
5. Each sensor shall respond to FACP scan for information with its type identification to preclude inadvertent substitution of another sensor type. The FACP shall operate with the installed type but shall initiate a mismatch (trouble) condition until the proper type is installed or the programmed sensor type changed.
6. Each sensor shall respond to FACP scan for information with an analog representation of measured fire-related phenomena (smoke density, particles of combustion, temperature). Systems which only monitor the presence of a conventional detector in an addressable base shall not be acceptable.
7. Photoelectric Smoke Sensors shall contain an optical sensing chamber with nominal sensitivity of 2.3% per foot obscuration.  
Acceptable Product:  
Honeywell TC 806 B.
8. Duct Ionization Smoke Sensors. Shall operate over an air velocity range from 300 to 4,000 fpm. Each shall be equipped with an air inlet sampling tube which completely traverses to duct width.  
Acceptable Product:  
Honeywell TC 807 A.  
Honeywell 14506873, smoke sensor duct housings.
9. Thermal Sensors shall provide temperature measurement when scanned by the FACP for information.  
Acceptable Product:  
TC 808 B Thermal Sensors
10. Flow Switch: Provide monitoring module for each flow switch. Flow switch shall be provided as part of Fire Protection System.

11. Tamper Switch: Provide monitoring module for each tamper switch. Tamper switch shall be provided as part of Fire Protection System.

D. Monitor Modules:

1. The Monitor Module shall provide an addressable input for N.O. or N.C. contact devices such as manual pull stations, duct smoke detectors, water flow switches, sprinkler supervisory devices, door contacts, intrusion detectors, etc.
2. The Monitor Module shall provide a supervised initiating circuit. An open-circuit fault shall be annunciated at the FACP. Subsequent alarms shall be reported. (Style D Operation)
3. The module shall contain an LED which blinks upon being scanned by the FACP. Upon determination of an alarm condition, the LED shall be latched on.
4. The module shall mount in a standard electrical box.  
Acceptable Product:  
Honeywell TC 809 A.

E. Control Modules:

1. The Control Module shall provide an addressable output for a separately powered alarm indicating circuit or for a control relay.
2. The Control Module shall provide a supervised indicating circuit where indicated on the plans. An open-circuit fault shall be annunciated at the FACP. Subsequent alarm signaling shall occur in spite of the fault condition.
3. The Control Module shall provide a control relay. The relay contacts shall be SPDT (Form "C") rated at 2 amps at 28 V dc.
4. The module shall contain an LED which blinks upon being scanned by the FACP. Upon activation of the module, the LED shall be latched on.
5. The module shall mount in a standard electrical box.  
Acceptable Product:  
Honeywell TC 810 A.

## 2.8 FIRE ALARM NOTIFICATION DEVICES

A. Alarm Horn/Strobe Units

1. Alarm horns shall be UL 1971 listed and suitable for indoor, or outdoor, application with the appropriate electrical box. All horns shall be 24 VDC

polarized. The minimum sound level shall be 75-130 dB at 10 feet. Horns shall be semi-flush mounted. Single and dual projectors are to be supplied.

2. The visual signal shall flash on alarm occurrence. The bezel shall extend 1-1/2 inches minimum from the finished wall, and be approximately 3-1/2 x 5 inches engraved "FIRE".
3. All Multi candela strobes shall be field selectable to 15, 30, 75 or 110 candelas. Multi candela Strobe shall be Wheel Lock NS4-24-MCW-FR.
4. All strobes in unisex and public restrooms shall be ADA compliant and shall be 15/75 candela. ADA strobe shall be Wheel Lock NS4-241575W-FR.

**B. Visual Alarm Unit**

1. Visual Alarm unit shall be UL 1971 listed. Electronic light source shall be sealed in silicone and protected by a Lexan lens. The word "FIRE" shall appear on the lens. The light shall flash at a rate of 1 to 3 flashed per second, maximum. Lamp shall be powered by a supervised 24 VDC polarized source
2. Multi candela strobes shall be field selectable to 15, 30, 75 or 110 candelas. Multi candela Strobe shall be Wheel Lock RSS-24-MCW-FR.
3. Strobes in unisex and public restrooms shall be ADA compliant and shall be 15/75 candela. ADA strobe shall be Wheel Lock RSS-24-241575W-FR.
4. High Intensity Strobes shall be 185 candelas. Strobe shall be Wheel Lock RSS-24-24185W-FR.

**2.9 REMOTE INDICATING LIGHTS AND IDENTIFICATION PLATES**

- A. Description: LED indicating light near each smoke detector that may not be readily visible, and each sprinkler water-flow switch and valve-tamper switch. Light is connected to flash when the associated device is in an alarm or trouble mode. Lamp is flush mounted in a single gang wall plate. A red, laminated, phenolic-resin identification plate at the indicating light identifies, in engraved white letters, device initiating the signal and room where the smoke detector or valve is located. For water-flow switches, the identification plate also designates protected spaces downstream from the water-flow switch.

## 2.10 MAGNETIC DOOR HOLDERS

- A. Description: Units are equipped for wall or floor mounting as indicated and are complete with matching door plate.
  - 1. Electromagnet: Requires no more than 3 W to develop 25-lbf (111-N) holding force.
  - 2. Wall-Mounted Units: Flush mounted, unless otherwise indicated.
  - 3. Rating: 120-V ac.
- B. Material and Finish:
  - 1. Match door hardware.

## 2.11 EMERGENCY POWER SUPPLY

- A. General: Components include nickel-cadmium battery, charger, and an automatic transfer switch.
  - 1. Battery Nominal Life Expectancy: 20 years, minimum.
- B. Battery Capacity: 24-Hours stand-by and 15-minutes in alarm back-up. Comply with NFPA 72.
- C. Battery Charger: Solid-state, fully automatic, variable-charging-rate type. Provide capacity for 150 percent of the connected system load while maintaining batteries at full charge. If batteries are fully discharged, the charger recharges them completely within four hours. Charger output is supervised as part of system power supply supervision.
- D. Integral Automatic Transfer Switch: Transfers the load to the battery without loss of signals or status indications when normal power fails.

## 2.12 ADDRESSABLE INTERFACE DEVICE

- A. Description: Microelectronic monitor module listed for use in providing a multiplex system address for listed fire and sprinkler alarm-initiating devices with normally open contacts.
- B. Integral Relay: Capable of providing a direct signal to the elevator controller to initiate elevator recall or to a circuit-breaker shunt trip for power shutdown.

## 2.13 GUARDS FOR PHYSICAL PROTECTION

- A. Description: Welded wire mesh of size and shape for the manual station, smoke detector, gong, or other device requiring protection.
  - 1. Factory fabricated and furnished by the manufacturer of the device.
  - 2. Finish: Paint of color to match the protected device.

## 2.14 WIRE

- A. Notification Circuits: Shall be in compliance with NFPA 70, Class A, Style Z, Type FPLR-CI, minimum 12 AWG solid copper conductors, shielded twisted pair rated at 600-volts, 90-degrees Celsius with color coded insulation.
- B. Initiating Line Circuits: Shall be in compliance with NFPA 70, Class A, Style D, Type FPLR-CI, minimum 14 AWG solid copper conductors, shielded twisted pair rated at 600-volts, 90-degrees Celsius with color coded insulation.
- C. Signaling Line Circuits: Shall be in compliance with NFPA 70, Class A, Style 5 Alpha, Type FPLR-CI, minimum 14 AWG solid copper conductors, shielded twisted pair rated at 600-volts, 90-degrees Celsius with color coded insulation.

END OF SECTION 13851

## SECTION 13975 – BUILDING AUTOMATION SYSTEMS (BAS)

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including Maryland Department of Transportation/Maryland Aviation Administration Standard Provisions to the Construction Contract for Projects at Baltimore/Washington International Airport, and other Division 1 Specifications Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes control equipment for HVAC systems and components, including control components for central station air handling units and other HVAC units that are not supplied with factory-wired controls, and programmable lighting control as specified in Section 16215.
- B. Related Sections
  - 1. Section 15175 "Variable (Adjustable) Frequency Drives" contains requirements that relate to this Section.
  - 2. Section 15122 "Meters and Gages" for turbine flowmeters.
  - 3. Section 16231 "Packaged Engine Generators."
  - 4. Section 16442 "Panelboards."
  - 5. Section 16443 "Motor Control Centers."

#### 1.3 SYSTEM DESCRIPTION

- A. The Contractor, through the use of an Automatic Temperature Control (ATC) System Supplier, shall furnish, install, and place into service the complete heating, ventilating, and air conditioning (HVAC) monitoring and control system, all in accordance with the requirements of the Contract Documents. The HVAC monitoring and control system shall communicate with the existing Baltimore Washington International Airport Facility Management System (FMS)/Building Automation Systems (BAS). Additional controls and monitoring shall be provided for electrical systems as described in Part 3.4 of this Section.
- B. The System Supplier shall assume and execute full responsibility to select, furnish, install and connect, test and calibrate, place into operation all specified components,

assemblies, and accessories needed for a complete and functional system of HVAC monitoring and control in full compliance with the requirements of the specification.

- C. The existing Baltimore Washington International Airport Facility Management System (FMS) is a Johnson Controls Metasys System.
- D. The ATC System shall be one of direct digital control utilizing electric or pneumatic actuation. Provide Network Control Units (NCU) to allow communication to the existing Metasys network. A Metasys "companion" system is unacceptable.
- E. Communications: The Building Automation Contractor shall be responsible for full communications to the existing BWI Metasys network. Full communications means, the MAA facility operators will be able from the existing Metasys operator workstations to do the following: fully utilize the Metasys network manager software. The FMS operator will be able to receive alarms, logs, and reports; monitor operating conditions; change control setpoints and operating schedules; and operate equipment as desired at all existing Metasys operator workstation locations.
- F. Air Handling Units:

The following is a brief description, but is not limited to:

- 1. Furnish and install DDC controller, sensors, switches, transmitters, and control actuating devices.
- 2. Provide damper actuators.
- 3. Provide hot water and chilled water control valves.

- G. Air Curtains:

The following is a brief description, but is not limited to:

- 1. Furnish and install DDC Controller, sensors, switches, transmitters, and control actuating devices.
- 2. Provide hot water control valves.

- H. Hot/Chilled Water Controls:

The following is a brief description, but is not limited to:

- 1. Furnish and install DDC controller, sensors, switches, transmitters, and control actuating devices.
- 2. Provide Onicon Dual Turbine Flow Meter.



3. Provide Hot Water control valves.

I. Roadway Ventilation Zone Control:

The following is a brief description, but is not limited to:

1. Furnish and install DDC controller, sensors, switches, transmitters, and control actuating devices.
2. Provide and install Mine Safety model 3800 carbon monoxide sensors with in line oxides of nitrogen sensors on each ventilation system.

J. Hot Water Unit Heaters: The following is a brief description, but is not limited to: Provide room thermostat to cycle the unit heater fan to maintain zone set point.

K. Stormwater/Sewage Pumps:

1. Furnish and install DDC controllers for monitoring sump level alarms.

L. Heat Tracing:

1. Furnish and install DDC controllers for monitoring heat tracing alarms.
2. Furnish and install DDC controls for controlling start/stop of heat tracing elements.

M. Emergency Generator:

1. Provide controls for monitoring emergency generator points as indicated on the plans.
2. HVAC controls for the emergency generator room shall be furnished and installed as shown on the plans.

N. Oil/Water Separators:

1. Furnish and install DDC controls for monitoring oil/water separator high level alarm sensors.

O. Cabinet Unit Heaters:

1. Furnish and install DDC controls for control of fan and 2-way control valves, as detailed on the plans.

P. VAV Boxes:

1. Furnish and install DDC controllers, sensors, transmitters, and control actuating devices for monitoring and control of all VAV boxes.

Q. Heating and Ventilation Units:

1. Furnish and install DDC controls for monitoring and control of the heating and ventilation units, as detailed on the plans.

R. Computer Room DX Units:

1. Provide DDC controls for monitoring status of units.
2. Provide temperature and humidity sensors for each space for monitoring and alarms.

S. Computer Room Chilled Water Units/Fan Coil Units:

1. Provide DDC controls for monitoring and control of fan coil units, exhaust fan and dampers.

T. Exhaust Fans:

1. Provide DDC controls for monitoring status of fans.
2. Provide DDC controls for interlock of fans with associated AHU's and dampers, etc.
3. Provide DDC control sensors when exhaust fans are controlled by space temperature.

U. Switchgear/Substation:

1. Provide DDC controls for monitoring of electrical devices as scheduled on the plans.

V. Lighting Controllers:

1. Provide DDC control items for monitoring and control of lighting systems as shown on the plans and specified herein.

W. Reheat Coils:

1. Provide new 3-way control valves, actuators and temperature sensors for all designated existing reheat coils. Remove all existing control devices and elements.

**X. Pumps:**

1. Furnish and install DDC controllers, sensor, and transmitters for operation of all chilled water, heating water, domestic hot water, and secondary heating water pumps.

**Y. Miscellaneous Controls:**

The following is a brief description, but is not limited to:

1. Provide monitoring of elevator sump pumps.
2. Extension of existing Johnson Controls Metasys Facility Management System for Automatic Temperature Controls.
3. Provide as necessary for other elements, as detailed on the plans.

**Z. Network:**

The following is a brief description, but is not limited to:

1. Furnish and install new Network Controllers with tie into existing BWI network.
2. Map all new control points and sequences back to existing Metasys Operator Workstation.
3. Create new graphics for project equipment on existing Metasys Operator Workstation.

**1.4 SUBMITTALS**

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data for each type of product specified. Include manufacturer's technical Product Data for each control device furnished, indicating dimensions, capacities, performance characteristics, electrical characteristics, finishes of materials, installation instructions, and startup instructions.
- C. Shop Drawings from manufacturer detailing equipment assemblies and indicating dimensions, weights, loadings, required clearances, method of field assembly, components, and location and size of each field connection. Submit damper leakage and flow characteristics, plus size schedule for controlled dampers.

- D. Shop Drawings containing the following information for each control system:
1. Schematic flow diagram showing pumps, fans, coils, dampers, valves, air flow measurement devices, and control devices.
  2. Each control device labeled with setting or adjustable range of control.
  3. Diagrams for all required electrical wiring. Clearly differentiate between factory-installed and field-installed wiring.
  4. Details of control panel faces, including controls, instruments, and labeling.
  5. Written description of sequence of operation.
  6. Trunk cable schematic showing programmable control unit locations and trunk data conductors.
  7. Listing of connected data points, including connected control unit and input device.
  8. System graphics indicating monitored systems, data (connected and calculated) point addresses, and operator notations.
  9. Software description and sequence of operation.
  10. System configuration showing peripheral devices, diagrams, and interconnections.
- E. Wiring diagrams detailing wiring for power, signal, and control systems and differentiating clearly between manufacturer-installed and field-installed wiring.
- F. Maintenance data for control systems equipment to include in the operation and maintenance manual specified in Division 1. Include the following:
1. Maintenance instructions and spare parts lists for each type of control device.
  2. Interconnection wiring diagrams with identified and numbered system components and devices.
  3. Inspection period, cleaning methods, cleaning materials recommended, and calibration tolerances.
  4. Calibration records and list of set points.
- G. Field Test Reports: Procedure and certification of pneumatic control piping system.

- H. Project Record Documents: Record actual locations of control components, including control units, thermostats, and sensors. Revise Shop Drawings to reflect actual installation and operating sequences.

## 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer specializing in control system installations.
- B. Startup Personnel Qualifications: Engage specially trained personnel in direct employ of manufacturer of primary temperature control system.
- C. Comply with NFPA 90A.
- D. Comply with NFPA 70.
- E. Coordinate equipment selection with Division 16 Section "Fire Alarm Systems" to achieve compatibility with equipment that interfaces with that system.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store equipment and materials inside and protected from weather.
- B. Factory-Mounted Components: Where control devices specified in this Section are indicated to be factory mounted on equipment, arrange for shipping control devices to unit manufacturer.

## 1.7 SPARE PARTS

- A. Provide the following quantity of spare parts:
  - 1. Temperature Sensors 10 percent of total.
  - 2. Pressure Sensors 10 percent of total.
  - 3. 10% of AHU, exhaust fans, supply fans and UNTs controllers.
- B. These items shall be delivered to the facility at the time of the acceptance testing and a copy of the receipt signed by the facility shall be included in the acceptance test. The MAA will not issue its letter of acceptance without receipt of spare parts.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. The System Supplier shall be a single firm, or corporation subcontracted by the Contractor to assume full responsibility to perform all engineering, to select, furnish, and place into operation a complete and functional system of HVAC monitoring and control. Acceptable System Supplier shall be "Factory Branch Office" of the following:

1. Johnson Controls, Inc., Loveton Circle, Sparks, Maryland (telephone: 410-527-2607).

Other bids by wholesalers, contractors, and franchised dealers are not acceptable.

### 2.2 GENERAL PRODUCT DESCRIPTION

- A. The Facility Management System shall be capable of integrating multiple building functions including equipment supervision and control, alarm management, energy management, information management, and historical data collection and archiving.
- B. The facility management system shall consist of the following:
1. Standalone DDC panels.
  2. Standalone application specific controllers (ASCs).
  3. Local Display Devices.

The system shall be modular in nature, and shall permit expansion of both capacity and functionality through the addition of sensors, actuators, standalone DDC panels, and operator devices.

- C. System architectural design shall eliminate dependence upon any single device for alarm reporting and control execution. Each DDC panel shall operate independently by performing its own specified control, alarm management, operator I/O, and historical data collection. The failure of any single component or network connection shall not interrupt the execution of control strategies at other operational devices.
- D. Standalone DDC panels shall be able to access any data from, or send control commands and alarm reports directly to any other DDC panel or combination of panels on the network without dependence upon a central processing device, including a Central File Server. Standalone DDC panels shall also be able to send alarm reports to multiple operator workstations, terminals, and printers without dependence upon a central processing device or File Server.

## 2.3 NETWORKING/COMMUNICATIONS

- A. The design of the FMS shall network operator workstations and Standalone DDC Panels as shown on the system configuration drawing. Inherent in the system's design shall be the ability to expand or modify the network either via a local area network, or auto-dial telephone line modem connections, or via a combination of the two networking schemes.
- B. Local Area Network
  - 1. Workstation/DDC Panel Support: Operator workstations and DDC panels shall directly reside on a local area network such that communications may be executed directly between controllers, directly between workstations, and between controllers and workstations on a peer-to-peer basis.
  - 2. Dynamic Data Access: All operator devices, either network resident or connected via dial-up modems, shall have the ability to access all point status and application report data, or execute control functions for any and all other devices via the local area network. Access to data shall be based upon logical identification of building equipment. Access to system data shall not be restricted by the hardware configuration of the facility management system. The hardware configuration of the FMS network shall be transparent to the user when accessing data or developing control programs.
  - 3. General Network Design: Network design shall include the following provisions:
    - a. High speed data transfer rates for alarm reporting, quick report generation from multiple controllers, and upload/download efficiency between network devices. The minimum baud rate shall be 1 Megabaud.
    - b. Support of any combination of controllers and Operator Workstations directly connected to the local area network.
    - c. Detection and accommodation of single or multiple failures of either workstations, DDC panels or the network media. The network shall include provisions for automatically re-configuring itself to allow all operational equipment to perform their designated functions as effectively as possible in the event of single or multiple failures.
    - d. Message and alarm buffering to prevent information from being lost.
    - e. Error detection, correction, and retransmission to guarantee data integrity.
    - f. Default device definition to prevent loss of alarms or data, and ensure alarms are reported as quickly as possible in the event an operator device does not respond.

- g. Commonly available, multiple sourced, networking components shall be used to allow the FMS to coexist with other networking applications. ETHERNET and ARCNET are acceptable technologies.
  - h. Communications must be of a deterministic nature to assure calculable performance under worst-case network loading. When a collision-based network is proposed, the Contractor shall provide detailed calculations showing worst-case network response times.
  - i. Automatic synchronization of the real-time clocks in all DDC panels shall be provided.
- C. Dial-Up Communications: Auto-dial/auto-answer communications shall be provided to allow standalone DDC panels to communicate with remote operator devices on an intermittent basis via telephone lines.
- 1. Dial-Up Standalone DDC Panels: Auto-Dial panels shall automatically place calls to workstations to report critical alarms, or to upload trend and historical information for archiving.
    - a. Standalone DDC Panels shall analyze and prioritize all alarms to minimize the initiation of calls. Non-critical alarms shall be buffered in memory and reported as a group of alarms, or until an operator manually requests an upload of all alarms.
    - b. The auto-dial program shall include provisions for handling busy signals, "no-answers," and incomplete data transfers. Default devices shall be called when communications cannot be established with primary devices.
  - 2. Dial-Up Workstations: Operators at dial-up workstations shall be able to perform all control functions, all report functions, and all database generation and modification functions as described for workstations connected via the local area network. Routines shall be provided to automatically answer calls, and either file or display information sent from remote DDC panels.
    - a. An operator shall be able to access remote buildings by selection of any facility by its logical name. The PC Dial-Up program shall maintain a user-definable cross-reference of buildings and associated telephone numbers, so the user shall not be required to remember or manually dial telephone numbers.
    - b. PC workstation may serve as an operator device on a local area network, as well as a dial-up workstation for multiple auto-dial DDC panels or networks. Alarm and data file transfers handled via dial-up transactions shall not interfere with local area network activity, nor shall local area network activity keep the workstation from handling incoming calls.



3. Modem Characteristics: Dial-up communications shall make use of Hayes compatible 56k baud modem and voice grade telephone lines. Each standalone DDC panel may have its own modem, or a group of Standalone DDC panels may share a modem.

## 2.4 STANDALONE DDC PANELS

- A. General: Standalone DDC panels shall be microprocessor based, multi-tasking, multi-user, real-time digital control processors. Each standalone DDC panel shall consist of modular hardware with plug-in enclosed processors, communication controllers, power supplies, and input/output modules. A sufficient number of controllers shall be supplied to fully meet the requirements of this specification.
- B. Memory: Each DDC panel shall have sufficient memory to support its own operating system and databases including:
  1. Control processes.
  2. Energy Management Applications.
  3. Alarm Management.
  4. Historical/Trend Data for all points.
  5. Maintenance Support Applications.
  6. Custom Processes.
  7. Operator I/O.
  8. Dial-Up Communications.
  9. Manual Override Monitoring.
- C. Point Types: Each DDC panel shall support the following types of point inputs and outputs:
  1. Digital Inputs for status/alarm contacts.
  2. Digital Outputs for on/off equipment control.
  3. Analog Inputs for temperature, pressure, humidity, flow, and position measurements.
  4. Analog Outputs for valve and damper position control, and capacity control of primary equipment.

5. Pulse Inputs for pulsed contact monitoring.

- D. **Expandability:** The system shall be modular in nature, and shall permit easy expansion through the addition of software applications, workstation hardware, field controllers, sensors, and actuators. The system architecture shall support 25% expansion capacity of all types of DDC panels, and all point types included in the initial installation.
- E. **Serial Communication Ports:** Standalone DDC panels shall provide at least two RS-232C serial data communication ports for simultaneous operation of multiple operator I/O devices such as industry standard printers, laptop workstations, PC workstations, and panel mounted or portable DDC panel Operator's Terminals. Standalone DDC panels shall allow temporary use of portable devices without interrupting the normal operation of permanently connected modems, printers, or network terminals.
- F. **Integrated On-Line Diagnostics:** Each DDC panel shall continuously perform self-diagnostics, communication diagnosis and diagnosis of subsidiary equipment.
- G. **Surge and Transient Protection:** Isolation shall be provided at all network termination's, as well as all field point termination's to suppress induced voltage transients consistent with IEEE Standard 587-1980.
- H. **Powerfail Restart:** In the event of the loss of normal power, there shall be an orderly shutdown of all standalone DDC panels to prevent the loss of database or operating system software. Non-Volatile memory shall be incorporated for all critical controller configuration data, and battery back-up shall be provided to support the real-time clock and all volatile memory for a minimum of 72 hours. Upon restoration of normal power, the DDC panel shall automatically resume full operation without manual intervention. Should DDC panel memory be lost for any reason, the panel will automatically receive a download via the local area network, phone lines, or connected computer. In addition, the user shall have the capability of reloading the DDC panel via the local area network, via the local RS-232C port, or via telephone line dial-in.

2.5 SYSTEM SOFTWARE FEATURES

A. General

- 1. All necessary software to form a complete operating system as described in this specification shall be provided. Provide a color graphic floor plan for all floors to show the on/off status of lighting zones.
- 2. The software programs specified in this section shall be provided as an integral part of the DDC panel and shall not be dependent upon any higher level computer for execution.

- B. Graphics Display: Color graphic floor plan displays and system schematic for each piece of mechanical equipment shown on plans shall be provided. Provide a color graphic floor plan for all floors to show the on/off status of lighting zones.
- C. Energy Management Applications: DDC Panels shall have the ability to perform any or all of the following energy management routines:
1. Time of Day Scheduling
  2. Calendar Based Scheduling
  3. Holiday Scheduling
  4. Temporary Schedule Overrides
  5. Optimal Start
  6. Optimal Stop
  7. Night Setback Control
  8. Enthalpy Switch Over (Economizer)
  9. Peak Demand Limiting
  10. Temperature Compensated Load Rolling
  11. Heating/Cooling Interlock
  12. Hot Water Reset
  13. Chilled Water Reset

All programs shall be executed automatically without the need for operator intervention, and shall be flexible enough to allow operator customization.

- D. Custom Process Programming Capability: DDC panels shall be able to execute custom, job-specific processes defined by the operator, to automatically perform calculations and special control routines.
1. Process Inputs and Variables: It shall be possible to use any of the following in a custom process:
    - a. Any system-measured point data or status.
    - b. Any calculated data.

- c. Any results from other processes.
  - d. User-Defined Constants.
  - e. Arithmetic functions (+, -, \*, / square root, exponential, etc.).
  - f. Boolean logic operators (and, or, exclusive or, etc.).
  - g. On-delay/Off-delay/One-shot timers.
2. Process Triggers: Custom processes may be triggered based on any combination of the following:
    - a. Time interval.
    - b. Time of day.
    - c. Date.
    - d. Other processes.
    - e. Time programming.
    - f. Events (e.g., point alarms).
  3. Dynamic Data Access: A single process shall be able to incorporate measured or calculated data from any and all other DDC panels on the local area network. In addition, a single process shall be able to issue commands to points in any and all other DDC panels on the local area network.
  4. Advisory/Message Generation: Processes shall be able to generate operator messages and advisories to operator I/O devices. A process shall be able to directly send a message to a specified device, buffer the information in a follow-up file, or cause the execution of a dial-up connection to a remote device such as a printer.
  5. Custom Process Documentation: The custom control programming feature shall be self-documenting. All interrelationships defined by this feature shall be documented via graphical flowcharts and English language descriptors.
- E. Alarm Management: Alarm management shall be provided to monitor, buffer, and direct alarm reports to operator devices and memory files. Each DDC panel shall perform distributed, independent alarm analysis and filtering to minimize operator interruptions due to non-critical alarms, minimize network traffic, and prevent alarms from being lost. At no time shall the DDC panel's ability to report alarms be affected by either operator activity at a PC Workstation or local I/O device, or communications with other panels on the network.

1. **Point Change Report Description:** All alarm or point change reports shall include the point's English language description, and the time and date of occurrence.
  2. **Prioritization:** The user shall be able to define the specific system reaction for each point. Alarms shall be prioritized to minimize nuisance reporting and to speed operator response to critical alarms. A minimum of three priority levels shall be provided. Each DDC panel shall automatically inhibit the reporting of selected alarms during system shutdown and start-up. Users shall have the ability to manually inhibit alarm reporting for each point. The user shall also be able to define under which conditions point changes need to be acknowledged by an operator, and/or sent to follow-up files for retrieval and analysis at a later date.
  3. **Report Routing:** Alarm reports, messages, and files will be directed to a user-defined list of operator devices or PC disk files used for archiving alarm information. Alarms shall also be automatically directed to a default device in the event a primary device is found to be off-line.
  4. **Alarm Messages:** In addition to the point's descriptor and the time and date, the user shall be able to print, display or store a 65-character alarm message to more fully describe the alarm condition or direct operator response. Each standalone DDC panel shall be capable of storing a library of at least 250 Alarm Messages. Each message may be assignable to any number of points in the panel.
  5. **Auto-Dial Alarm Management:** In Dial-up applications, only critical alarms shall initiate a call to a remote operator device. In all other cases, call activity shall be minimized by time-stamping and saving reports until an operator scheduled time, a manual request, or until the buffer space is full. The alarm buffer must store a minimum of 50 alarms.
  6. **Transaction Logging:** Operator commands and system events shall be automatically logged to disk in Personal Computer industry standard database format. Operator commands initiated from Direct-connected workstations, dial-up workstations, and local DDC panel Network Terminal devices shall all be logged to this transaction file. This data shall be available at the Operator Workstation. Facility shall be provided to allow the user to search the transaction file using standard database query techniques, including searching by dates, operator name, data point name, etc. In addition, this transaction file shall be accessible with standard third party database and spreadsheet packages.
- F. **Historical Data and Trend Analysis:** A variety of Historical data collection utilities shall be provided to automatically sample, store, and display system data in all of the following ways:
1. **Continuous Point Histories:** Standalone DDC panels shall store Point History Files for all analog and binary inputs and outputs. The Point History routine shall continuously and automatically sample the value of all analog inputs at half hour

intervals. Samples for all points shall be stored for the past 24 hours to allow the user to immediately analyze equipment performance and all problem-related events for the past day. Point History Files for binary input or output points and analog output points shall include a continuous record of the last ten status changes or commands for each point.

2. **Control Loop Performance Trends:** Standalone DDC panels shall also provide high resolution sampling capability in one-second increments for verification of control loop performance.
  3. **Extended Sample Period Trends:** Measured and calculated analog and binary data shall also be assignable to user-definable trends for the purpose of collecting operator-specified performance data over extended periods of time. Sample intervals of 1 minute to 2 hours shall be provided. Each standalone DDC panel shall have a dedicated buffer for trend data, and shall be capable of storing a minimum of 5000 data samples.
  4. **Data Storage and Archiving:** Trend data shall be stored at the Standalone DDC panels, and uploaded to hard disk storage when archival is desired. Uploads shall occur based upon either user-defined interval, manual command, or when the trend buffers become full. All trend data shall be available in disk file format compatible with Third Party personal computer applications.
- G. **Runtime Totalization:** Standalone DDC panels shall automatically accumulate and store runtime hours for binary input and output points as specified in the Execution portion of this specification.
1. The Totalization routine shall have a sampling resolution of one minute or less.
  2. The user shall have the ability to define a warning limit for Runtime Totalization. Unique, user-specified messages shall be generated when the limit is reached.
- H. **Analog/Pulse Totalization:** Standalone DDC panels shall automatically sample, calculate and store consumption totals on a daily, weekly, or monthly basis for user-selected analog and binary pulse input-type points.
1. Totalization shall provide calculation and storage of accumulations of up to 99,999.9 units (e.g., KWH, gallons, KBTU, tons. etc.).
  2. The Totalization routine shall have a sampling resolution of one minute or less.
  3. The user shall have the ability to define a warning limit. Unique, user-specified messages shall be generated when the limit is reached.
- I. **Event Totalization:** Standalone DDC panels shall have the ability to count events such as the number of times a pump or fan system is cycled on and off. Event totalization shall be performed on a daily, weekly, or monthly basis.

1. The Event Totalization feature shall be able to store the records associated with a minimum of 9,999,999 events before reset.
2. The user shall have the ability to define a warning limit. Unique, user-specified messages shall be generated when the limit is reached.

J. Lighting Control Software Description: Provide lighting control software/programming at Metasys and at each lighting control panel. Prior to start of programming work, request a lighting control schedule from the MAA. This schedule will dictate default on and off control of lights on a per day basis. Do not proceed until the approved schedule is obtained from the MAA. Provide a menu driven selection screen that will allow the following:

1. Monitoring of the corridor and holdroom lighting zone on/off status.
2. Individual control of each lighting zone.

K. Ventilation Control Software Description

1. Ventilation Control Application

- a. ASHRAE Standard 62-1989, Ventilation for Acceptable Indoor Air Quality, provides a procedure to determine outdoor air flow rates for buildings: The "Ventilation Rate Procedure."
- b. The "Ventilation Rate Procedure" specifies the outdoor air flow rate as a function of occupancy and building use. The specified outdoor air flow rates are "derived from physiological considerations, subjective evaluations and professional judgments." The ventilation (outdoor) air must have acceptable quality, as specified in the Standard. The contaminant concentrations in the indoor air are not directly measured under this procedure, but are expected to be at typical levels for the given types of occupied space. The prescribed outdoor air flow rates are then expected to dilute the indoor air contaminant concentrations to acceptable levels.

2. Software Features: The following software features shall be part of the ventilation control application.

- a. CO<sub>2</sub> Multiplexer--Controls the sampling sequence and storing of the three measured CO<sub>2</sub> concentrations.
- b. CO<sub>2</sub> Sensor Autozero function--Causes the controller to read outdoor air CO<sub>2</sub> concentrations for one hour each day for the auto zeroing algorithm in the CO<sub>2</sub> sensor.

- c. Outdoor Air Flow Calculator--Uses the CO<sub>2</sub> 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<sub>2</sub> 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<sub>2</sub> high limit control setpoint. The CO<sub>2</sub> high limit control function supplements the scheduled outdoor air flow function, addressing any higher than expected occupancy periods.
- g. Return Air CO<sub>2</sub> Alarm capability--Alerts building operators to conditions of high CO<sub>2</sub> levels, indicating loss of ventilation control, or conditions of low CO<sub>2</sub> levels indicating a CO<sub>2</sub> 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<sub>2</sub> Concentration Values Check--Warns the operator if the CO<sub>2</sub> concentration values are not in the proper relationship; supply air CO<sub>2</sub> concentration should be higher than that of the outdoor air and lower than that of the return air.
- j. Lead Ventilation--Provides ventilation prior to occupancy, diluting building source contaminants to acceptable levels.
- k. Trend Tool--This Excel work, in conjunction with an OWS and Metalink™, provides expanded graphic presentation of trend data.
- l. Outdoor Air Actuator Ramp Generator--Diagnostic software process compound ramps outdoor air damper through 0%, 50% and 100% positions for precommissioning tests and ventilation control verification.



- m. Trend Automator--Starts and stops trending of object attributes when the air handling unit is started and stopped. This avoids wasted disk space which occurs if trending continues during equipment off periods.
- n. Reliability Checker--Replaces unreliable trend data with zero.
- o. Outdoor Air Flow Calculator - Energy Balance Method--Uses mixed, return and outdoor air temperature data to calculate the outdoor air flow rate for comparison purposes (not for control).

### 3. Measurement of Outdoor Air Flow Rate

- a. ASHRAE Standard 62-1989 states: "When mechanical ventilation is used, provision for air flow measurement should be included" and "sufficient ventilation shall be demonstrable." This is being interpreted to mean that for VAV systems, measurement of the outdoor air flow is required to meet the Standard. An additional benefit of outdoor air flow measurement is to improve the operation of space pressurization and mixed air controls.
- b. Outdoor air flow is measured indirectly, using the "CO<sub>2</sub> Concentration Balance" measurement method. In the "CO<sub>2</sub> Concentration Balance" method, the outdoor air flow is calculated from supply air flow (measured directly via airflow measuring station), and from three CO<sub>2</sub> concentrations. Outdoor, supply, and return air CO<sub>2</sub> 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<sub>2</sub> in the return air stream and CO<sub>2</sub> sensors are available, CO<sub>2</sub> is a good tracer gas for this method.

### 4. Implementation of Outdoor Air Flow Software Control Strategies

- a. The multiplexed method of CO<sub>2</sub> measurement that is used to provide accurate CO<sub>2</sub> 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<sub>2</sub>.

- c. The outdoor air flow rate can then be determined as

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

using the supply air volumetric flow rate in CFM (or m<sup>3</sup>/sec) and the CO<sub>2</sub> concentrations in ppm (parts per million).

$$\frac{CO_{2,RA} - CO_{2,SA}}{CO_{2,RA} - CO_{2,OA}}$$

- d. The expression  $CO_{2,RA} - CO_{2,OA}$  can be viewed as a “flow coefficient” that determines the “outdoor air fraction” in the supply air. The typical return air CO<sub>2</sub> concentration in an occupied building is in the range of 500 to 1000 ppm while the outdoor air CO<sub>2</sub> 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<sub>2</sub> 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<sub>2</sub> 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<sub>2</sub> concentration is equal to that of the outdoor air and the flow coefficient will have value of one, indicating that the air handling unit is using 100% outdoor air.
- e. Single CO<sub>2</sub> sensor with a sampling air pump and appropriate software is used to measure and store, in sequence, CO<sub>2</sub> 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<sub>2</sub> sensor.
- f. With the use of a single CO<sub>2</sub> sensor, the relative differences between CO<sub>2</sub> 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<sub>2</sub> measurements. Because the flow coefficient requires only calculation of the ratio of the CO<sub>2</sub> differentials, the identical errors in the individual measurements will cancel out. Only infrequent field calibration of the CO<sub>2</sub> sensor is required because only the differentials are used, rather than absolute values.

- g. The return air CO<sub>2</sub> concentration, one of the three CO<sub>2</sub> concentrations read and stored during the multiplexing cycle, can be utilized in some cases for purposes other than indirect outdoor air flow calculation. For example, it can be used for CO<sub>2</sub> high limit control and for Return Air CO<sub>2</sub> Alarms. For these applications, when an absolute CO<sub>2</sub> measurement is needed, accurate CO<sub>2</sub> sensor calibration is required. The CDS-2000 CO<sub>2</sub> sensor provides its own internal auto zeroing algorithm that has proved to be quite effective and limits the need for recalibration. For absolute measurements, CDS-2000 CO<sub>2</sub> sensors require periodic (annually) calibration with a calibration gas that contains a specific concentration of CO<sub>2</sub>.

## 5. CO<sub>2</sub> Sensing Point Location

- a. Selection of the CO<sub>2</sub> 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<sub>2</sub> concentration in mixed air is identical to the CO<sub>2</sub> concentration in the supply air. Therefore, there is never any need to sense CO<sub>2</sub> in the mixed air plenum where an averaging sensing probe would be required. Because the CO<sub>2</sub> 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<sub>2</sub> 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<sub>2</sub> sample is obtained from a location that is isolated from the building exhausts, the CO<sub>2</sub> 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<sub>2</sub> 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<sub>2</sub> measurements and the supply air flow. The outdoor CO<sub>2</sub> 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<sub>2</sub> sensing point reading while positioning the outdoor air damper from its fully closed to its fully open position and verify that the sensor reading does not change.

## 2.6 APPLICATION SPECIFIC CONTROLLERS - HVAC APPLICATIONS

- A. Each Standalone DDC Controller shall be able to extend its performance and capacity through the use of remote Application Specific Controllers (ASCs).
- B. Each ASC shall operate as a standalone controller capable of performing its specified control responsibilities independently of other controllers in the network. Each ASC shall be a microprocessor-based, multi-tasking, real-time digital control processor.
- C. Each ASC shall have sufficient memory to support its own operating system and data bases including:
  - 1. Control Processes
  - 2. Energy Management Applications
  - 3. Operator I/O (Portable Service Terminal)
- D. The operator interface to any ASC point data or programs shall be through any network-resident PC workstation, or any PC or portable operator's terminal connected to any DDC panel in the network.
- E. Application Specific Controllers shall directly support the temporary use of a portable service terminal. The capabilities of the portable service terminal shall include, but not be limited to, the following:
  - 1. Display temperatures.
  - 2. Display status.
  - 3. Display setpoints.
  - 4. Display control parameters.
  - 5. Override binary output control.
  - 6. Override analog setpoints.
  - 7. Modification of gain and offset constants.

- F. Powerfail Protection: All system setpoints, proportional bands, control algorithms, and any other programmable parameters shall be stored such that a power failure of any duration does not necessitate reprogramming the controller.
- G. Surge and Transient Protection: Isolation shall be provided at all network terminations, as well as all field point terminations to suppress induced voltage transients consistent with IEEE Standard 587-1980. Isolation levels shall be sufficiently high as to allow all signal wiring to be run in the same conduit as high voltage wiring where acceptable by electrical code.
- H. Powerfail Restart: In the event of the loss of normal power, there shall be an orderly shutdown of all standalone DDC panels to prevent the loss of database or operating system software. Non-volatile memory shall be incorporated for all critical controller configuration data, and battery back-up shall be provided to support the real-time clock and all volatile memory for a minimum of 72 hours.
  - 1. Upon restoration of normal power, the DDC panel shall automatically resume full operation without manual intervention.
  - 2. Should DDC panel memory be lost for any reason, the user shall have the capability of reloading the DDC panel via the local area network, via the local RS-2320 port, or via telephone line dial-in.

## 2.7 AHU CONTROLLERS

- A. AHU controllers shall support all the necessary point inputs and outputs to perform the specified control sequences in a totally stand alone fashion.
- B. AHU controllers shall have a library of control routines and program logic to perform the sequence of operation as shown on the plans.
- C. Occupancy-Based Standby/Comfort Mode Control: Each AHU controller shall have a provision for occupancy sensing overrides. Based upon the contact status of either a manual wall switch or an occupancy sensing device, the AHU controller shall automatically select either standby or comfort mode to minimize the heating and cooling requirements while satisfying comfort conditions.
- D. Continuous Zone Temperature Histories: Each AHU controller shall have the capability to automatically and continuously maintain a history of the associated zone temperature to allow users to quickly analyze space comfort and equipment performance for the past 24 hours. A minimum of two samples per hour shall be stored.

## 2.8 SEQUENCE OF OPERATION

- A. See Mechanical plans.

## 2.9 SENSORS

### A. Electronic Sensors: Vibration and corrosion resistant, for wall, immersion, or duct mounting as required.

#### 1. Resistance Temperature Detectors: Platinum.

- a. Accuracy: Plus or minus 0.2 percent at calibration point.
- b. Wire: Twisted, shielded-pair cable.
- c. Insertion Elements in Ducts: Use where not affected by temperature stratification or where ducts are smaller than 9 sq. ft.
- d. Averaging Elements in Ducts: Use where ducts are larger than 9 sq. ft. or where prone to stratification, length as required.
- e. Insertion Elements for Liquids: Brass socket with minimum insertion length of 2-1/2 inches.
- f. Room Sensors: Discrete sensor.
- g. Outside Air Sensors: Watertight inlet fitting, shielded from direct sunlight.
- h. Duct and Outside Air Sensors: With element guard and mounting plate, range of 0 to 100 percent relative humidity.

### B. Equipment Operation Sensors: As follows:

- 1. Status Input for Pumps: Differential-pressure switch piped across pump with adjustable pressure-differential range of 8 to 60 psi.
- 2. Status Inputs for Fans: Differential-pressure switch with adjustable range of 0 to 5 inches wg.
- 3. Status Inputs for Electric Motors: Current-sensing relay with current transformers, adjustable and set to 175 percent of rated motor current.

### C. Humidity Sensors: Bulk polymer sensor element.

- a. Accuracy: 5 percent full range with linear output.
- b. Room Sensors: With locking cover matching room thermostats, span of 25 to 90 percent relative humidity.
- c. Duct and Outside-Air Sensors: With element guard and mounting plate, range of 0 to 100 percent relative humidity.

- D. Static-Pressure Transmitter: Nondirectional sensor with suitable range for expected input, and temperature compensated.
  - 1. Accuracy: 2 percent of full scale with repeatability of 0.5 percent.
  - 2. Output: 4 to 20 mA.
  - 3. Building Static-Pressure Range: 0 to 0.25 inch wg (0 to 62 Pa).
  - 4. Duct Static-Pressure Range: 0 to 5 inches wg (0 to 1243 Pa).
- E. Pressure Transmitters: Direct acting for gas, liquid, or steam service; range suitable for system; proportional output 4 to 20 mA.
- F. Digital-to-Pneumatic Transducers: Convert plus or minus 12-V dc pulse-width-modulation outputs, or continuous proportional current or voltage to 0 to 20 psig (0 to 138 kPa).
- G. Pneumatic Valve/Damper Position Indication: Potentiometer mounted in enclosure with adjustable crank-arm assembly connected to damper to transmit 0 to 100 percent valve/damper travel.
- H. Electronic Valve/Damper Position Indication: Visual scale indicating percent of travel and 2- to 10-V dc, feedback signal.
- I. Water-Flow Switches: Pressure-flow switches of bellows-actuated mercury or snap-acting type, with appropriate scale range and differential adjustment, with stainless-steel or bronze paddle. For chilled-water applications, provide vaporproof type.
- J. Occupancy Sensor: Passive infrared, with time delay, daylight sensor lockout, sensitivity control, and 180 degree field of view with vertical sensing adjustment, for flush mounting.

## 2.10 THERMOSTATS

- A. Combination Thermostat and Fan Switches: Line-voltage thermostat with two-, three-, or four-position, push-button or lever-operated fan switch.
  - 1. Label switches "FAN ON-OFF," "FAN HIGH-LOW-OFF," "FAN HIGH-MED-LOW-OFF." Provide unit for mounting on two-gang switch box.
- B. Low-Voltage, On-Off Thermostats: NEMA DC 3, 24-V, bimetal-operated, mercury-switch type, with adjustable or fixed anticipation heater.

- C. **Line-Voltage, On-Off Thermostats:** Bimetal-actuated, open contact or bellows-actuated, enclosed, snap-switch type, or equivalent solid-state type, with heat anticipator, integral manual on-off-auto selector switch.
1. Equip thermostats, which control electric heating loads directly, with off position on dial wired to break ungrounded conductors.
  2. **Dead Band:** Maximum 2 deg F (1 deg C).
- D. **Remote-Bulb Thermostats:** On-off or modulating type, liquid filled to compensate for changes in ambient temperature, with copper capillary and bulb, unless otherwise indicated.
1. Bulbs in water lines with separate wells of same material as bulb.
  2. Bulbs in air ducts with flanges and shields.
  3. **Averaging Elements:** Copper tubing with either single- or multiple-unit elements, extended to cover full width of duct or unit, adequately supported.
  4. Scale settings and differential settings are clearly visible and adjustable from front of instrument.
  5. **On-Off Thermostat:** With precision snap switches, with electrical ratings required by application.
  6. **Modulating Thermostats:** Construct so complete potentiometer coil and wiper assembly is removable for inspection or replacement without disturbing calibration of instrument.
- E. **Room thermostat accessories include the following:**
1. **Insulating Bases:** For thermostats located on exterior walls.
  2. **Thermostat Guards:** Locking; heavy-duty, transparent plastic; mounted on separate base.
  3. **Adjusting Key:** As required for calibration and cover screws.
  4. **Aspirating Boxes:** For flush-mounted aspirating thermostats.
  5. **Set-Point Adjustment:** 1/2-inch- (13-mm-) diameter, adjustment knob.
- F. **Immersion Thermostat:** Remote-bulb or bimetal rod-and-tube type, proportioning action with adjustable throttling range and adjustable set point.



- G. Airstream Thermostats: Two-pipe, fully proportional, single-temperature type, with adjustable set point in middle of range and adjustable throttling range, plug-in test fitting or permanent pressure gage, remote bulb, bimetal rod and tube, or averaging element.
- H. Electric Low-Limit Duct Thermostat: Snap-acting, single-pole, single-throw, manual- or automatic-reset switch that trips if temperature sensed across any 12 inches (300 mm) of bulb length is equal to or below set point.
  - 1. Bulb Length: Minimum 20 feet (6 m).
  - 2. Quantity: One thermostat for every 20 sq. ft. (2 sq. m) of coil surface.
- I. Electric High-Limit Duct Thermostat: Snap-acting, single-pole, single-throw, manual- or automatic-reset switch that trips if temperature sensed across any 12 inches (300 mm) of bulb length is equal to or above set point.
  - 1. Bulb Length: Minimum 20 feet (6 m).
  - 2. Quantity: One thermostat for every 20 sq. ft. (2 sq. m) of coil surface.
- J. Heating/Cooling Valve-Top Thermostats: Proportional acting for proportional flow, molded-rubber diaphragm, remote-bulb liquid-filled element, direct and reverse acting at minimum shutoff pressure of 25 psig (172 kPa), and cast housing with position indicator and adjusting knob.

## 2.11 HUMIDISTATS

- A. Duct-Mounted Humidistats: Electric insertion, 2-position type with adjustable 2 percent throttling range, 20 to 80 percent operating range, single- or double-pole contacts.

## 2.12 ACTUATORS

- A. Electric Motors: Size to operate with sufficient reserve power to provide smooth modulating action or two-position action.
  - 1. Permanent Split-Capacitor or Shaded Pole Type: Gear trains completely oil immersed and sealed. Equip spring-return motors with integral spiral-spring mechanism in housings designed for easy removal for service or adjustment of limit switches, auxiliary switches, or feedback potentiometer.
  - 2. Nonspring-Return Motors for Valves Larger Than 2-1/2 Inches: Size for running torque of 150 inch-pounds and breakaway torque of 300 inch-pounds.

3. Spring-Return Motors for Valves Larger Than 2-1/2 Inches: Size for running and breakaway torque of 150 inch-pounds.
- B. Pneumatic Valve Operators: Rolling-diaphragm, spring-loaded, piston type with spring range as required. Select operator for full shutoff at maximum pump differential pressure.
- C. Pneumatic Damper Operators: Rolling-diaphragm, piston type with adjustable stops and spring return, sized to operate with sufficient reserve power to provide smooth modulating action or two-position action. Where actuators operate in sequence, provide pilot positioners.
  1. Pilot Positioners: Starting point adjustable from 2 to 12 psi and operating span adjustable from 5 to 13 psi.

## 2.13 CONTROL VALVES

- A. Control Valves: Factory fabricated, of type, body material, and pressure class indicated. Where type or body material is not indicated, make selection as determined by manufacturer for installation requirements and pressure class, based on maximum pressure and temperature rating of piping system.
- B. Globe Valves: As follows:
  1. Globe Valves NPS 2 Inches (DN50) and Smaller: Bronze body, bronze trim, rising stem, renewable composition disc, screwed ends with backseating capacity repackable under pressure.
  2. Globe Valves NPS 2-1/2 Inches (DN65) and Larger: Iron body, bronze trim, rising stem, plug-type disc, flanged ends, renewable seat and disc.
  3. Hydronic Systems: As follows:
    - a. Chilled Water Rating: Service at 125 psi WSP and 250 degrees F.
    - b. Hot Water: Service at 150 PSI WSP and 400 degrees F.
    - c. High Temperature Hot Water (HTHW): Carbon Steel, Class 600.
    - d. Internal Construction: Replaceable plugs and seats of stainless steel or brass.
      - 1) Single-Seated Valves: Cage trim provides seating and guiding surfaces for plug on top and bottom of guided plugs.

- 2) Double-Seated Valves: Balanced plug; cage trim provides seating and guiding surfaces for plugs on top and bottom of guided plugs.
  - e. Sizing: 3 psi (cooling) 5 psi (heating) maximum pressure drop at design flow rate.
  - f. Flow Characteristics: 3-way valves have linear characteristics. Select operators to close valves against pump shutoff head.
  - g. High Temperature Hot Water: Class 600 or 800.0
- C. Butterfly Pattern: Iron body, ductile iron (Nylon II coated) disc; resilient, EPDM seat for service to 250 degrees F lug ends; extended neck, 416 stainless steel stem.
1. Rating: Service at 125 psi WSP and 250 degrees F.
  2. Sizing: 1 psi maximum pressure drop at design flow rate.
- D. Terminal Unit Control Valves: Bronze body, bronze trim, two- or three-port as indicated, replaceable plugs and seats, union and threaded ends.
1. Rating: Class 125 for service at 125 psig (862 kPa) and 250 deg F (121 deg C) operating conditions.
  2. Sizing: 3-psig (21-kPa) maximum pressure drop at design flow rate, to close against pump shutoff head.
  3. Flow Characteristics: Two-way valves shall have equal percentage characteristics; three-way valves shall have linear characteristics.
- E. Pressure Reducing Valve (PRV): 250-psig minimum rating. Pressure reducing valve shall automatically reduce a higher inlet pressure to a steady lower downstream pressure regardless of changing flow rate and/or varying inlet pressure. The pressure reducing valve shall be an accurate, pilot-operated regulator capable of holding downstream pressure to a pre-determined limit. The cover on the pilot control shall be sealed to prevent tampering. Pressure reducing valve shall be pre-set at factory.
1. Pressure Reducing Valve Material:
    - a. Body and Cover: Ductile iron, internally epoxy coated.
    - b. Disc Retainer and Diaphragm Washer: Cast iron.
    - c. Trim (Disc Guide, Seat and Cover Bearing): Stainless steel.
    - d. Disc: Buna-N rubber.

- e. Stem, Nut and Spring: Stainless steel.
- f. Diaphragm: Nylon reinforced Buna-N rubber.
- 2. Pilot System Material:
  - a. Pilot Control: Bronze ASTM B 62.
  - b. Trim: Stainless steel Type 303.
  - c. Rubber: Buna-N synthetic rubber.
- 3. Adjustment Range: 2 to 30 psi.
- 4. Accessories: Strainer, isolation valve.
- 5. Manufacturer and Model: Pressure reducing valves shall be manufactured by Cla-Val, Model 90-01 or equal."

#### 2.14 DAMPERS

- A. Dampers: AMCA-rated, parallel or opposed blade design; form frames from not less than 0.1084-inch galvanized steel with mounting holes for duct mounting; damper blades not less than 0.0635-inch galvanized steel, with maximum blade width of 8 inches.
  - 1. Blades secured to 1/2-inch diameter, zinc-plated axles using zinc-plated hardware, with nylon blade bearings, blade-linkage hardware of zinc-plated steel and brass. Ends sealed against spring-stainless-steel blade bearings. Thrust bearings at each end of every blade.
  - 2. Operating Temperature Range: From -40 to 200 degrees F.
  - 3. For standard applications as indicated, (as selected by manufacturer's sizing techniques) with optional closed-cell neoprene edging.

#### 2.15 AIR SUPPLY

- A. Control and Instrumentation Tubing: Type K, seamless copper tubing complying with ASTM B 88 (ASTM B 88M) or Type ACR, copper tubing complying with ASTM B 280.

1. Fittings: Cast-bronze solder fittings complying with ASME B16.18; or wrought-copper solder fittings complying with ASME B16.22, except forged-brass compression-type fittings at connections to equipment.
2. Joining Method: Soldered or brazed.
- B. Control and Instrumentation Tubing: Virgin-polyethylene, flame-retardant, nonmetallic tubing complying with ASTM D 2737 with flame-retardant harness for multiple tubing.
  1. Fittings: Compression or push-on polyethylene fittings.
- C. Tank: ASME storage tank with drain test cock, automatic moisture removal trap, tank relief valve, and rubber-cork vibration isolation mounting pads.
- D. Duplex Air Compressor: Capacity to supply compressed air to temperature-control system. Minimum two (2) duplex air compressors, with air dryer and accessories shall be provided.
  1. Adjustable electric contacts pressure control, set to start and stop both compressors at different pressures.
  2. Electrical alternation set with motor starters and disconnect to operate compressors alternately or on time schedule.
- E. Compressor Type: Reciprocating.
- F. Size compressor and tank to operate compressor not more than 20 minutes during a 60-minute period.
- G. Compressor Accessories: Low-resistance intake-air filter, and belt guards.
- H. System Accessories: Air filter rated for 97 percent efficiency at rated airflow, and combination filter/pressure-reducing station or separate filter and pressure-reducing station.
- I. Refrigerated Air Dryer: Self-contained, refrigerated air dryer complete with heat exchangers, moisture separator, internal wiring and piping, and with manual bypass valve.
  1. Heat Exchangers: Air-to-refrigerant coils with centrifugal-type moisture separator and automatic trap assembly.
  2. Refrigeration Unit: Hermetically sealed, operating to maintain dew point of 13 deg F (minus 11 deg C) at 20 psig (138 kPa), housed in steel cabinet with access door and panel.
  3. Accessories: Air-inlet temperature gage, air-inlet pressure gage, on-off switch, high-temperature light, power-on light, refrigerant gage on back, air-outlet

temperature gage, air-outlet pressure gage, and with contacts for remote indication of power status and high-temperature alarm.

- J. Pressure Gages: Black letters on white background, 2-1/2-inch (64-mm) diameter, flush or surface mounted, with front calibration screw to match sensor, in appropriate units.
- K. Instrument Pressure Gages: Black letters on white background, 1-1/2-inch (38-mm) diameter, stem mounted, with suitable dial range.
- L. Diaphragm Control and Instrument Valves: 1/4-inch (6-mm) forged-brass body with reinforced polytetrafluoroethylene diaphragm, stainless-steel spring, and color-coded phenolic handle.
- M. Gage Cocks: Tee or level handle, bronze, rated for 125 psig (862 kPa).
- N. Relays: For summing, reversing, amplifying, highest or lowest pressure selection, with adjustable input/output ratio.
- O. Switches: With indicating plates, accessible adjustment, calibrated and marked.
- P. Pressure Regulators: Zinc or aluminum castings with elastomeric diaphragm, balanced construction to automatically prevent pressure build-up, and producing flat reduced-pressure curve.
- Q. Particle Filters: Zinc or aluminum castings with 97 percent filtration efficiency at rated airflow, quick-disconnect service devices, and aluminum or plastic bowl with metal guard and manual drain cock.
- R. Combination Filter/Regulators: Zinc or aluminum castings with elastomeric diaphragm, balanced construction to automatically prevent pressure build-up, and producing flat reduced-pressure curve; with threaded pipe connections, quick-disconnect service devices, and aluminum or plastic bowl with metal guard and manual drain cock.
- S. Airborne Oil Filter: Filtration efficiency of 99.9 percent for particles of 0.025 micrometer or larger particles of airborne lubricating oil.
- T. Pressure Relief Valves: ASME rated and labeled.
  - 1. High Pressure: Size for installed capacity.
  - 2. Low Pressure: Size for installed capacity of pressure regulators and set at 20 percent above low pressure.
- U. Pressure-Reducing Stations: Two parallel pressure regulators.

## 2.16 CONTROL CABLE

- A. Electronic Cable for Control Wiring: Refer to Division 16 Section "Control/Signal Transmission Media."

## 2.17 AIR HANDLING UNIT CONTROL PANEL

- A. Air Handling Units: Control panel for each air handling unit shall be furnished by the FMS supplier and field installed adjacent to air handling unit equipment.

## 2.18 DDC AIR FLOW MEASUREMENT EQUIPMENT

### A. DDC Air Flow Measuring System

1. Provide Dybec Model D-91 DDC or equal, air flow measuring systems including microprocessor panels and air flow measuring sensor struts as specified.
2. Pitot tube arrays and differential pressure arrays are not acceptable.
3. DDC Air Flow Measuring System shall have velocity range from 45 ft/min to 6400 ft/min with duct measurement accuracy (including repeatability, zero offset, and temperature compensation) of plus or minus 2.5 percent.

### B. DDC Processor Panel

1. Processor shall calculate duct air flow by independently measuring the flow over each thermistor/sensor and calculating the velocity of the air for each thermistor/sensor. Equipment which averages multiple thermistors is not acceptable.
2. DDC Air Flow Measuring Systems shall require no field calibration and shall allow field replacement of thermistors without calibration. Equipment which requires shipment to factory for recalibration is not acceptable.
3. In the event of a thermistor failure, the processor shall ignore the failed thermistor and continue to operate with the remaining thermistors. The microprocessor shall have diagnostics which can identify the failed thermistor.
4. Display: Processor panels measuring one or two ducts shall have two line display and panels measuring three or four ducts shall have four line display. Display shall be 16 characters/line LCD type and shall display all air flows and temperatures. Processor must also be able to display user-defined custom values such as measured delta cfm and delta cfm set point as specified at time of purchase.

5. **Printer Port:** Processor shall have serial printer port for hard copy system commissioning and for tenant confirmation of outdoor ventilation rates.
6. **Communications Port:** Processor panel shall have RS232 serial interface port for local computer or phone remote diagnostics.
7. **Ambient Operating Conditions:** 50 degrees F to 105 degrees F and less than 95 percent relative humidity.
8. **Enclosure and Power:** NEMA 1 24 VAC 5 amp fused input power.
9. **Signal Outputs:** 0-5 VDC.

**C. Thermistor Sensor Struts**

1. **Manufacturer** must provide documentation certifying that the thermistor meets military specifications for drift rates which do not exceed 0.1 degree F in five years at 140 degrees F.
2. **Sensor Operating Range:** -50 degrees to 120 degrees F.
3. Each sensor on the strut shall have integral flow straighteners both upstream and downstream of thermistors.
1. At least one strut in each duct shall have a solid state temperature sensor.
2. **Sensor Struts:** Sensor struts shall be mounted in duct by sheet metal contractor and wired by the temperature control contractor.
3. **Manufacturer** shall provide tagged struts with prewired cables (one cable/strut) for screw-in connections to respective processor panel.

- D. Submittals:** Submittals shall include all relevant data (all service bulletins) regarding setup for flow measuring system. Submittal shall include factory approved startup service. Submittal must include signed statement from manufacturer stating equipment recalibration is not necessary and if for any reason is required, manufacturer shall pay for all costs (material, labor, shipment) associate with the recalibration of equipment. Submittal must include detailed procedure for replacement of thermistor



## PART 3 – EXECUTION

### 3.1 EXAMINATION

- A. Verify that conditioned power supply is available to control units and operator workstation. Verify that field end devices, wiring, and pneumatic tubing are installed before proceeding with installation.

### 3.2 INSTALLATION

- A. Install equipment as indicated to comply with manufacturer's written instructions.
- B. Connect and configure equipment and software to achieve the sequence of operation specified on the plans.
- C. Verify location of thermostats, and other exposed control sensors with plans and room details before installation. Locate 60 inches above floor.
  - 1. Install averaging elements in ducts and plenums in crossing or zigzag pattern.
- D. Install damper actuators on outside of duct in warm areas, not where exposed to outdoor temperatures.
- E. Install labels and nameplates to identify control components according to Division 15 Sections specifying mechanical identification.
- F. Install hydronic instrument wells, valves, and other accessories according to Division 15 Section "Hydronic Piping."

### 3.3 ELECTRICAL WIRING AND CONNECTIONS

- A. Install raceways, boxes, and cabinets according to Division 16 Section "Raceways, Boxes, and Cabinets."
- B. Install building wire and cable according to Division 16 Section "Wires and Cables."
- C. Install automatic temperature control/direct digital control wiring as follows:
  - 1. Install automatic temperature control/direct digital wiring in raceways, boxes, and cabinets according to Division 16, Section 16130, "Raceways, Boxes, and Cabinets."
  - 2. Fasten flexible conductors, bridging cabinets and doors, neatly along hinge side; protect against abrasion. Tie and support conductors neatly.

3. Number-code or color-code conductors, except local individual room controls, for future identification and servicing of control system.
- D. Connect electrical components to wiring systems and to ground as indicated and instructed by manufacturer. Tighten connectors and terminals, including screws and bolts, according to equipment manufacturer's published torque-tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals according to tightening requirements specified in UL 486A.
- E. Connect manual reset limit controls independent of manual control switch positions. Automatic duct heater resets may be connected in interlock circuit of power controllers.
- F. Motor Controllers: Monitor on/off status. Communication shall be as a feature of motor protection relay.
- G. Lighting Control: Provide lighting control by panelboards powerlink modules wiring with Metasys Network. For details refer to Division 16, Section 16442, Paragraph 2.4, subparagraph C.

### 3.4 CONTROLS FOR ELECTRICAL SYSTEMS

All power monitoring/control modules are specified to be compatible with Johnson Controls N2 protocol for remote display and controls. The following electrical components shall be monitored and/or controlled by Metasystem Network provided by Johnson Controls.

- A. 480V Switchgears: Provide monitoring of overcurrent, ground-fault conditions, and main circuit breaker trip status for Fire Cycle III pre-action at the substations. Use main circuit breaker dry contacts to wire for communication to Metasystem.
- B. Standby Generator: Monitor on/off status of generator and generator circuit breaker.
- C. Transfer Switches: Monitor on/off status of all the autotransfer switches.
- D. Motor Controllers: Monitor on/off status. Communication shall be as a feature of motor protection relay. Comply with the requirements of this Section paragraph 2.6 and 2.7.
- E. Lighting Control: Provide lighting control by panelboards powerlink modules wiring with Metasys Network.
- F. UPS Status: Monitor on/off status of UPS units.
- G. Fire Cycle III pre-action cabinets shall be monitored in substation, elevator machinery and all communications rooms.

### 3.5 COMMISSIONING

- A. Manufacturer's Field Services: Provide the services of a factory-authorized service representative to start control systems.
- B. Test and adjust controls and safeties.
- C. Replace damaged or malfunctioning controls and equipment.
- D. Start, test, and adjust control systems.
- E. Demonstrate compliance with requirements.
- F. Adjust, calibrate, and fine tune circuits and equipment to achieve sequence of operation specified herein and as shown on the plans.

### 3.6 FIELD QUALITY CONTROL

- A. Pressure test control air piping at 30 psi or 1.5 times the operating pressure for 24 hours, with maximum 5 psi loss.

### 3.7 HVAC SYSTEM EVALUATION AND PRECOMMISSIONING VERIFICATION

- A. Ensure that air handling units are operating properly before the application of outdoor air flow controls. If a retrofit application is involved, the equipment and controls must be evaluated to bring the system up to the intended operating level before applying this control strategy.
- B. Perform a walk through inspection: Look for and correct unstable control loops by checking transducer and pilot positioner calibration as well as controller tuning.
- C. Instability of any of the following existing control loops would degrade the operation of the Outdoor Air Flow Controller: Discharge air temperature/economizer control loop, supply fan static pressure control loop (which may in turn be affected by individual VAV box control loop instability) and space pressurization (volume matching) control loop.
- D. Confirm that the mixed air damper actuators, linkages and controls are operable and capable of achieving the specified flow rates. Confirm that the outdoor air, return air and exhaust air dampers are controlled by the same signal and can close off without "excessive" leakage.

- E. Ensure that the variable frequency drives, inlet guide vanes or other equipment employed to modulate the capacity of the supply and return fans is operating and capable of achieving the specified flow modulation for the job.
- F. Remove any mechanical or software "stops" that may be limiting the operation of the outdoor air, return air and exhaust air dampers.
- G. Perform verification of new and existing equipment and controls with the following "sanity checks" at the extreme positions of the coupled outdoor air, return air and exhaust air dampers.
- H. These checks, at fully closed and fully open outdoor air damper positions can, in addition to verification of the flow sensing accuracy, also be used for rough verification of accuracy of temperature and CO<sub>2</sub> sensing and for verification of proper placement of outdoor air temperature and CO<sub>2</sub> 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<sub>2</sub> 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<sub>2</sub> should be equal to the outdoor air CO<sub>2</sub>. 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<sub>2</sub> should be equal to the return air CO<sub>2</sub>. 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<sub>2</sub> 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<sub>2</sub> 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<sub>2</sub> concentrations) should be equal to the supply air flow (measured by the flow station). This check should be performed at various supply flows and any difference between the two air flow measurements should be identified. If the outdoor air flow is

lower than the supply air flow, it could be caused by leaks of equipment room air or return air into the negatively pressurized mixed air plenum. The leaks can be traced with a powder gun and located. Sealing the leaks as well as possible to minimize the flow difference is essential to general system performance and energy efficiency as well as ventilation control strategy.

### 3.8 DEMONSTRATION AND TRAINING

- A. The BMS/ATC contractors shall provide three copies of an operator's manual describing all operating and routine maintenance service procedures to be used with the temperature control and Facility Management Systems supplied. The Contractors shall instruct the MAA's designated representatives in these procedures during the start-up and test period.
- B. Instructions to MAA Personnel: The Control Contractor shall include in his bid price the cost of providing the services of competent instructors to fully instruct designated personnel in the adjustment, operation, and maintenance, including pertinent safety requirements, of the equipment and systems specified. The training shall be oriented toward the installed system rather than being a general (canned) training course. Each instructor shall be thoroughly familiar with all aspects of the subject to be taught. The number of man-days of instruction furnished shall be specified below. All equipment and material required for classrooms training shall be provided by the Contractor.
- C. Training Program: Each of the two training programs shall be accomplished in three phases for the time interval specified for each phase. A training day is defined as eight (8) hours of instruction including two 15-minute breaks and excluding lunchtime.
- D. Phase I
  - 1. This phase will be for a period of (3) days prior to the acceptance test period at a time mutually agreeable between the Contractor and the MAA. Operating personnel shall be trained in the functional operations of the installed system, the procedures employed for system operation and the maintenance of FMS equipment.
  - 2. The first (2) days of training shall include:
    - a. General FMS Architecture
    - b. Operation of Computer and Peripherals
    - c. Command Line Mnemonics
    - d. Operation Control Functions

- e. Graphics Generation
- 3. The third day of training shall include:
  - a. General Equipment Layout
  - b. Troubleshooting of FMS Components
  - c. Preventive Maintenance of FMS Components
  - d. Sensor Maintenance and Calibration
- E. Phase II: This phase of training shall be conducted approximately four (4) weeks after system acceptance testing for a period of three (3) days. The first day of training shall be condensed review of the entire first phase subject material. The second and third days shall be based upon subject matter proposed by MAA personnel. One week prior to the date of the first Phase II training session, the MAA shall submit to each of the two Contractors a detailed list of subject matter which shall determine the content of the program (e.g., system software operational problems, software utilization, capability and usage, etc.).
- F. Phase III:
  - 1. Provide detailed training for two MAA's personnel for a minimum of five days (total 80 hours) at the Manufacturer's plant or training facility. Training must be in depth in the operation, maintenance, troubleshooting, and repair of the chillers.
  - 2. Schedule training with MAA, through Engineer, with at least 60 days advance notice.

### 3.9 WARRANTEE

- A. The control system herein specified shall be free from defects in workmanship and material under normal use and service. If within one (1) year from the date of acceptance by the Engineer, any of the equipment herein described is proved to be defective in workmanship or material, it will be adjusted, repaired, or replaced free of charge by the BAS Contractor.

### 3.10 MAA ACCEPTANCE

- A. The FMS shall be considered acceptable to the MAA when the following conditions have been met.
  - 1. Successful completion of the acceptance test.

2. Receipt of Operation and Maintenance Manuals.
3. Receipt of spare parts.
4. Correction of all punchlist items.
5. Receipt of all other documentation required, as noted below.
6. Phase I of Instructions to MAA's personnel as specified.

### 3.11 COMMISSIONING, TESTING, AND ACCEPTANCE

A. Perform a three-phase commissioning procedure consisting of field I/O calibration and commissioning, system commissioning, and integrated system program commissioning. Document all commissioning information on commissioning data sheets which shall be submitted prior to acceptance testing. Commissioning work which requires shutdown of system or deviation from normal function shall be performed when the operation of the system is not required. The commissioning must be coordinated with the MAA and construction manager to ensure systems are available when needed. Notify the operating personnel in writing of the testing schedule so that authorized personnel from the MAA and construction manager are present throughout the commissioning procedure.

1. Field I/O Calibration and Commissioning: Prior to system commissioning, verify that each control panel has been installed according to plans, specifications, and approved shop drawings. Test, calibrate, and bring on line each control sensor and device. Commissioning to include, but not be limited to:
  - a. Sensor accuracy at 10, 50, and 90 percent of range.
  - b. Sensor range.
  - c. Verify analog limit and binary alarm reporting.
  - d. Point value reporting.
  - e. Binary alarm and switch settings.
  - f. Actuator and positioner spring ranges.
  - g. Fail safe operation on loss of control signal, electric power, network communications, etc.

Record calibration and test data on commissioning data sheets. Sufficient space should be provided near each point name for sign off.

## **PART 4 - MEASUREMENT**

### **4.1 METHOD OF MEASUREMENT**

- A. No separate measurement shall be made for work under this Specification Section.**

## **PART 5 – PAYMENT**

### **5.1 METHOD OF PAYMENT**

- A. No separate payment will be made for work under this Specification Section. The cost of the work, complete in place, described in this Specification Section shall be included in the respective Lump Sum Bids under Item 01010-1 “Building Construction.”**
- B. Costs include all labor, material, services and equipment necessary to complete the work in every respect.**

**END OF SECTION 13975**



## **SECTION 16430 - POWER MONITORS FOR LOW VOLTAGE SWITCHGEAR**

### **PART 2 - PRODUCTS**

#### **2.1 COMPONENTS**

- A Multifunction Digital-Metering Monitor:** All double-ended substations shall be equipped with a multifunction digital-metering monitor located at each secondary main circuit breaker. Metering monitor shall be sole-sourced exclusively from Square-D. There will be "No Exceptions Allowed". Metering monitor shall have as a minimum all capabilities of Square-D CM3350 circuit monitor. Metering monitor display and control unit shall be flush or semi-flush mounted in instrument component door. Metering monitor shall be fully compatible with Johnson Controls N2 protocol for monitoring and displaying basic electrical data.

**END SECTION 16430**

## SECTION 16442 - PANELBOARDS

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Manufacturers: All Panelboards shall be sole-sourced exclusively from Square-D. There will be "No Exceptions Allowed".

#### 2.2 MANUFACTURED UNITS

- A. Enclosure Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.
- B. Phase and Ground Bus Material: Hard-drawn copper, 98 percent conductivity.
- C. Panel Short-Circuit Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals.
- D. Branch Overcurrent Protective Devices:
  - 1. All circuit breakers shall be bolt-on type, whenever possible, replaceable without disturbing adjacent units.
  - 2. All 120/240 VAC rated circuit breakers shall have VISI-TRIP trip indicator.
- E. <Insert other features as required for specific project>.

END OF SECTION 16442

## SECTION 16714 –FLEXIBLE RESPONSE SYSTEM

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. The existing Flexible Response System is manufactured by Fire Lite Alarms, Inc., therefore modules shall be exclusively by Fire Lite Alarms, Inc. only. All other products required for system integration shall be submitted and approved by MAA with input from TENN security.

#### 2.2 CONTROL PANEL

- A. Provide monitoring modules and addressable control relay modules as described below for existing Fire Lite control panel MS-9200 for expansion.

#### 2.3 MONITORING MODULE

Provide addressable monitoring module suitable for monitoring a normally open, dry contact device. Module shall be able to mount inside a single gang device box. Module shall have direct dial address entry (01-99).

Acceptable Product:

Fire-Lite Alarms, Incorporated, MMF301, Monitoring Module.

#### 2.4 ADDRESSABLE CONTROL RELAY MODULE

Provide addressable control relay module with two independently addressed and controlled normally open relays. Model shall have direct dial address entry (01-99).

Acceptable Product:

Fire-Lite Alarms, Incorporated, CRF C304 Control Module

#### 2.5 SECURITY STROBES

Strobe lights shall provide high Intensity flashes for fast premise identification, excellent visibility for the widest-angle coverage, 12V operating voltage and suitable for surface mounting. Red strobe light shall be Ademco Series SL1R or approved equal. Amber strobe light shall be approved equal.

Acceptable Product:

Amesco Series SL1A, Amber Strobe Light  
Amesco Series SL1B, Blue Strobe Light

## 2.6 PIEZO HORN

Horn shall provide minimum 100 dB output at 175 mA or as recommended by manufacturer.

Acceptable Product:

Moose MPI-47 or approved equal Piezo Horn.

## 2.7 POWER SUPPLY

Power supply shall be a complete assembly of 16VA transformer (120V primary to 12V secondary), battery charger, 12V, 2.6AH sealed lead acid battery in NEMA 1 enclosure. It shall provide precision voltage regulation, transient protection and blowout protection for efficient operation of strobe lights, horns, panic button, footbar, etc. It shall activate devices during normal as well as emergency operation.

Acceptable Product:

Moose Product Inc. Series CH-12 or approved equal power supply.

## 2.8 FOOT BAR

Foot bar shall be 18 inches wide cast aluminum and operated by upward toe movement for security alarm with key re-settable indicator flag. It shall be provided with double pole double throw switch to activate audio and visual alarms.

Acceptable Product:

Ademco No. 266 or approved equal foot bar.

## 2.9 PANIC BUTTON

Panic button operation takes place when two large levers on either side of the switch are depressed simultaneously in order to activate alarm, and alarm signal cannot be activated if one lever is accidentally depressed. Panic button shall have key re-settable indicator flag and double pole double throw contacts to activate audio and visual alarms.

Acceptable Product:

Ademco Catalog No. 268 or approved equal panic button.

## 2.10 SILENCE KEY SWITCH

Silence key switch shall be provided with lock-mounted switch and key for silence operation. It shall be provided with double pole double throw contacts to activate audio and visual alarms.

Acceptable Product:

Ademco Catalog No. 269 or approved equal.

## 2.11 CONDUCTOR

Provide twisted shielded copper cables as recommended by manufacturer.

## 2.12 AUTOMATED EXTERNAL DEFIBRILLATORS

- A. Defibrillator shall be 10.5 inches wide x 11.6 inches high x 4.0 inches deep, lightweight portable, with low maintenance requirements and long shelf life non-rechargeable lithium batteries. Biphasic Technology shall be used to deliver defibrillation truncated exponential with voltage and duration for patient impedance at 200 to 360 joules energy levels as recommended by the American Heart Association and International Guidelines Display of low battery alert service, shock count, CPR time and real time on two lines, 20 characters LCD on each line.

Acceptable Product:

Medtronic Physio-Control, Life Pack Series 500 Defibrillator.

- B. Automated external defibrillator cabinets. Defibrillator cabinet shall be 12 inches wide x 16 inches high x 6 inches deep, with glass front door, magnetic contact, lead wires for monitoring module connection and disable alarm key in white epoxy finish. Provide BWI Fire Marshall approved sign above cabinet.

Acceptable Product:

Medtronic Physio control Series 3012604, Cabinet

END OF SECTION 16714

## SECTION 16724 – CONTROLLED ACCESS SECURITY SYSTEM

### PART 2 – PRODUCTS

#### 2.1 MANUFACTURERS

The existing Controlled Access Security System is manufactured by General Electric Infographics; therefore, networked Intelligent Controllers, Card Readers and Remote Modules shall be exclusively by General Electric Infographics only. All other substituted products shall be submitted and approved by MAA with input from ADT. There will be "No Exceptions Allowed".

#### 2.2 NETWORKED INTELLIGENT CONTROLLER (ACU)

- A. The Networked Intelligent Controller (ACU) shall be a microprocessor-based device, which utilizes a 32-bit processor and a 32-bit bus structure. The controller shall have a minimum clock speed of 90 MHz, and shall be provided with at least 16 Mbytes of battery backed-up dynamic RAM. The controller shall feature a direct LAN/WAN connection to the controller bus structure in addition to two RS-232 or RS-485 connections, all of which shall be designed for use in communication with the existing server. The communication architecture of the ACU shall be such that in the event that the primary communication channel to the server is lost, the unit shall be capable of automatically switching to a secondary communication channel using one of the host RS-232 or RS-485 connections, and if required, shall be able to establish communications via dial-up modem.
- B. The ACU shall be provided with a parallel printer port, which will enable it to print transaction data during loss of communication with the existing server. The ACU shall be capable of dynamically allocating its memory between database information and transaction history, which shall be stored if the controller has lost communication with the existing server. Such transaction history shall be automatically uploaded to the server once communication has been restored. The ACU shall be configured for local storage of no less than 100,000 cardholders. In its maximum configuration, the ACU shall be capable of storing 500,000 cardholders, and its memory utilization shall be such that if storing database information for 10,000 cardholders, it shall also be capable of storing one million transactions.
- C. The ACU shall support the monitoring and control of 16 readers, with or without keypads. It shall also be provided with at least 12 five-state, fully supervised and fully configurable input points, and at least 12 fully configurable auxiliary output control relays mounted on the main circuit board.
- D. Each controller must also be capable of expansion, by external Remote Input Modules (RIMs) and/or Remote Relay Modules (RRMs), to support a combination of up to 172

fully configurable five-state supervised input points or 156 output relays per ACU depending on configuration.

- E. Each ACU shall be provided with a UL Listed uninterruptible power supply (UPS) mounted within the ACU enclosure. It shall provide sufficient battery backup to sustain complete operational effectiveness of all devices and equipment connected to the ACU including card readers Remote Reader Electronic (RRE) modules, electric locks, RIMs and RRM's for a minimum of four (4) hours of normal operation.
- F. Each ACU shall utilize on-board self-diagnostic LEDs, removable terminal strips and a pop-in/pop-out circuit board.
- G. Each ACU in addition to its on-board LAN/WAN connection shall support RS-232 and multi-drop RS-485 communication topologies. Provision of external LAN terminal server devices that are connected through serial communications to the ACU are not acceptable.
- H. Each ACU shall support RS-485 bi-directional communication paths (dual multi-drop paths back to file server) with no additional hardware or firmware required.
- I. Each ACU shall be supplied with all specified options available, including an enclosure with a tamper switch and lock.
- J. Each ACU shall be capable of reporting the following alarm conditions to the existing ACAM file server:
  - 1. Enclosure door tamper.
  - 2. Primary power failure.
  - 3. Low battery conditions.
  - 4. Lost of communications.
  - 5. All access control violations.

Acceptable Product:

GE Infographics System ACU2XL/16-E-2-UL-UPS-24V, Network Intelligent Controller.

### 2.3 RMS CARD READER/PINPAD

- A. Reader shall be a single stage design to include a swipe/pass-through and the electronic interface to the ACU2 Controller. Each shall include a 32-character LCD display that allows the use of various text messages for user prompts or event notices.

- B. LED lamps (red, yellow, green) shall visually display reader status with an internal audible annunciation providing response to keypad entries and door alarm conditions.
- C. The readers can be configured for card with keypad.
- D. The readers shall include four supervised alarm inputs that are user-configured for door contact, door release button and two general-purpose alarm points. The reader shall also have a solid state output that can be configured to operate the door strike.
- E. The reader shall provide two single pole double throw relays. One relay can be used for door unlock. The other relay can be used for remote control functions.

Acceptable Product:

GE Infographics Systems Series RMS-2 Card Reader.

## 2.4 REMOTE INPUT MODULE

- A. The Remote Input Module (RIM) shall be provided to support additional input points as required. The RIM shall support all industry standard alarm input devices.
- B. Each RIM shall support 16 five-state supervised input points and two output relays. The status of each input point shall be indicated by a tri-state LED, and shall be available if required with an enclosure with a tamper switch through which these status LEDs can be viewed, and it shall be possible to append legends denoting the connection details of each input point on the outside of the enclosure. Each RIM shall be capable of being powered by the on-board UPS of an ACU or by a local 24 VDC UPS.
- C. Each RIM shall utilize on-board self-diagnostic LEDs, industry standard terminal strips and a pop-in/pop-out circuit board.
- D. Each RIM shall be supplied with all specified options available, including an enclosure with a tamper switch and lock. Quantity and location of remote input modules shall be as required for a physically complete and operational system. The RIM shall be Infographics Systems, no substitutions.

Acceptable Product:

GE Infographic RIM REND 1N0-RPL-E-2-RPL02, Remote Input Module.

## 2.5 REMOTE RELAY MODULE (RRM)

- A. The Remote Relay Module (RRM) shall be provided to support additional output relays. The RRM shall utilize industry standard dry contact output relays.



- B. Each RRM shall support eight SPST and eight DPDT output relays. Each RRM shall be capable of being powered by the on-board UPS of an ACU.
- C. Each RRM shall utilize on-board self-diagnostic LEDs, and a pop-in/pop-out circuit board.
- D. Each RRM shall be support 2 unsupervised inputs and 16 output relays. Each enclosure shall be provided with a tamper switch and lock. Quantity and location of RRM's shall be as specified in contract documents and drawings. The RRM shall be Infographics Systems, no substitutions.

Acceptable Product:

GE Infographic REND 1-RPL, Remote Relay Module.

## 2.6 DOOR RELEASE BUTTON

Release button shall be mounted in stainless steel green lit outlet. It shall be SP/ST rated for 10 amp, 24 VDC.

Acceptable Product:

Securitron No. PB2E, or approved equal, Door Release Button.

## 2.7 DOOR POSITION SWITCH

Door position switch shall be surface mount, SPDT, and accommodate wider break distance to minimize false alarm. Contact and magnet shall be 3.9" L x 0.6" W x 0.7" D to provide faster installation.

Acceptable Product:

Sentrol Series 1045, or approved equal, Door Position Switch.

## 2.8 EMERGENCY DOOR RELEASE BUTTON

Emergency button shall be mounted in custom made lexon cover junction box for emergency release. It shall be SP/DT to send "Door Release" alarm signal to ACU panel and locally unlock power to the electromagnetic lock.

Acceptable Product:

Securitron No. EEB2 or approved equal, Energy Door Release Button.

## 2.9 ELECTRICAL POWER and BACKUP

- A. Normal System Power Supply: 120 V, 60 Hz from lockable disconnect device. System components shall be supplied with power through the ACU battery back-up and field located power supplies. Refer to the Contract Drawings for ACU and field power supply locations.
- B. Power Source Transfer: When normal power is interrupted, system is automatically switched to back-up supply without degradation of critical system function or loss of signals or status data.
- C. Field Power Supplies: Provide power supplies for supply of power to the electrical door hardware at locations detailed on the Contract Drawings. Power supplies shall be as recommended by the equipment manufacturer for devices being powered from supply. Power supplies shall provide four (4) hours of battery backup under full load of devices supported. Submit battery back-up calculations for each power supply to the Engineer for approval.

## 2.10 CONDUCTORS

- A. Wire and cabling shall be as recommended by the manufacturer and all wire and cabling shall be installed in an enclosed conduit and raceway system.
- B. After installation and before termination, all wiring and cabling shall be checked and tested to insure there are no grounds, opens or shorts on any conductors or shields.
- C. Visually inspect wire for faulty insulation prior to installation. Protect cable ends at all times with acceptable end caps except during termination.

END OF SECTION 16724

## SECTION 16740 – PUBLIC ADDRESS SYSTEM

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

The existing Public Address System is manufactured by Innovated Electronics Designs, Inc.; therefore, Announcement Control System, Ambient Analysis System, Testing and Monitoring System shall be exclusively by Innovated Electronics Design, Inc., only. All other substituted products shall be submitted and approved by MAA with input from WPS. There will be "No Exceptions Allowed."

#### 2.2 ANNOUNCEMENT CONTROL SYSTEM (ACS)

##### A. Main Frame and Expansion Cards (ACS)

###### 1. Main Frame

Mainframe shall consist of a modular mainframe with 16 ACS plug in cards without disconnecting system wiring. Mainframe provides digital interface and DC power connection to ACS plug in cards.

###### 2. Microphone Interface Card

Microphone interface card addresses and decodes 8 microphone stations for microprocessor / CPU card. Microphone interface card buffers, isolates and routes audio signals through solid state switches to internal audio buses. Microphone interface card directs the audio signal from microphone stations to appropriate internal audio busses per ACS software configuration.

###### 3. Central Processing Unit

CPU manages the all functions of ACS without need of external PC. CPU controls audio routing, relays, play back, and microphone stations. CPU also commutates with ACS PC.

###### 4. Zone Output Card

Zone output card distributes the audio from the internal audio busses to the system zones per ACS software configuration. Zone output card allows software to select any signal from any one of the 8 internal audio busses to direct to any bus or zone output at any time. Zone output cards have two modes for background

music. One mode uses background music bus and send same signal to all zone outputs and other modes allows individual background music to each zone.

5. Relay Card

Relay Card activates relay for zone when it detects audio signal per ACS software configuration.

6. Hard Drive Card

Hard drive cards stores non-volatile programs, operating system data, control program, configuration files and permanent messages. Watchdog timer of hard drive card can refresh pulse to CPU and resets Announcement control system. Manual switch of hard drive card can reset announcement control system.

7. Digital Record/ Playback Card

Digital Record/ Playback card can play 8-recorded messages on 8 different audio channels simultaneously. Audio signals are digitized and store in DRAM. When messages are stored permanently, it transmits to hard drive card.

8. Rack Mounted Computer System

Rack mounted computer system consists of PC, monitor, keyboard and mouse drawer.

9. Power supply

Power supply provides 110 Watts, + 5 V DC output voltage with +/- 10 % output adjustment. Power supply has 25 A, 32 V (auto fuse) overload protection for + 5 VDC output circuits. Micro controller of power supplies allows main processor to switch the supply on and off by relay.

10. Power supply

Power supply provides 200 Watts, +/- 15 V DC output voltages with +/- 5 % output adjustment. Power supply has 10 a, 2 AG overload protection for +/- 15 VDC output circuits.

Micro controller of power supplies allows main processor to switch the supply on and off by relay. Power supply also allows the voltage adjustment by microprocessor.

Acceptable Products:

IED 500 M Main Frame  
IED 500 C Microphone Interface Card  
IED 500 CPU Central Processing Unit  
IED 500 D Zone Output Card  
IED 500 DR Relay Card  
IED 500 P Hard Drive Card  
IED 500 R Digital Record/ Playback Card  
IED 590 R Rack Mounted Computer System  
IED 405 L Power supply  
IED 415 L Power supply

A. B. Microphone Stations

1. Limited Function Page 4 Button Stations – Limited function page stations shall have 4 zone group select buttons and ready/busy LEDs. Mounting configurations shall be horizontal or vertical orientation, flush or surface mount, desktop, or locking door enclosure. Microphone shall be handheld HFM\_H series.

Acceptable Products:

IED 500 series microphone station with hardware

2. 2. Full Function Page 12 Button Stations – Full function page stations shall have a 12-button keypad for data entry, an LCD digital display and ready/busy LEDs. Mounting configurations shall be horizontal or vertical orientation, flush or surface mount, desktop, rack mount (with or without powered speaker), or locking door enclosure. Microphone options shall be handheld handset.

Acceptable Products:

IED 508 series microphone station with hardware

2.3 AMBIENT ANALYSIS SYSTEM (AAS)

A. Main Frame

1. Mainframe shall consist of a modular mainframe that holds 11 AAS plug in cards. Mainframe provides remote sensor interface and DC power connection to AAS plug in cards.
2. Central Processing Unit

CPU compares channel signals with sensor signal per AAS software and sends signals to each channel digital attenuator.

3. Power supply

Power supply provides 130 Watts, +31 VDC, +/- 15 V DC output voltage with +/- 10 % output adjustment. Micro controller of power supplies allows main processor to switch the supply on and off by relay.

4. Attenuator Card

Each Attenuator card channel controls the signal level of the program audio.

5. Remote Sensor

Sensors samples audio signal and sends to attenuation card to compare signal with channel signal by CPU.

Acceptable Products:

IED 540 M Main Frame  
IED 540 CPU Central Processing Unit  
IED 540P Power supply  
IED 540 I Attenuator Card  
IED 540 AC Attenuator Card  
IED 540 IAC Attenuator Card  
IED 540 S Remote Sensor

2.4 AUTOMATIC TEST AND MONITOR SYSTEM (ATMS):

A. ATMS Mainframe: The existing ATMS mainframe has spare points available for connection of points as indicated in the block diagram to the existing system.

1. The Contractor shall interface the additional equipment required into the existing Automatic Test and Monitor System. Programming shall follow the current methodology and also be completed by the Contractor.
2. Contractor shall provide equipment, as shown on contract documents, including interface cables as required.

Acceptable Products:

IED 596ML/H Audio Monitor/Test Switch Mainframe

**B. Power Amplifiers**

1. The power amplifiers shall be of a modular design using a slide in amplifier card installed in an existing mainframe. Each mainframe shall accommodate eight (8) amplifier cards. Card shall be 100-Watt dual-channel amplifier or 200-Watt single channel amplifier.
2. The amplifiers shall be of a high efficiency design to provide for long term operating efficiency. Minimum efficiency shall be 79 percent at full rated power.

Acceptable Products:

Dual 100 Watt 70-Volt Amplifier Cards: IED 6272L/ Single 200 Watt-70Volt Amplifiers w IED 6000 Series Frame and IED 596GS modules.

- B. C. Equalization:** The equalization system shall be modular and provide for up to twenty-two (22) processor-controlled four channel equalizers, a central processing unit (CPU), and available redundant power supplies.

1. Equalizers shall have nine (9) parametric or configurable bands.
2. Contractor shall provide interface cabling and software as required to interface this system with the existing ACS and Ethernet network.

Acceptable Products:

Four Channel Equalizer: IED 8044DSP Digital Signal Processing Card Main Frame  
IED 8001MF, IED 8001 CPU, IED 8102PS

- C. D. Fiber Optic Interface:**

1. Ethernet Network Interface shall be a 10/100 baseT Ethernet switch with a minimum of 6 ports. Cat #IED 903
2. The fiber optic transmission system shall be a network-based system capable of transmitting and receiving both data and professional audio signals over multimode fiber optic cabling. The system shall be 19" EIA/TIA standard rack mountable and shall have the following system features:
  - a. Dynamically controlled routing and switching.

b. Scalable network

Acceptable Products:

BEC Technologies – OMNIInet Series or equal Fiber Optic Transmission System.

3. System Rack Chassis: The system rack chassis shall have the following specifications.

a. Redundant power supplies.

b. 21 Slot back plane for hot swappable modules.

Acceptable Products:

BEC Technologies OCHSYS or equal rack.

4. Network Interface Module: The network interface module shall have the following specifications.

a. 147.456MB/s effective rate

b. Redundant network operation

c. Hot swappable

d. Non volatile memory for storage of system information

e. Automatic detection and reporting of system level problems

f. System power and data accuracy indicators

g. Integrated network management system

Acceptable Products:

BEC Technologies FC101 or equal Network Interface Module.

5. Two Channel Slow Scan Data Input/Output (I/O) Module: The I/O module shall have the following specifications.

a. Individual channel allocation

b. Two channels per card

c. I/O software configurable to RS232, RS422, and RS485

d. Normal and fast transfer modes

e. 84 sub-nets per fiber optic strand – 672 on fully loaded network



f. Hot swappable

Acceptable Product:

BEC Technologies SSD002 or equal Scan Module

6. 24 Bit Professional Audio Input Module: The audio input module shall have the following specifications.
  - a. Four channel audio inputs
  - b. Hot swappable
  - c. Burr Brown INA103 low noise analog front end
  - d. Phantom switching of individual mic preamps, 0 to +60dB gain control
  - e. Dynamic Range: 116dB typical
  - f. Frequency Response: 10Hz – 22 kHz +/- .1dB
  - g. THD+N: 0.0002% typical
  - h. Crosstalk: < 120dB
  - i. Sample Rate: 48 kHz Fixed
  - j. Oversampling: 64x
  - k. Group Propagation Delay: 1.23mS
  - l. Signal Indicators: Green = Signal Present > -60dB Reference FS

Amber = Signal > -24dB Reference FS

Red = Clip

Acceptable Product:

BEC Technologies ADA424 or equal audio input module.

7. 24 Bit Professional Audio Output Module: The audio output module shall have the following specifications.
  - a. Four channel audio outputs
  - b. Hot swappable
  - c. Dynamic Range: 116dB typical

- d. Frequency Response: 10Hz – 22 kHz +/- .1dB
- e. THD+N: 0.0002% typical
- f. Crosstalk: <108dB
- g. Sample Rate: 48 kHz Fixed
- h. Oversampling: 64x
- i. Output Drive: > 50ohm Active Balance Line
- j. Signal Indicators: Green = Signal Present > -60dB Reference FS

Amber = Signal > -24dB Reference FS

Red = Clip

Acceptable Product:

BEC Technologies DAA424 or equal Audio Output Module

- 8. Universal AC Input Power Supply Module: The power supply module shall have the following specifications.
  - a. Hot swappable
  - b. Redundant Operation
  - c. 90 – 264 VAC Input
  - d. 47 – 440 Hz Input Frequency
  - e. Output Power: 200 Watts Continuous, 220 Watts Peak
  - f. Output Voltages: +5 Volts Digital Supply
    - +12 Volts Analog Positive Supply
    - 12 Volts Analog Negative Supply
    - +48 Volts Phantom Power Supply
  - g. Input Surge Current: 25 Amps maximum, Cold Start
  - h. Operating Temperature: 0 – 50 degrees C

i. Approvals: UL, ULc recognized and TUC Approved

Acceptable Product:

BEC Technologies PSA01 or equal Power Supply Module

D. E. Equipment Cabinet:

1. Equipment Cabinet shall be 83 1/8" high, 24 1/4" wide, 32 1/2" deep and have mounting rail spacing to support mounting of standard 19" EIA equipment.
2. Equipment Cabinet shall be provided with front vented and rear solid locking doors.
3. 3. Equipment Cabinet shall include copper grounding buss bar system.
4. Equipment cabinet shall be void of open spaces on the front the cabinet. Provide blank panels, vent panels and cabinet top panels as required for full cabinet build out.

Acceptable Products:

Middle Atlantic WRK Series or equal equipment cabinet.

E. F. Terminal Cabinet

Terminal Cabinets provided for the termination of system cables shall have minimum dimensions of 24"W X 36" H x 4" deep. Equipment enclosures shall be provided with locking doors (keyed as directed by BWI technical staff) and backboard for termination fabrication and cable routing.

Acceptable Products:

Hoffman Type 1 Enclosure Series or equal Terminal Cabinet.

F. G. Type 1 Loudspeaker Assembly: 4-inch, flush mounted speaker assembly in acoustic tile or bulkhead with grille, enclosure, mounting hardware and transformer.

1. Sensitivity shall be at least 88 dB average (1 Watt/1 Meter)
2. Frequency Response: 75 to 20 kHz
3. Transformer shall have 70 Volt primary and multiple taps and an 8-ohm secondary.

4. Transformer shall mount integrally to the loudspeaker.
5. Grille shall be a low profile.
6. Power handling: 25 Watts  
Acceptable Products:

Atlas FAP42T or equal Type 1 speaker Assembly

H. Type 2 Loudspeaker Assembly: Assembly shall be a multiple driver speaker cabinet, mounted on corrugated ceilings, with grille, backbox and all mounting accessories.

1. Sensitivity shall be at least 94 dB SPL (1 Watt at 1 meter).
2. Frequencies Response: 62 to 20 kHz.
3. Power Handling: 500W continuous.
4. Transformer shall mount integrally to the loudspeaker.
5. Grille shall be a low profile, with finish to match surface to which it is mounted. Prior to ordering the grille the Contractor shall submit color/finish for architectural approval.

Acceptable Products:

EAW CP499 and support system or equal Type 2 speaker assembly.

G. I. Type 3 Loudspeaker Assembly: Assembly shall be dual 4" drivers and 1" dome tweeter, in surface mounted enclosure, mounting hardware and transformer.

1. Sensitivity shall be at least 85 dB Peak (1Watt/1Meter)
2. Frequency Response: 120 to 20 kHz
3. Transformer shall have 70 Volt primary and multiple taps.
4. Transformer shall mount integrally to the loudspeaker.
5. Grille shall be a round profile, with finish to match surrounding surface.
6. Power handling: 90 Watts

Acceptable Products:

TOA H-1 or equal speaker assembly.

- J. Type 4 Loudspeaker Assembly: Assembly includes 8" woofer and 1" exit coil compression driver on a 90X60 Constant Directivity horn, mounting hardware and transformer. System shall attach to structure as required.

7. 1. Sensitivity shall be at least 95 dB Peak (1Watt/1Meter)
8. 2. Frequency Response: 89 to 18 kHz
3. Transformer shall have 70 Volt primary and multiple taps.
4. Transformer shall mount integrally to the loudspeaker.
5. Cabinet shall be finished to match surrounding surface.
6. CD horn shall be able to rotate in 90degree increments.
7. CD horn shall have optional 120x60 degree pattern available to fix cabinet.
8. Custom mounting hardware.
9. Power handling: 300 Watts

Acceptable Products:

EAW MK8196T or equal speaker assembly.

- K. Type 5 Loudspeaker Assembly: Assembly includes weather resistant 2 way speaker with asymmetrical coverage.

10. 1. Sensitivity shall be at least 95 dB Peak (1Watt/1Meter)
11. 2. Frequency Response: 100 to 15 kHz
12. 3. Transformer shall have 70 Volt primary and multiple taps.
13. 4. Speaker pattern shall be 70 – 120 degrees horizontal by 75 degrees vertical.
14. 5. System shall have 2 – 8" low frequency drivers.
15. 6. System shall have 1 – 1" titanium driver for High frequencies.
16. 7. Cabinet shall be hand laminated fiberglass with gray gel coat and black powder coated grille.
17. 8. Custom mounting hardware.

18. 9. Power handling: 200 Watts

Acceptable Products:

Community WET2V8 or equal Type 6 speaker assembly.

- L. Type 6 Loudspeaker Assembly: Flush mount acoustical ceiling speaker assembly shall include flush mount Backcan, 8" speaker with baffle and support hardware.

19. 1. Sensitivity shall be at least 95 dB (1Watt/1Meter)
20. 2. Frequency Response: 100 to 16 kHz
21. 3. Transformer shall have 70 Volt primary and multiple taps.
22. 4. Speaker pattern shall be 90 degrees conical.
23. 5. System shall have 10 ounce magnet dual cone speaker.
24. 6. Backcan shall be a flush mount enclosure with ½' and ¾' knockouts.
25. 7. Power handling: 15 Watts

Acceptable Products:

Atlas SD72W or equal speaker baffle assembly

Atlas EZ 96-8 or equal backcan/supports

- H. M. Type 7 Loudspeaker Assembly: Assembly includes surface mount re-entrant horn.

1. Sensitivity shall be at least 105 dB (300-3000Hz. Band limited)
2. Frequency Response: 280 to 8 kHz
3. Transformer shall have 70 Volt primary and multiple taps.
4. Speaker pattern shall be 100 degrees by 60 degrees.
5. System shall have a compression driver.
6. Enclosure shall be a weather resistant surface mount horn assembly with weatherproof cable.

7. Power handling: 60 Watts

Acceptable Products:

Electrovoice Cobraflex III horn with 1829BT Convertible Driver or equal.

- I. N. Type 8 Loudspeaker Assembly: Flush mount speaker assembly for gypsum ceiling shall include a 12" coaxial speaker with backcan, baffle and support hardware

1. Sensitivity shall be at least 99 dB (1Watt/1Meter)
2. Frequency Response: 58 to 15 kHz
3. Transformer shall have 70 Volt primary and multiple taps.
4. Speaker pattern shall be 90 degrees conical.
5. System shall have 12" low frequency driver.
6. System shall have 1 – 1" titanium compression driver for High frequencies.
7. Backcan shall be a flush mount square enclosure with ½' and ¾' knockouts with 4 cubic feet of volume minimum.
8. Power handling: 250 Watts

Acceptable Products:

Atlas 12CXT60 or equal speaker

Atlas Q4712 or equal backcan

Atlas 164-12A or equal baffle

- J. O. Type 9 Loudspeaker Assembly: Assembly includes weather resistant surface mount speaker system for working side of aircraft general paging coverage.

1. Sensitivity shall be at least 98 dB (100-16,000Hz.)
2. Frequency Response: 90 to 16 kHz ± 5dB.
3. Transformer shall have 70 Volt primary and multiple taps.
4. Speaker pattern shall be 90 degrees horizontal by 40 degrees vertical.
5. System shall have 12" low frequency driver.
6. System shall have 1 – Kaladex driver for High frequencies.

7. Enclosure shall be finished in roto-molded gray polyethylene supplied with heavy duty bracket.
8. Power handling: 60 Watts

Acceptable Products:

Community R.5-94T or equal speaker assembly

K. P. System Wiring

1. Unless otherwise required, Contractor shall use the following cables, or approved equals:
2. Microphone and line-level audio cable in conduit or cable tray:
  - a. Nominal Capacitance of 35 pF/ft
  - b. Nominal Outside dimension of 0.118 inch
  - c. 100% shield with Z- Fold shielding

Acceptable Products:

Belden 82761 or equal audio cable

3. Microphone and line-level audio cable for internal cabinet wiring:
  - a. Nominal capacitance of 24 pF/ft
  - b. Nominal outside dimension of 0.175 inch.
  - c. 100% shield with Z-Fold

Acceptable Products:

Belden 8761 or equal audio cable.

4. Loudspeaker signal lines shall be sized to allow no greater than 5 percent loss from source to first speaker. Lines shall be twisted pair, Plenum jacketed with no shield.
  - a. Minimum conductor strand count: 19



- b. UM type CMR or CL3R

Acceptable Products:

Belden 6000UE series or equal.

L. Q. Audio Termination System

1. Provide wall mount termination located in terminal cabinet to connect incoming field microphone station lines.
2. Termination system shall provide:
  - a. Compression terminal blocks certified for stranded and solid wire.
  - b. Rigid mount terminals which can be replaced if damaged
  - c. Designation strips for contractor to provide label information on.
3. Provide as many units as necessary.

Acceptable Products:

Electrovert KI1620PA or equal.

R. Speaker Terminal Strips

1. Provide speaker terminal strips to terminate incoming speaker field circuits to amplification equipment in terminal cabinets.
2. Provide track system with end stops and terminal blocks with screws for terminations.

Acceptable Products:

MP Flexi-Block System or equal.

END OF SECTION 16740

## SECTION 16782 - CLOSED-CIRCUIT TELEVISION (CCTV) SYSTEM

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. The existing Closed Circuit Television System is manufactured by Philips Communication; therefore, Matrix Switches, digital recorders, camera, and power supplied shall be exclusively by Philips Communication only. All other products required for system integration shall be submitted and approved by MAA with input from ADT. There will be "No Exceptions Allowed."

#### 2.2 GENERAL

- A. Provide CCTV systems, of types, sizes, capacities and electrical characteristics indicated below, consisting of CCTV cameras, LCD monitors, video matrix switcher, keyboard controllers, signal equipment, camera enclosures, power supplies, and other components as required for complete installation. Except as otherwise indicated, provide manufacturer's standard CCTV system components as indicated by published product information, designed and constructed as recommended by manufacturer.

#### 2.3 SATELLITE MATRIX SWITCHER

- A. The Matrix System shall integrate the specified CCD cameras and peripheral products into a comprehensive extension of the existing MAA CCTV system. A built-in cable compensation circuit on every input channel shall provide high quality picture and control. The system's extensive program capability shall include versatile camera sequences, alarm mode, time/date event scheduling, password protection, operator's access level, priority and system partitioning, providing outstanding flexibility.
- B. A keyboard controller shall be used for setup, camera control and video routing. The keyboard controller unit's 2-line character LCD display and function keys shall provide direct menu access to cameras.
- C. The system shall have 80 inputs and 4 outputs as base configuration; by adding 16-channel video input modules, and/or 4-channel video output modules the system can be expanded to accommodate up to 256 cameras, 64 monitors and 32 keyboard controllers.
- D. The system shall have the ability to integrate external devices such as computers, printers and alarm input devices. The built-in RS-232C port shall permit up and downloading of the system data for back-up and restore purposes with a PC. The system can be controlled and programmed through the RS-232C port, if a printer is connected,

the system set-up data can be printed and verified. The built-in diagnostic program shall help to identify a malfunction speedily for system maintenance and repair. The power source shall be 120VAC, 60Hz. The system shall be UL listed.

- E. The system shall have a data connection via a fiber optic multiplexer specified elsewhere within this specification for communications with the existing matrix switcher. The Contractor shall be responsible for all required new and existing system programming for a functionally complete and operational system.

Acceptable Products:

Philips Model LTC 8800 System Matrix Switcher.

The Matrix shall be manufactured by Philips Model LTC 8800 System, no substitutions.

The following parts, in quantities as required, shall be included in Matrix Switcher:

Philips LTC 8801/60 CCTV switching bay, CPU and power supply.

Philips LTC 8821/00 Video input module, 16-video inputs per card.

Philips LTC 8834/00 Video output module, 4-video outputs per card.

Philips KBD Universal Universal Digital Keyboard Controller.

## 2.4 DIGITAL VIDEO RECORDER

- A. General: The digital video recorder (DVR) shall have the following general specifications:
  - 1. Video Inputs - 16
  - 2. Software - Windows 2000
- B. The DVR shall provide full screen or selectable multi-screen displays of 2x2 (quad), 3x3, and 4x4 formats.
- C. The recorder shall be capable of sequencing the 16 camera inputs as four quad displays.
- D. The date/time, recorder name, and camera name shall be stored with each image recorded.
- E. The recorder shall provide 16 video inputs with independently configurable frame rate settings (ips).
- F. The recorder shall provide 16 video inputs with independently configurable frame rate settings (ips). Each recorder input for this project shall be configured for 3.75 ips. Recorded digital video shall be stored for a period of 30 days for all inputs.
- G. The digital recorder shall be capable of recording at the following images per second (ips) rates:

1. Up to 120 ips (1 to 4 cameras) or up to 80 ips (5 to 16 cameras) with one compression card installed.
  2. Up to 240 ips (1 to 8 cameras) or up to 160 ips (9 to 16 cameras) with two compression cards installed.
- H. The recorder shall use temporal compression based on proprietary MJPEG and H.263 technology.
- I. Image integrity shall be maintained using proprietary codec, time/date stamp, watermark authentication.
- J. The recorder shall be capable of providing simultaneous recording and playback.
- K. The recorder shall provide five independently configurable motion detection zones per camera.
- L. The recorder shall provide a function to bookmark a specific time and date of a video file for easy retrieval at a later date.
- M. The recorder shall provide pre and post alarm recording.
- N. The recorder shall provide both local and remote pan/tilt/zoom control.
- O. The system shall provide the following minimum TV Lines of Resolution (TVL) as related to the digital memory resolution:
1. 450TVL at 640H x 480V; 280TVL at 320H x 240V; 120TVL at 160H x 120V
- P. The recorder shall include the following:
1. CDRW unit.
  2. SCSI-2 interface connection to allow video archiving to a disk array.
  3. 3.5 Floppy drive.
  4. Inputs for sixteen (16) programmable, N/O, N/C dry alarm contacts.
  5. Sixteen (16) programmable output relays.
  6. 480 Gigabyte hard drive for storage of digital video.
- Q. The recorder shall provide the capability to load a bitmap image of a facility, then drag and drop camera and alarm icons to create an overview of the installation thereby allowing an operator to click on the camera icons to view video from the selected camera.

- R. The recorder shall be capable of recording single channel audio.
- S. The recorder shall include remote viewer Graphical User Interface (GUI) software to allow simultaneous access via Ethernet to live and recorded video. This software shall also provide system configuration and pan/tilt control supporting up to sixteen (16) recorders. The Contractor shall configure this software and program the GUI for connection to an Ethernet system provided by others. Contractor work shall include physical connection of the recorders to the Ethernet switch and configuration of the software on a computer workstation provided by others.
- T. The recorder shall have remote administrator configuration capability.
- U. The recorder shall provide a POS database interface that allows search parameters for time, date, camera, merchandise, and cash amount of sale.

V. Electrical Specifications:

- 1. Video Input: 1Vp-p, composite video, 75 ohms.
- 2. Video Output: 1Vp-p, composite video 75 ohms.
- 3. Power supply: Switch selectable between 110 VAC, 60Hz and 220 VAC, 50Hz. 4. Audio: 1-channel (line in or mic. in, line out).
- 4. Connectors:
  - a. Video input: 16 BNC, non-looping
  - b. Video output: RCA (BNC converter supplied.
  - c. SCSI-2 HD-50 interface to disk array
  - d. RJ-45 10/100 Mb base-T Ethernet connection.
  - e. Audio: 1/8-inch mini phone jack.

Acceptable Product:

Philips Model DR16248 Digital Video Recorder.

## 2.5 QUAD VIDEO PROCESSOR

- A. The quad video processor shall permit viewing of 4 cameras on a single LCD display.
- B. The unit shall offer full time quad display and full screen display of video images.
- C. The unit shall have 720 x 484 pixel resolution and 525 lines resolution.
- D. The rear panel shall feature 4 loop through Auto Terminated BNC video inputs, 4 alarm

input connections, one BNC monitor output, one BNC record output, and a RS-232 remote callup 15-pin D input.

- E. The unit shall be rack-mountable. The power source shall be 120VAC, 60Hz, and shall be UL listed.

Acceptable Product:

Philips Model LTC 22377/60, Quad Video Processor.

## 2.6 CLOSED-CIRCUIT TELEVISION CAMERAS

- A. General: Provide CCTV color cameras, associated accessories and wiring for MAA surveillance. Cameras shall be connected to the existing MAA matrix switcher via fiber optic multiplexers installed under this project.
- B. Fixed Color Cameras: Provide 1/3 inch format cameras using solid state, interline transfer, charge coupled device (CCD) image sensors. Cameras shall produce standard EIA video signals with composite output level of 1.0 v p-p and 75 ohms impedance. Output connectors shall be BNC types. All cameras shall feature no geometric distortion, immunity to electrical and magnetic fields. All cameras shall be provided as standard resolution for color as specified herein and indicated on plans.

1. Standard resolution for color cameras shall have the following features.

- a. The minimum scene illumination to obtain "usable video " shall be 2 lux at F 1.4 (0.2 foot-candle) based on scene illumination, 75 % reflectance factor, automatic gain control (AGC).
- b. Signal to noise ratio shall be 50 dB, minimum with AGC off.
- c. The camera shall incorporate back light compensation (BLC), aperture correction and auto tracing white balance (ATW).
- d. The camera shall conform with UL 544 and 1409 and radiation standards of FCC class B. Input power shall be 24 volt AC, 60 Hz.
- e. The camera shall accept C and CS mount lenses and shall be capable of functioning over a temperature range of -20° – 32° F. External dimensions of camera shall not exceed 2.65 inches wide x 2.56 inches x 4.81 inches length and weight shall not exceed 2 pounds. The housing shall be weatherproof metal case with top heater, blower and bottom mounting provision.

Acceptable Product:

Philips Model LTC 0450/21, Cameras.

C. Integrated high-speed dome color pan/tilt/zoom camera: Cameras shall be provided complete with all back boxes, mounting adapters, and hardware required to install camera in location shown on the Contract Drawings.

1. Integrated dome pan/tilt/zoom camera shall be suitable for in-ceiling mount, pendant mount, or wall mount as required for the camera location and meet the following specifications:

- a. 99 Presets
- b. 0.5° preset accuracy
- c. Proportional Pan and Tilt
- d. Privacy Masking
- e. Guard Tour
- f. Image sensor:
  - 1) Sensor shall incorporate integral infrared cutoff filter.
  - 2) Image sensor shall be a color 1/4-inch interline transfer CCD.
  - 3) Sensor shall be free of blemishes as defined by EIA-330, and shall not have dead pixels.
  - 4) Sensor shall have at least 768 horizontal pixels and 494 vertical pixels.

2. Resolution: Camera shall have at least 470 lines of horizontal resolution. Resolution shall not vary over the life of the camera.

3. Signal-to-noise ratio: At least 50 dB unweighted with no gain.

4. Sensitivity:

- a. Slow shutter off: 0.025 fc/0.25 lux.
- b. Slow shutter on: 0.0016 fc/0.016 lux.

5. Automatic Circuits: The camera shall have:

- a. Automatic white clip.
- b. Automatic white balance.
- c. Automatic gain control.

- d. Electronic light control (electronic shutter speed).
  - e. Auto-iris drive.
6. Lens:
- a. Lens shall be equipped with an auto-iris mechanism.
  - b. Lens shall be an 18 times optical (4.1mm - 73.8mm) and 12 times digital zoom with an aperture range of f/1.4 to f/3.0.
7. Dome pan/tilt drive:
- a. Shall be supplied as part of the integrated assembly.
  - b. Dome shall have continuous 360° pan capability.
  - c. Pan speed rate shall be variable from 0.1-120° per second (manual operation).
  - d. Shall have variable-rate, proportional pan and tilt speed that shall decrease the pan and tilt speed in proportion to the zoom focal length.
  - e. Presets position speed rate shall be 360° per second, +/- 0.50° accuracy.
  - f. Dome bubble shall be smoked gray color or clear as approved by the Engineer.
  - g. Dome drive shall have auto flip functionality and have quick disconnect for mechanical and electrical connections.
  - h. Domes for outdoor use shall be rated as follows:
    - 1) NEMA 4X.
    - 2) Humidity: 0% to 90% relative, non-condensing.
    - 3) Operating Temperature Range: -40°F to +122°F
8. Mount shall be furnished complete with all interface cards, receiver/drivers, translator cards, cables and appurtenances so they are fully functional and compatible with the existing switcher and pan/tilt control system.
9. Contractor shall consult with the Engineer on color of pendants and exposed hardware and submit samples to the Engineer for approval.

Acceptable Product:



**Philips G3 Autodome Bu ENV Euvito Dome Series.**

- D. Vari-focal lenses:** Provide 1/3-inch format auto iris vari-focal lens with the following operational features.
1. Focal length: 2.8 -6 mm, 3.5 - 8 mm, and 5 - 50 mm. As required for each specific camera location.
  2. Iris Range - F1.2 - close
  3. Focus Range: 1 foot to infinity
  4. Weight: .18 lbs
  5. Lens mount: CS
  6. Angle of view: Wide 88.7° x 69.2°  
Tele 44.2° x 34.0°
  7. Iris Type: Automatic  
Acceptable Product:  
Philips Models LTC-3364/20, LTC-3364/31, and LTC-3374/20 lenses, no substitutions.
- E. Indoor Housing for Fixed Camera:** Provide indoor housing for fixed or suspended ceilings with following features.
1. Maximum camera/ lens size: 8" L x 4" W x 4" H.
  2. Dome: .13-inch thick polycarbonate.
  3. Mounting: suspended ceiling mount.  
Acceptable Product:  
Philips Model LTC 9370/00, Camera.
- F. Camera Power Supply:** Provide 120/24 VAC, 60 HZ camera power supply with the following characteristics:
1. Camera outputs: 4, 8, and 16.
  2. Voltage input: 120 VAC, 60 Hz.
  3. Voltage outputs: 24 VAC.
  4. Current Output: Maximum current available for each terminal pair is 1.85 AC.
  5. Controls and indicators Power LED and on/off switch inside cabinet.

6. Connectors: Screw terminals.
7. Construction/finish: Beige metal case.
8. Dimensions: approximately 11.25 " W x 3.5 " D x 11.25.  
Acceptable Product:  
Philips Model LTC 540X/60 Series, Power Supply where X equals the number of outputs as required per number of cameras fed."

## 2.7 9-INCH COLOR MONITOR

- A. The 9-inch color monitor shall be mounted in a 19-inch vertical cabinet located within the MDF Room A206.  
Acceptable Product:  
Philips Model LTC 2810/90, 9-inch color monitor.

## 2.8 42-INCH LDC MONITOR

- A. General:
  1. Video displays shall be provisioned with UL, CE or ETL labeling indicating compliance with recognized standards.
  2. Suitable manufacturers of LCD video screens include: Eternal Graphics, NEC, Philips, or approved equal.
- B. Display Characteristics:
  1. Minimum Active Area: 41.4" for 42-inch units.
  2. Aspect ratio: 16:9.6
  3. Resolution: WVGA (1280 x 768)
  4. Horizontal Viewing Angle: 170°
  5. Vertical Viewing Angle: 170°
  6. Brightness: 450 Cd/m<sup>2</sup>
  7. Color Range: 16.7 Million colors
  8. Contrast Ratio: 600:1

**C. Physical Parameters & Special Features:**

1. Unit Dimensions (WxHxD): 36.5"x23.2"x3.95"
2. Backlight Half-Life: 50,000 Hours
3. Power Consumption: 110-120VAC/50-60Hz, 240 Watt
4. Unit Weight: 53 lbs.
5. Ambient Temperature/Humidity: warranted operational range +32°F to +95°F and 20 to 80% relative humidity (non-condensing)

**D. Signal & Control Features for Video Displays**

1. RS-232 Video Display Remote Control
2. Infra-Red Remote Control
3. Video Signal Input:
  - a) Data: VGA (640x480), WXGA (1280x768), DVI-I
  - b) Video: Composite Video (NTSC, PAL, SECAM), S-Video (NTSC, PAL)

**2.9 DIGITAL FIBER OPTIC VIDEO MULTIPLEXER AND DATA TRANSCEIVER**

- A. Provide digital fiber optic video/data multiplexers as required. Multiplexer shall allow transmission of 4 channels of high resolution, real-time color video, as well as bi-directional data simultaneously on one optical fiber. The unit shall employ 8-bit digital encoding for transmission of these signals. The multiplexer shall consist of a video transmitter/data transceiver, and a video receiver/data transceiver. The multiplexer shall allow bi-directional transmission of Manchester Encoding, Bi-Phase, RS-232, RS-422 or RS-485 (2 or 4 wire) data protocols. No in-field electrical or optical adjustments or in-line attenuators shall be required. All units shall be available in both rack mount and surface mount versions. The units shall have solid-state limiters on all power lines, which shall provide for automatic reset. All rack mount units shall have an internal DC power supply. A short circuit in one unit shall not affect operation of other units powered from the common power supply. The rack mount units shall be hot swappable with no risk of damage to other units or rack during replacement. The unit shall be UL listed. Operating temperature shall be -40°C to +74°C for all units.

**Acceptable Products:**

IFS model VT7420DRDT-R3. The video transmitter/data transceiver rack mount rack mount.

IFS model VR7420DRDT-R3. The video receiver/data transceiver rack mount.

- B. 19" Rack Mount Panel – Provide IFS R3 card cages, no substitutions with the following characteristics:

1. Input Voltage: 115 VAC (line cord)
2. Power supply (to plug-ins): 20 VAC @ 2.8A
3. # Slots/Spacing: 14 slots available, with internal power supply.
4. Size (In.) (W x H x D): 19.0 x 5.2 x 7
5. Fusing: 1A slow blow (Rack Power supply) (Plug-in modules individually fused)

## 2.10 ETHERNET SWITCH

- A. The Contractor shall provide Ethernet switches to support the transmission of digital video between the remote DVRs and the existing DVR workstation as specified herein and detailed on the contract drawings. This includes provision of the proper quantities of media ports. The Ethernet switches shall be intelligent, layer 2 and SNMP manageable. Provide all intra-rack cabling, connectors and transceivers required for operating the system.
- B. Ethernet switches shall be compatible with the existing MAA/BWI CISCO network: Rack mount 24 port 100BaseTX switch, with redundant Power supply unit and fiber optic GBIC uplinks.
- C. Coordinate with MAA IT/Network representative for, IP address, network management and redundancy scheme.

### Acceptable Product:

Cisco 2950G-EI Ethernet Switch.

## 2.11 19-INCH EQUIPMENT CABINET

- A. Provide 19-inch equipment cabinets as specified in Section 16741 - Premise Wiring and Distribution Systems.

## 2.12 SIGNAL TRANSMISSION COMPONENTS

- A. CCTV camera cable: Cellular-polyethylene dielectric, bare copper double braided shield with 95 percent minimum shielding factor, No. 18 AWG stranded copper conductor and PVC jacket, RG-6U.
- B. CCTV coaxial cable Connectors: Type BNC, 75 ohms.
- C. CCTV coaxial cable splitter: Type BNC, 75 ohms.

**D. CCTV camera covert operations outlets: Recessed, Type BNC, 75 ohms.**

**Fiber Optic Patch Cords: Provide all required fiber optic patch cords. Patch cords shall be as specified in Section 16741.**

**END OF SECTION 16782**

## **ITEM L-109 MODIFICATIONS AND ADDITIONS TO AIRFIELD LIGHTING CONTROL SYSTEM**

### **EQUIPMENT AND MATERIALS**

**109-2.1 COMPUTERIZED AIRFIELD LIGHTING CONTROL SYSTEM (CALCS) MODIFICATIONS, ADJUSTMENTS, AND CALIBRATION.** Modify the existing computerized airfield lighting control system (CALCS) so that the display reflects new Lighting Circuits. Add new components to control and monitor new regulators and adjust the existing (CALCS) equipment as required including additional wiring and conduits. Provide all necessary wire and conduit to accommodate new components necessary to provide a working system. The Contractor shall sub-contract Siemens Airfield Solutions (SAS) to modify the existing computer system software and screen graphics to reflect the changes required by this contract. All screen graphic and software changes shall be submitted to the Engineer for approval prior to installation. Work under this contract shall not void any existing warranties on the existing system. After all lights are installed and all other electrical modifications have been made, recalibrate all lighting circuits which have had load changes. This will require field work to verify that lighting fixtures are properly operating (or recording outages). It is the Contractor's responsibility to restore the computerized lighting control system at the Air Traffic Control Tower, Electrical Vault or Portable Personal Computers, and any other existing airfield monitoring locations to full calibration and operation reflecting all changes at the end of the project.

Materials for changes to the CALCS shall be in all ways matched to and compatible with the existing system component parts.

All new components shall be compatible with the existing SAS CALCS system installed in 2000. Contact SAS at 860-408-9546 for system details.

#### **a. TESTING AND COMMISSIONING**

1. The Contractor in cooperation with SAS shall prepare and submit a proposed testing and commissioning procedure for the CALCS. Prepare these documents listing the testing and commissioning procedures and expected test results. As a minimum, tests shall include:

- (a) Point-to-point wiring continuity tests.
- (b) Insulation and grounding tests.
- (c) Fiber-optic network communications tests. Include in Pay Item Section 16134.
- (d) Verification of all remote control functions for each controllable element.
- (e) Touch-screen monitor operations, screen display sections, command select acknowledgement, and action confirmed representations, alarm indications.

(f) AEMS computer tests.

b. **WARRANTY.** Provide a written guarantee that the CALCS equipment and components supplied and installed are guaranteed against defects and malfunction for a period of 12 months from date of completion of commissioning.

## **109-2.2 INDIVIDUAL LAMP CONTROL AND MONITORING SYSTEM**

### **a. Addressable Device**

The lighting series circuits shall be used as the transmission backbone or infrastructure of a communication command and information network. Addressable devices shall provide the interfacing between the controlled and monitored elements (lamps, signs, etc.) and the rest of the system. To allow communication to a controllable element in the field, via the lighting series circuit, the only required airfield hardware installation is to plug an addressable device into the secondary circuit of the relevant FAA L-830 isolation transformer. The addressable device shall be enclosed in a permanently sealed watertight epoxy case and suitable for installation in L-867 or L-868 size B light base. No additional wires shall be required between the field elements and the electrical vault. No bypasses or filters shall be required in the field.

The addressable device shall be designed to control and monitor individual airfield elevated or in-pavement lighting fixtures and to receive signals from sensors and detectors. The addressable device shall be able to function properly on circuits powered by various CCR styles and different manufacturers. The device shall be capable of functioning properly on constant current series circuits having various wave shapes, load variations and high noise levels.

The addressable device shall be a microprocessor-based unit and consist of:

1. **Master.** The Master shall be able to communicate with remote units via series circuit and shall have an interface with the existing CALCS. The Master shall have lightning protection equal to that on the output of the CCR. Input power for Master shall be 120 VAC, 60 HZ.

2. **Remote.** The remote shall provide the following data:

(a) ON/OFF switching and flashing of elements (lights, signs, stop-bar, segments of lights, runway guard light, etc.).

(b) Collection of signals from airplane position sensors and their transmission via the lighting series circuit.

(c) Detection of burnt out lamps.

(d) Short-circuiting of isolation transformer in case of lamp failure.

- (e) Watchdog timer to provide a fail-safe mode.

### **109-3 COMPUTERIZED AIRFIELD LIGHTING CONTROL EQUIPMENT - GENERAL**

#### **a. Control and Monitoring Equipment**

1. The control and monitoring equipment shall be of a distributed nature and shall not be a PLC based. The IU (Interface Unit) units shall be installed locally at each Constant Current Regulator (CCR), which requires control and/or monitoring within the airfield lighting electrical vault(s).
2. Each new CCR shall be connected to an IU.
3. The IU shall be a microprocessor based module that includes all of the communication, control commands, input/output interface and failsafe functionality.
4. The IU shall be connected to both existing networks associated with the Redundant Communications Network (RCN) via quick disconnects.
5. The IU can communicate back to the Vault computer via either of the networks.
6. Removal of any IU unit(s) from the vault network shall not affect the operations of the CALCS system.
7. The IU shall be a universal device that can be used on any type of CCR from any manufacturer.
8. Each IU shall be identical and have interchangeable components.
9. The IU unit shall be optically isolated from the airfield series circuit via a quick disconnect.

#### **b. Existing Redundant Vault Control and Monitoring Network**

1. A Redundant Communication Network (RCN) using two (2) existing independent communication networks in the electrical vault(s).
2. The existing RCN has two (2) cables each consisting of two (2), 24AWG, shielded twisted pairs with a common (drain wire) meeting EIA RS-422 applications (Belden™ No. 9842 or equivalent).
3. The network shall be used to control and monitor all the CCR(s).
4. Each CCR shall be interfaced to an IU.
5. Any malfunction in one network shall not affect the operation of the system.



6. Any malfunction in one of the IU communication ports, transfers communication to the remaining port without affecting system functions.

**c. Overview of Operation**

1. Each IU unit shall have a unique factory set address and a field programmable communication address.
2. The IU receives commands via the existing RCN, executes those commands, and transfers back the status of the element to the existing vault computer.
3. The IU shall perform the following functions:
  - (a) Brightness setting control of the CCR(s) or ON/OFF control as required by the controlled element.
  - (b) CCR output voltage and current monitoring.
  - (c) CCR status monitoring (i.e., remote/local, loss of input power).
  - (d) Monitor all requirements per FAA L-827 monitoring requirements (See Monitoring section).
  - (e) Perform all failsafe functions.
  - (f) Communication via both networks to the vault computer.
  - (g) Self-diagnostic function to monitor for proper operation.
  - (h) Locally store all data and parameters specific to the controlled CCR.

**d. Subcomponents: Each IU unit shall consist of the following six components:**

1. **Input/Output Module**
  - (a) Interface for all control and monitoring connections.
  - (b) Distribution bus for interfacing internal boards.
  - (c) Easy access, quick disconnect terminal blocks.
2. **Processor Module**
  - (a) Interface for redundant communication network.
  - (b) Easy access, quick disconnect terminal block connections for RCN.

- (c) Receives and transmits data to the vault computer.
- (d) Interface for insulation resistance monitoring.
- (e) Quick disconnect connection for interface to the Insulation Resistance Monitoring Module.

### **3. Monitoring Module**

- (a) Interface for current and voltage monitoring.
- (b) Quick disconnect connections for interface to the Voltage and Current Sensor Module.
- (c) Receives current and voltage samples from the Voltage and Current Sensor Module.
- (d) Can interface with up to one (1) circuit.

### **4. Display Module**

(a) The following LED's shall be installed as a minimum on the IU's and provide the following information:

- (1) Running status: LED indicator display of IU status.
- (2) Brightness Step: LED display indicating the commanded step of the CCR.
- (3) Remote/Local: LED display indicating the status of the remote local switch of the CCR.
- (4) Primary Power: LED display indicating the status of the input power to the CCR.
  - (a) Over Current Shutdown: LED display indicating over current shutdown of the CCR.
  - (b) Open Circuit Shutdown: LED display indicating open circuit shutdown of the CCR.
  - (c) Channel A: LED display indicating the status of existing channel A of the existing redundant communication network.
  - (d) Channel B: LED display indicating the status of existing channel B of the existing redundant communication network.

**(5) Current and Voltage Module (CVM)**

- (a)** Collects current and voltage samples.
- (b)** Transmits current and voltage samples to the Monitoring Board.
- (c)** Interfaces to the output of the CCR.
- (d)** Shall be isolated from the series circuit via a quick disconnect interface.
- (e)** Quick disconnect connections for interface to the Monitoring Board.

**(6) Insulation Resistance Monitoring Module (IRMM)**

- (a)** Collects insulation resistance samples.
- (b)** Transmits insulation resistance samples to the Processor Board.
- (c)** Interfaces to the output of the CCR.
- (d)** Shall be isolated from the series circuit via a quick disconnect interface.
- (e)** Quick disconnect connection for interface to the Processor Board.

**e. Control and Feedback Interface**

**1. The IU unit shall have the following interface points available:**

- (a) Control:** Five mechanical latching output points (expandable to 16). These control points shall also be self-monitored and provide back-indication to the Vault computer verifying proper execution of control command.
- (b) Feedback:** Two digital-isolated input points (expandable to 6).
- (c) Current/Voltage Monitoring:** One digital interface (expandable to 3).
- (d) Insulation Resistance Monitoring:** Two digital interface.

**f. Monitoring**

- (1) The IU unit shall provide full FAA L-827 monitoring per FAA AC 150/5345-10 (current edition).
- (2) The IU shall include the monitoring board and provide the following information for each CCR:
  - (a) Loss of input power to the CCR.
  - (b) CCR shutdown by open-circuit/over-current protective devices.
  - (c) Drop of more than 10 percent in the CCR VA load.
  - (d) Failure of the CCR to deliver the selected output current.
  - (e) The number of burnt-out lamps in each series circuit.
  - (f) Remote/local status of the CCR.
  - (g) Actual CCR output current.
  - (h) Actual CCR output voltage.
  - (i) Actual CCR output load (wattage).
- (3) The Monitor and Control Equipment (MCE) will also monitor the control relays that are interfaced to the control equipment.
  - (a) Each relay output is fed to a discrete digital input on the IU device.
  - (b) Each digital input is monitored for proper execution by the IU device.
  - (c) This type of contact monitoring provides positive back indication that the correct control commands have been executed by the IU device.
5. The system shall include software for calibrating the following measurements:
  - (a) The number of burnt-out lamps in the series circuit.
  - (b) Actual CCR output current.
  - (c) Actual CCR output voltage.
  - (d) Actual CCR output load (wattage).

**g. Programming**

1. Each IU unit shall have a unique factory set address and specific parameters, which are field-programmable. Downloading of the IU's parameters shall be done from the existing electrical vault computer.

2. The control system shall continuously scan all the IU units and detect any malfunctioning units as well as inconsistency between the commanded brightness step and the actual brightness step.

3. Each IU unit shall transmit internal diagnostic information to the control system and provide detailed information regarding its operating status. Any malfunction can easily be isolated to the exact location through the use of troubleshooting and diagnostic screens available at the vault computer.

4. A computer when connected to the IU port, shall be able to perform the following functions:

- (a) Monitor the commands being received at the MCE unit.
- (b) Perform ON/OFF and brightness step switching of the CCR.
- (c) Monitor the communications status of the Redundant Communication network.
- (d) Read all the status information of the CCR (i.e., Remote/Local).
- (e) Read the current, voltage and wattage of the CCR.
- (f) Monitor all the information received at that location.
- (g) Perform/transmit any control operation that the MCE is capable of.
- (h) Configure and test the MCE at that location.

**h. Interface Device Reliability:** The MCE device shall have an actual minimum calculated Mean Time Between Failure (MTFB) of 150,000 hours.

**i. Communication**

1. Each IU unit shall support a data communication rate of up to 115.2 kbaud.

2. The communication protocol shall include adequate security to prevent unauthorized access to the network.

**j. Failsafe**

1. Each IU unit shall provide a self-contained failsafe feature that shall perform the following functions:

(a) Ensure default operation of the airport lighting, even if the entire airport lighting control system is not functioning.

(b) Display the commands sent by the existing computer to the CCR's and/or to the other controllable items.

(c) Self-monitor the IU outputs and verifies proper commands are executed.

(d) Adaptable to each CCR regardless of internal or external control voltage.

(e) Permits maintenance of portions of the control system, without changing the operational status of the lighting system.

2. The failsafe mode of each IU unit shall be defined per the requirements of the airport. The failsafe modes are as follows:

(a) **Active Failsafe Mode:** This mode shall be executed as follows:

(1) If the CCR was switched ON before the failure, it shall remain ON at the same brightness level.

(2) If the CCR was switched OFF before the failure, it shall switch ON to a pre-determined brightness level.

(b) **Passive Failsafe Mode:** This mode shall be executed as follows:

(1) If the CCR was switched ON before the failure, it shall remain ON at the same brightness level.

(2) If the CCR was switched OFF before the failure, it shall remain OFF.

**3. Technical Specifications**

(a) The failsafe system shall operate independently of the computer, providing failsafe interfacing to the CCR and/or other controllable elements.

(b) The failsafe system shall be based on electromechanical latching relays with the following characteristics:

(1) Maximum Switching Voltage: 240 VAC, 125 VDC.

(2) Nominal Switching Capacity: 8A/250 VAC, 5A/30 VDC.

- (3) Rated Current (Resistive): 5A.
- (4) Operational Life: Mechanical  $5 \times 10^7$ , Electrical  $10^5$ .
- (5) Protection: IP67 (protection against ingress of dust and water in harmful quantities).
- (6) Approval: UL and CSA.

#### **4. Mode of Operation**

- (a) The commands executed by the IU to switch the CCR and/or controllable element shall be momentary commands.
- (b) The control commands shall be mechanically latched upon execution.
- (c) Failure of the IU and/or loss of communication to the network shall not change the status of the airport lighting.
- (d) The active failsafe mode shall be triggered by the internal watchdog of the IU unit upon detection of a failure within the IU unit or with the control system. The watchdog shall activate the failsafe and switch any controllable items that are OFF to their predetermined state.
- (e) IU Unit shall be manufactured by ADBA Siemens Company.

### **109-2.4 INSULATION RESISTANCE MONITORING SYSTEM**

#### **a. General**

- 1. The insulation resistance monitoring system (IRMS) shall be an integral component of the IU unit.
- 2. The IRMS shall be capable of automatically or manually monitoring and reporting the insulation resistance value of the series circuit cabling (one IRMS per circuit).
- 3. The IRMS shall be capable of measuring the cable leakage current and display the actual insulation resistance.
- 4. The IRMS shall be capable of measuring from 20k Ohms up to 1000M Ohms.
- 5. The IRMS DC test voltage shall have an automatic range of 500 and 1000 volts with current limiting to 5 milliamperes.
- 6. The IRMS system shall be capable of taking resistance readings on circuits that are energized or de-energized. This will allow the system to be used as a troubleshooting tool for assisting in locating circuit faults.

7. The IRMS system shall provide database record keeping that allows for graphical trend analysis of the insulation resistance readings.

**b. Overview of Operation**

1. The IRMS shall operate while the circuit is energized or de-energized and allow for automatic or manual readings during either condition. This shall allow for a more flexible troubleshooting tool for maintenance personnel versus systems that only operate while the circuit is energized.

2. The IRMS shall have a self-calibration feature that performs checks on the hardware to verify proper operation prior to taking measurements.

3. The IRMS shall be flexible, user programmable and allow for all of the following variables to be programmed by the user at any computer location:

(a) Start Time 1: This represents the first time of the day in which the IRMS is to take the first automatic reading of the series circuit.

(b) Start Time 2: This represents the second time of the day in which the IRMS is to take the first automatic reading of the series circuit

(c) Period: This specifies how often the circuit is measured. The period selection shall be made from an options list that includes the following choices: 1 hour, 8 hours, daily, weekly (once a week), biweekly (every 2 weeks), Monthly (once a month) or any variation defined by the operator

(d) Charge Time: This is the amount of time, in seconds, that the IRMS shall charge the circuit before taking a reading. The charge time shall be a number from 15 to 900 seconds. Charge time adjustments allow for greater flexibility in the IRMS system and provide readings that are more accurate for those circuits that are older and/or are longer runs.

(e) Warning Limit: This is a limit value, in Ohms, at which point a resistance warning shall be generated. If a resistance reading is below this value, the warning shall be sent to the event database. When the value goes above this level, the warning shall be marked as cleared in the event database. This number can be any value between 20k Ohm and 1G Ohm.

(f) Alarm Limit: This is a limit value, in Ohms, at which point a resistance alarm shall be generated. If a resistance reading is below this value, the alarm shall be sent to the event database. When the value goes above this level, the alarm shall be marked as cleared in the event database. This number can be any value between 20k Ohm and 1G Ohm.

4. All user programmable variables shall be able to be changed at any specified computer within the CALCS system.



5. The IRMS data for all of the series circuits shall be viewable from any specified computer within the CALCS system.

6. All the IRMS data shall be viewable in real-time or historical at any specified computer location. The IRMS information shall be available at all times and shall not require any special transferring of data between the IRMS system and the control system since the IRMS shall be an integral component of the CALCS.

**END OF ITEM L-109**

**AIRPORT WIDE DESIGN STANDARD**

**DIVISION OF AIRPORT TECHNOLOGY**  
**DESIGN STANDARD**  
**&**  
**UNIFORM SPECIFICATIONS**

**VERSION 1.0**  
**JUNE 2007**



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Appendix A - Sample Drawings of MDF and IDF Rooms

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# ***INTRODUCTION***

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The purpose of this airport wide standard is to establish a Design Standard and Uniform Specifications for equipping the Maryland Aviation Administration (MAA), Division of Airport Technology's (OAT) communication facilities, providing data distribution pathways, and infrastructure, both within and between buildings (Outside Plant) at Baltimore/Washington International Thurgood Marshall Airport (BWI).

The Design Standard will provide the Architect/Engineer with the design parameters, details and features that the Division of Airport Technology will require to be incorporated into projects. This will provide consistency and compatibility between new and existing equipment/infrastructure.

The intent of the Uniform Specifications is to provide the Architect/Engineer with technical sections (Part 2 – Products) that can be inserted with minimal editing.

*Purpose:* To document and provide consistent and current guidance to all personnel performing design, construction, inspection, and field certifying design systems and assembly components.

*Objective:* Publish the criteria that are in place and which have been confirmed as the means by which all MAA representatives shall interpret the building code and standard references with respect to new construction and renovation at BWI.

*Policy:* The Maryland Aviation Administration as a branch of the Maryland Department of Transportation (MDOT) shall follow the criteria, as stated in the most recently adopted legislation in Annapolis, and contained in the Code of Maryland Regulations. All amendments to these regulations are as a result of Federal or International requirements sanctioned by the MDOT Director of Transportation, to provide a better quality of service to the customers utilizing Maryland Transportation Systems.

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*Application:* The standards and guidelines contained in this document are to be used in the design, construction, inspection, and certification of buildings and structures owned and operated by MAA, and tenant facilities in buildings owned and operated by MAA at BWI.

*Review of Standards:* This standard will be reviewed annually by a committee made up of representatives from the following MAA offices:

Operations, Public Safety & Security  
Airport Technology & Community Affairs  
Facilities Development & Construction Management  
Office of Planning & Environmental Services  
Office of Maintenance & Utilities  
Procurement

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## ***AMENDMENT RECORD***

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Amendments to this standard are issued by the MAA Office of Airport Technology upon approval.

<u>Amendment #</u>	<u>Date of Issue</u>	<u>Title/Remarks</u>
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## ***DESIGN CRITERIA***

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### **DESIGN REQUIREMENTS OF LOCAL AUTHORITY HAVING JURISDICTION**

#### ***General***

The Premise Wiring Distribution System (PWDS) shall be designed and installed in strict conformance with all applicable Federal, State and Local codes and laws. The following list of Codes is provided for reference only and is not all inclusive:

Maryland Building Performance Standards (MBPS)  
National Fire Protection Agency (NFPA) - National Electrical Code (NEC)  
Code of Maryland Regulations (COMAR) - Maryland Accessibility Code  
American with Disabilities Act and Accessibility Guidelines - (ADA/ADAAG)

While standards are not mandatory they do offer a significant benefit to and for the telecommunication facilities. They set a level of interoperability, uniform testing and installation requirements. The following list of Standards is provided for reference only and is not all inclusive:

American National Standards Institute/Telecommunication Industry  
Association/Electronic Industries Alliance (ANSI/TIA/EIA)  
Institute of Electrical and Electronic Engineers (IEEE)  
National Electrical Installation Standards (NEIS)  
National Electrical Safety Code (NESC)  
NFPA-13: Pre-Action Sprinkler System  
NFPA-2001: Clean Agent Fire Extinguishing System

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## ***Design Consultant Qualifications***

Company Experience: It is recommended that the Design Consultant for a particular project's communications system submit documentation demonstrating that the company has successfully designed minimum of (3) projects of similar size, complexity and scope within the last 3-years.

Staff Experience: It is recommended that detailed information be provided regarding the certification, training and experience of all key members of the project team. It is further recommended that the project team include at least one Professional Engineer (PE) specializing in "Electrical" and that at least one Registered Communication Distribution Designer (RCDD) certified by BICSI.

## **PROJECT PLANNING CONSIDERATIONS**

All Information Technology related projects shall be initially coordinated with MAA OAT. The Architect/Engineer shall contact MAA OAT to arrange a meeting prior to the initial submittal of the project (i.e., prior to 30% submittal). The project coordination shall include all MAA projects, as well as all Tenant related projects. Depending on the magnitude of the project, "Break-Out Session" meetings may also be necessary. The Architect/Engineer shall also coordinate this with MAA OAT.

## **TEST AND ACCEPTANCE**

All facilities installed must be tested and or certified to comply with the standards and requirements included in this document and or as part of the final contract documents.

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## AS BUILT DRAWINGS

Comprehensive AS BUILT documentation must be provided for all facilities installed within the scope of this document AND prior to final acceptance and contract closure. As built drawings shall be presented in electronic format consistent with the nature of the installation, i.e. CAD for in-building facilities and rack face/equipment layout, civils format for OSP civils facilities, electronic schematics for cables etc. They shall be compatible with the record system being maintained by MAA at the time of installation.

### ***General Requirements:***

#### **Manhole/Conduit:**

Civil drawings shall detail routing and structure (tied to GPS points) and other significant elements such as other utilities, structures etc. Drawings of manholes shall be “butterflied” to provide detail of windows and conduit termination points. Racking detail and including intra manhole cable routing and splice closures locations shall be included. Provide digital photographs of the manhole interior. Provide digital photographs of exterior topographical surrounding of manhole. Photographs should be able to aid in locating manholes in the field.

Include details of building entrances.

#### **Outside Plant Cables:**

A detailed schematic shall be provided for all outside plant cables both copper and fiber. The schematic shall show cable type, size and count, splice/termination points, lengths and other details/call offs, as may be required. Include references to manholes, buildings, rooms etc. Provide digital photographs showing the cable routing, from window to window, within the manhole.

#### **MDF/IDF:**

Room layout indicating equipment locations, conduit entrance points, intra room cable/conduit runs, cable termination locations, power receptacle locations and all other structural items as may be required by MAA. All items are to be labeled. Power receptacles

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are to be labeled with circuit number and receptacle type. Bay faces of all racks, cabinets, protector fields, terminals etc shall be included regardless of the installation contractor or system; examples of a system that may be beyond the installation scope of this document, but required as a part of the as built, would be security CCTV system.

**IntraBuilding Cable Tray/Conduit:**

CAD drawings of the inside plant facilities shall include a layer detailing the routing, size, penetration points etc of all intrabuilding cable tray and conduit. The layer shall include size, penetration/pass through points, elevation points, pull boxes, sleeves etc. Where tray/conduit are installed in areas that are not easily assessable such as above hard ceiling, through tunnels or sterile areas, adequate detail shall be provided to allow for the accurate location for future use.

**IntraBuilding Cable :**

A detailed schematic shall be provided for all intrabuilding cables both copper and fiber. The schematic shall show cable type, size and count, splice/termination points, lengths and other details/call offs as may be required. Include references to manholes, buildings, rooms etc.

**UTP Horizontal Cable:**

CAD drawings based on architectural as built drawings shall indicate the location of each communications receptacle (face plate) and shall provide type and identification data. Serving IDF or MDF shall be shown or referenced on drawings. Room numbers and door numbers as well as other detail necessary to make the drawings accurate and complete shall be provided.

## **OUTSIDE PLANT SYSTEM (OPS)**

### ***Planning Considerations:***

The following factors shall be considered when designing an underground raceway system: (1) The overall length of the raceway from source to destination, (2) the length of raceway between pulling points, (3) the quantity of bends and offsets between pulling points, (4) the maximum pulling tension recommended by the cable manufacturer, (5)

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the minimum bend radius recommended by the cable manufacturer, (6) the minimum depth raceway shall be installed under runways, taxiways, apron areas, roadways, walkways, etc., (7) location and quantity of manholes, (8) size, weight and quantity of cable reels, (9) impact on airport operations during installation and future maintenance.

Cable pulling calculations shall be performed and submitted during design to show that cable pulling tensions and sidewall pressure recommendations are not exceeded and that the jamming ratio meets criteria for a jam free pull.

### ***Raceways:***

Fill, sizing and installation of raceways shall be in accordance with the National Electrical Code, current edition adopted by the MAA. Raceway between manholes shall not exceed 500-feet and shall not contain more than the equivalent of three 90-degree bends between pulling points. Communication raceways shall be permitted to share the same trench as power raceways provided they maintain a 12-inch minimum separation rated at 600-Volts and below, and a 72-inch minimum separation with raceways rated above 600-Volts. Coordinate raceway routing with other underground utility lines keeping the installation perpendicular and parallel to structures above/below grade. The Designer shall encase all raceways with 3-inches of concrete using separators, reinforcement rods and ties. Provide magnetic warning tape 12-inches above concrete envelope. Use only large radius fittings. Show installation details that denote trench depth, spacing of conduit supports, backfill and compaction requirements, size and orientation of ducts, concrete encasement details, over/under crossing requirements of underground utilities, etc.

### ***Manholes/Handholes:***

Show installation details that orient the manhole(s) to the site along with site preparation details. Site preparation details shall denote the excavation requirements to safely and properly install a manhole. Provide a detail showing the interface between the duct bank and the manhole and how to seal that interface. Size and detail the installation of manhole/handholes in accordance with the latest edition of the National Electrical Code and National Electrical Safety Code.

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NOTE: HANDHOLES SHALL BE USED ONLY FOR SPECIAL APPLICATIONS AND WITH PRIOR DESIGN APPROVAL OF MAA OAT.

**Other design considerations and requirements:**

The manhole type, shape and size shall be determined by evaluating duct bank size, duct bank entry orientation, cable installation and routing, racking and splicing requirements, personnel entry and exit,

Include racking and splicing detail for full duct entry capacity.

Include ring and cover marking detail and permanent manhole ID within manhole.

Include grounding and bonding detail.

All conduits installed shall be proofed by pulling a 5' flexible mandrel or cable section having a diameter no less than 90% of the diameter of the conduit between manholes and manholes and building entrances. Pulling tensions shall be monitored with a dynamiter and maximum tension recorded.

Grounding points shall be measured for resistance to ground, readings shall not exceed 5 ohms.

***Building Entrances:***

Provide details of building entrances coordinated with MDF/IDF plans. Entrance detail shall include conduct layout, racking and splicing detail, "TIP" cable routing, protection field and main distribution frame detail.

***Other Installation Methods:***

Other construction methods primarily directional bore may be used as conditions and cable requirements dictate.

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## ***Coordination Drawings:***

Do not provide diagrammatic routing of underground raceways. Provide site drawings complete with baseline and offsets to enable the Contractor to accurately install the raceways. In addition, the Designer shall require the contractor to provide for on-site testing to verify existing underground utilities locations, as well as, as-built drawings that denote accurate measurements for locating the underground duct bank.

## ***Communication Cabling:***

Following cables shall be considered for inclusion in the Backbone Outside Plant network:

Single Mode Fiber Optic Minimum fiber count 148 strands

Multi Mode Fiber Optic Minimum fiber count 72 strands

High Count Copper Twisted Pair Minimum pair count 1200

Other special systems cables as may be required.

Cables shall be sized to accommodate known requirements plus a minimum of 50 % growth. A "FILL BOX" matrices shall be developed for each cable segment showing proposed cable pair utilization.

### **Outside Plant Copper Cable:**

Splice Closures: Pressure tested per manufactures specifications. Enlew of manufacture specifications closures shall remain under 10 pounds of pressure for 48 hours.

Cable Shield: End-to-end continuity isolated from ground; no connection to ground shall be present.

Cable Pairs: Each cable pair shall be tested end-to-end through all splices and protection fields for the following conditions:

- Sequential count

- 
- Continuity
  - Shorts
  - Opens
  - Transpositions

**Outside Plant Fiber Optic Cables:**

Splice Closures: Pressure tested per manufactures specifications. Enlew of manufacture specifications closures shall remain under 10 pounds of pressure for 48 hours.

**Fibers Pre Installation:**

All fiber optic cables shall be pre-tested prior to start of placement, results will be compared to and must be consistent with manufactures factory tests results. The test shall consist of a non terminated OTDR tracing of each fiber on the reel.

**Fiber Post Installation:**

All fibers are to be tested for light guide position confirmation, end to end attenuation (loss) and structural integrity at bandwidths consistent with the grade and type of fiber.

Light Guide Position Confirmation/Attenuation: Test each fiber with a light source and power meter from near end to far end connector position as follows:

SM using Laser source at 1310 nm and 1550 nm

MM using LED source at 850 nm and 1300 nm

Record losses of each fiber. Total loss shall be within calculated loss budget.

Confirm that each fiber is terminated at the assigned position within each of the light guide units and that terminations are consistent with the color coding of the buffer tubes and fiber strands.

**Fiber Structural Integrity:**

Perform an OTDR trace on each fiber from near end connector to far end connector. Fiber shall be free of defects, micro bends and other defects. All loss points shall be within the specified loss parameters and total loss shall not exceed loss budget.



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### ***Splicing:***

Design intent should be to avoid splices. Where possible cables shall be pulled through manholes and properly racked. Where splices are required fiber optic cables shall be fusion spliced and copper twisted pair cables shall be spliced with high density filled splicing modules.

Splicing enclosures shall be re-enterable and filled with re-enterable flooding compound. All splice closures shall be pressure tested per manufactures recommendations.

Affix permanent labels to splice cases and to all cables within 24' of each window indicating cable size, type and count.

### ***Testing and Documentation:***

The Designer shall provide a comprehensive document that includes cable tests for multimode, single-mode and copper cabling and the desired test results. The document shall include manufacturer oversight and/or certification regarding use and setup of test instruments. The contractor will submit the test results for review and approval.

## **INTERIOR DISTRIBUTION FRAME ROOMS**

### **Definition:**

Main Distribution Frame Room (MDF) is defined as the primary serving/distribution point for communications services to a major facility or grouping of facilities.

Intermediate Distribution Frame Room (IDF) is defined as a local distribution point for communication services to a locally confined area.

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## ***Architectural:***

**Planning Considerations:** The following factors shall be considered when designing an area to be occupied by a Main Distribution Frame (MDF) or an Intermediate Distribution Frame (IDF) Room: (1) the room shall have a minimum dimension of 8' x 10', and a floor to ceiling clearance of 10-feet. The final size of the room will depend on the quantity of racks/cabinets and other equipment associated with systems such as public address and controlled access, (2) future growth shall also be factored into the final size of the room without the need for moving existing equipment, (3) the door shall be a metal hollow door fire-rated for 2-hours and sized at 36" wide for an IDF and double 36" wide for an MDF, (4) door hardware shall be standard MAA hardware with a magnetic lock and transfer hinge, (5) the walls shall be constructed of Concrete Masonry Unit (CMU) and a minimum of two walls shall be provided with 3/4" AC grade plywood, painted with 2 coats of light colored fire retardant intumescent paint, (6) no windows, (7) the flooring shall have electrostatic-safe vinyl tile and with a minimum floor loading capacity of 150 lbs/sq-ft, (8) exposed to structural ceiling, (9) locate the room to avoid any potential water damage sources from above (i.e., rest rooms), (10) space IDF's so that the furthest workstation cabling does not exceed 90-meters in total length.

## ***Mechanical Systems:***

**Planning Considerations:** The following factors shall be considered when designing an area to be occupied by IT systems: (1) HVAC equipment, (2) humidity control, (3) dust and contaminant control, (4) HVAC redundancy, and (5) type of fire protection.

**HVAC:** The system shall be designed to function properly for 24-hour operations all year. The system shall be designed to operate under positive pressure with respect to its surrounding. Ideally, the equipment shall be sized and dedicated for the room it serves and be located outside of the room. This will reduce the possibilities of condensate water entering the racks/equipment. However, any equipment located inside the room shall be provided with drip pans and condensate pumps to shield the equipment below from

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potential water damage. A fire damper shall also be provided to maintain the room's 2-hour fire rating.

Temperature shall be maintained from 72-degrees to 75-degrees F with a relative humidity from 30% to 55%. All temperature sensors and controls shall be located within the room the HVAC equipment serves and at no more than 5-feet above the finished floor. Heat rejection per rack/cabinet shall vary from 750 (BTU's) per hour to 5000 (BTU's) per hour.

For the Primary Communications Rooms/MDF, in addition to the requirements above, a dual/redundant HVAC system shall be provided.

**Fire Protection:** Consult with MAA OAT at concept design phase to determine required level of fire protection. Generally, a Pre-Action system shall be installed serving the room. The location of the Pre-Action Fire Alarm Control Panel shall be located in a nearby room, but not within the same room it serves.

Depending on what equipment is to be located inside the Communications Room, a Clean Agent type fire suppression system may be required in lieu of a Pre-Action system. A Clean Agent system will also require a separate room to house the system. The Communications Room served by the Clean Agent system will also be required to be fire-stopped and sealed per the system requirement. The Architect/Engineer shall coordinate with MAA OAT on the need for a Clean Agent system.

**Coordination Drawings:** The Designer shall show the location of all devices associated with the Pre-Action (or Clean Agent) system within the room coordinated with structural, architectural, mechanical and electrical systems, inclusive of piping, equipment, etc.

## ***ELECTRICAL SYSTEM:***

**Planning Considerations:** The following factors shall be considered when designing for a Communications Room: (1) location and quantity of equipment

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racks/cabinets, (2) location and space requirements for in-coming backbone raceways, and (3) location and space requirements for out-going horizontal raceways.

Restrict routing of conduit, pipes, ducts etc through MDF's and IDF's.

**Electromagnetic Interference:** There shall be no equipment located within the Communications Rooms that can produce harmful levels of electromagnetic interference.

**Normal Power:** Normal power (a minimum of one dedicated 20A/120V circuit) shall be provided to convenience receptacles serving the Communications Room. Receptacle shall be spaced at 6-foot on center along walls and at 18-inches above the finished floor. The receptacles shall be accessible at all times and not be blocked by racks, cabinets or other equipment.

**System Power Requirements:** All systems requiring AC power in MDF's and IDF's shall be provided with an uninterruptible power system (UPS). The UPS shall be sized to accommodate calculated load plus 200% with run time of 15 minutes. Minimum size of floor mount UPS units shall be 20 kVA, minimum size of rack mount units shall be 1400 VA. Floor units shall be equipped with a Battery Cabinet and Emergency Bypass Cabinet. Output panel board for UPS power distribution should be located in the communication room. The UPS shall be provided with a network interface card for Simple Network Management Protocol (SNMP) connection. The UPS shall also be provided with components for the Building Automation System (BAS) connection, compatible with the Johnson Controls' Metasys System.

**Auxiliary HVAC Power Receptacle:** All communication rooms shall be equipped with a 30A/208V normal power twist lock receptacle capable of supporting an emergency cooling unit.

**Electrical Panelboards:** In so far as practical, electrical panelboards shall not be located within Communications Rooms. Where necessary, panelboards shall be dedicated to loads within the Communications Room only and shall be located to minimize electromagnetic interference.

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**Transformers:** In so far as practical, transformers shall not be located within Communications Rooms. Where necessary, transformers shall be dedicated to loads within the Communications Room only and shall be located to minimize electromagnetic interference. Transformer shall have a Faraday Shield installed to further improve noise immunity and be K-rated to accommodate non-linear loads. As an alternative, the transformer can use harmonic canceling techniques to mitigate the affects of harmonics.

**Lighting:** Lighting shall be limited to the use of 4-foot industrial style with 20% uplight fluorescent, two lamp fixtures minimum (with wire guards) controlled via a light switch at each exit. There shall be at least one fixture connected to the emergency circuit to serve the area in case of power failure. The design luminance shall be 50-foot-candle measured at 3-foot above the finished floor, while taking into account equipment in the room. Suspend all light fixtures from a UL listed strut-type channel raceway. Raceways shall be suspended at least 9'-6" above finished floor and attached to structural steel above and coordinated with equipment racks and cabinets. Provide one light fixture inside the Communications Room to function as a 'Nite-Lite'.

**Grounding/Bonding:** Grounding and bonding shall be installed in accordance with the latest edition of the National Electrical Code, the latest edition of the IEEE Standard 142, "Green Book" Recommended Practice, and the latest edition of BICSI's Telecommunications Distribution Methods Manual. Where any conflict exists between the code and the standards, the code shall take precedence. A more stringent level of Grounding/Bonding may be necessitated by systems within the communication rooms, fully comply with these requirements.

**Access Control System:** All Communications Rooms shall have a Card Access Security System (CASS) entry system installed in accordance with MAA Standards. In general, the card access system will release a magnetic door lock having a separate power supply located on the secure side of the door along with a "Request-to-Exit" push-button release. To assure the occupant can exit the room under any circumstance, an additional "Emergency Request-to-Exit" push-button shall be located on the secure side. The emergency exit push-button shall be provided with a clear plastic hinged cover with label.

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**Voice:** A wall mounted phone shall be installed 48-inches above the finished floor located near the exit.

**Raceways and Supports:** The Designer shall show details of a cable tray system around the entire perimeter of the room and routed above each equipment rack/cabinet. The mounting height shall be a minimum of 12-inches above the racks and shall be supported directly to the structural ceiling above.

**Fire Alarm System Interface:** A Honeywell monitoring module and smoke detector shall be installed at the location of the Pre-Action (or Clean Agent) Fire Alarm Control Panel that protects the Communications Room(s). The monitoring module serves as the interface between the fire protection system protecting the room and the BWI's Fire Alarm System. In general, the fire protection system will have pull stations and audio/visual devices within the Communications Room.

**Splice Case and Supports:** At the location where the outside plant cabling enters into the building, a splice case and wall support system shall be provided. Coordinate layout with 'Outside Plant System' building entry design.

**High Density Protection Field:** When exiting the splice case, the copper cabling shall be routed to a high density protector frame using stub cables. The protector frame shall be located adjacent to the splice case and coordinated with the available lengths of stub cables. Distribution stub cables shall be extended from the protector frame to the main wire distribution frame.

**Coordination Drawings:** See the Appendices for sample drawings. In general, the coordination drawings shall show all systems within the Communications Room, coordinated with each other and shown on a composite drawing. The composite drawing will have related elevations, sections and plan views to validate coordination. In addition, the composite drawing shall show all floor and wall penetrations.

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## BACKBONE DISTRIBUTION

***Communication Cabling:*** All Intra-Building cables installed on MAA property must be Plenum rated. Non-Plenum rated cables may be used on an exception basis with prior approval of MAA OAT and MAA Fire Marshal.

The Standardization of Communication Cabling among IDF Rooms is as follows:

- 24 Strands of Multimode (MM) Fiber Optic cables using ‘ST Connectors’;
- 48 Strands of Singlemode (SM) Fiber Optic cables using ‘SC Connectors’; and
- 200-Pair Copper Cables.

Backbone cabling shall be “star topology” with Homeruns to the local MDF.

***Raceways and Supports:*** Cable tray is the preferred method to route cabling among Communication Rooms. When cable trays are not feasible, metallic conduits may be used.

Base design shall provide for 100 % growth in cable capacity.

Cable tray shall contain barriers to separate cables by type and application.

Design consideration shall consider future access to tray for maintenance and cable placement.

Tray shall be labeled as “MAA Use Only”

***Pull Boxes:*** In no case shall communication cabling be routed through a pull box containing power cables or non-power limited fire alarm conductors. Pull boxes shall be sized in accordance with the latest edition of the National Electrical Code while maintaining the cable manufacturer’s minimum bend radius requirements. The distance between pull boxes shall not exceed 150-feet having more than (3) 90-degree bends.

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***Grounding/Bonding:*** Grounding and bonding shall be installed in accordance with the latest edition of the National Electrical Code, the latest edition of the IEEE Standard 142, “Green Book” recommended practices, and the latest edition of BICSI’s Telecommunications Distribution Methods Manual. Where any conflict exists between the code and the standards, the code shall take precedence.

***Floor/Wall Penetrations:*** All wall and floor penetrations shall be made consistent with the design of the conduit/tray to be installed. Conduit penetrations must be sleeved and trays must have “tray portals”.

Approved UL listed fire stopping must be specified for fire rated wall penetrations. Fire stopping shall be consistent with requirements as specified for other trades on the project.

***Coordination Drawings:*** The Designer shall show proposed routing of backbone raceways coordinated with all major systems, including structural backgrounds. Drawings shall include changes of elevation.

## **HORIZONTAL DISTRIBUTION**

***Cable Type:*** All communications cable must be PLENUM RATED regardless of pathing method.

***Raceways and Supports:*** All wiring shall be installed in accordance with MAA Design Standard 2000-02, “Electrical Cable”. All cables must be installed in either cable tray or conduit through its entire length. No free run of cable is permitted.

***Communication Cabling:*** Base installation requires three Category 6 or better cables to each communication face plate. Provide one Category 6 cable to each wall phone and courtesy phone location. Specialized installations such as dispatch consoles etc will require cabling quantities and types as necessary to support the specific applications.



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***Floor Penetrations:*** All floor penetrations to a work station shall use fire-rated poke through assemblies.

***Wall Penetrations:*** All wall penetrations to a work station shall be recessed in the wall and terminate in a device box and have a device wall plate. Penetrations shall be sealed to match the rating of the wall construction.

***AC UPS Power Receptacles:*** A quad 20A/120V UPS receptacle is to be installed adjacent to workstation communication faceplates to support MAA IT PC's and associated hardware.

***Labeling:*** Permanent labeling must be affixed to near and far end termination points of all cable runs. Coordinate labeling scheme with MAA OAT.

***Coordination Documents:*** The Designer shall develop and maintain a spreadsheet that quantifies each drop according to its location, application (voice/data) along with its routing distance to the IDF Room.

## **EQUIPMENT RACKS/CABINETS**

***General Requirements:*** A minimum of two 19" open face EIA relay racks shall be provided for each MDF/IDF. One rack to house fiber optic termination, data patch panels, and MAA network hardware. The second rack shall be utilized for special systems hardware and growth. Normal clearances from walls are 36" to front and 30" to rear of equipment. Enclosed equipment racks may be required for other system applications.

***Space Allocation & Access:*** Equipment racks shall be dedicated to the cabling used, i.e., multimode fibers, singlemode fibers and copper cabling. Each 19" EIA rack shall have a footprint 21-inches wide and 15-inches deep. In addition, each rack shall have a 6-inch wide cable management section that is 13-inches deep. 36-inches front

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clearance and rear clearance are also required for access to equipment. Equipment cabinets shall also have similar space requirement within the room.

***Termination Shelves:*** Each rack/cabinet shall have the necessary quantity of termination shelves plus one spare shelf.

***Labeling:*** All equipment shall be labeled. Labels identifying twisted pair termination points shall clearly indicate the cable count and provide easy identification of the individual conductors. Labels for the exterior of fiber optic termination cabinets shall identify both near and far end termination points. A labeling record sheet shall be included with the cabinet that details layout and provides the identification of terminated fibers, the label shall also provide a field for recording fiber use detail. Coordinate labeling scheme with MAA OAT.

***Splicing Shelves:*** Each rack/cabinet shall have the necessary quantity of splicing shelves plus one spare shelf.

***UPS:*** Each rack/cabinet containing power equipment shall have an Uninterruptible Power Supply (UPS) as specified and fed from the Standby Power system.

***Power Strips:*** Each rack/cabinet containing power equipment shall have two power strips vertically installed, one on each side. Coordinate with MAA OAT on the need for twist-lock receptacles at the rack, utilizing either 20A or 30A, 120V circuits.

***Grounding/Bonding:*** Each rack/cabinet shall be grounded and bonded in accordance with the latest edition of the National Electrical Code, Article 780.

***Anchoring:*** Each rack/cabinet shall be securely anchored to the floor.

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## SYSTEMS NOT PERMITTED WITHIN AN IDF ROOM

***Flexible Response System:*** Raceway, conductors and/or signaling devices.

***Lightning Protection:*** Down conductors or grounding components.

## REQUEST FOR VARIANCE

If the Designer wishes to request an exception to the Standard as applied to a specific project, he/she should submit the attached "Request for Variance" form for approval. Every effort should be made to meet the Standard outlined and requests for variances will only be considered for instances where sufficient technical, budgetary and code merit exists. It is recommended that the Designer contact the Division of Airport Technology to informally discuss the circumstances of a possible request for variance prior to submission. Variances require Fire Marshall, Operations Manager and MAA Director of Engineering approval. The request for Variance should identify if and when a "variance" to the Standard is requested. It shall provide for an equivalent level of service or rating per NFPA 101-1.5, "Equivalency".

## CHANGES TO THIS STANDARD

Changes to this Standard can be requested by submitting the attached "Change Request". Sufficient technical and/or budgetary and/or code merit must be proven. Changes will be reviewed and approved by the parties noted on the Change Request Form.

Designer and other interested parties should contact the Division of Airport Technology to have their name put on the distribution list for delivery of change pages/revisions to this Standard.

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# ***REQUEST FOR VARIANCE FORM***

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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 Permit No. \_\_\_\_\_

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

**BELOW THIS LINE IF FOR INTERNAL USE ONLY**

A. *Fire Marshall Comments.*

B. *Director of Engineering Comments.*

- C.    ?    *Variance approved as submitted.*  
      ?    *Variance approved with comments incorporated.*  
      ?    *Variance denied.*

\_\_\_\_\_  
Fire Marshall      Date      \_\_\_\_\_ Yes      \_\_\_\_\_ No

\_\_\_\_\_  
Operations Manager      Date      \_\_\_\_\_ Yes      \_\_\_\_\_ No

\_\_\_\_\_  
MAA Director of Engineering      Date      \_\_\_\_\_ Yes      \_\_\_\_\_ No

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

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## ***CHANGES TO THIS STANDARD FORM***

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

CHANGE REQUEST

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Company: \_\_\_\_\_

Tel. No.: \_\_\_\_\_

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**

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CHANGE APPROVAL

\_\_\_\_\_

\_\_\_\_\_ Yes \_\_\_\_\_ No  
Date

Mr. Edward P. Carey  
Deputy Executive Director  
Airport Technology & Community Affairs

\_\_\_\_\_

\_\_\_\_\_ Yes \_\_\_\_\_ No  
Date

Mr. Paul L. Shank  
Deputy Executive Director -  
Facilities Development & Engineering

\_\_\_\_\_

\_\_\_\_\_ Yes \_\_\_\_\_ No  
Date

Mr. Stephen D. Sheehan  
Deputy Executive Director -  
Operations, Public Safety & Security

\_\_\_\_\_

\_\_\_\_\_ Yes \_\_\_\_\_ No  
Date

Mr. Michael H. Rafter  
Director - Office of Engineering &  
Construction Management

\_\_\_\_\_

\_\_\_\_\_ Yes \_\_\_\_\_ No  
Date

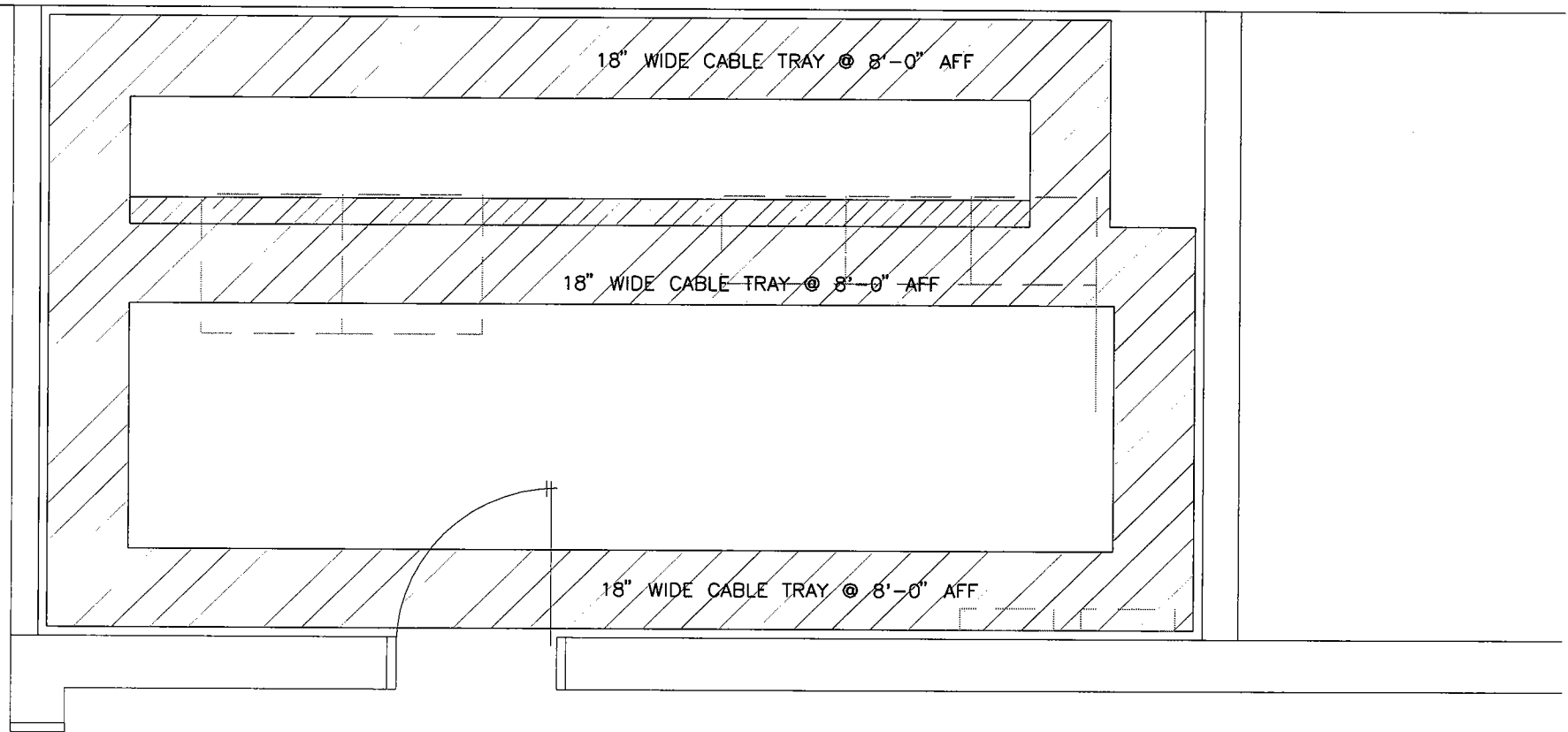
Mr. Woodrow W. Cullum  
Chief - BWI Thurgood Marshall Airport Fire  
& Rescue Department

## **APPENDICES**

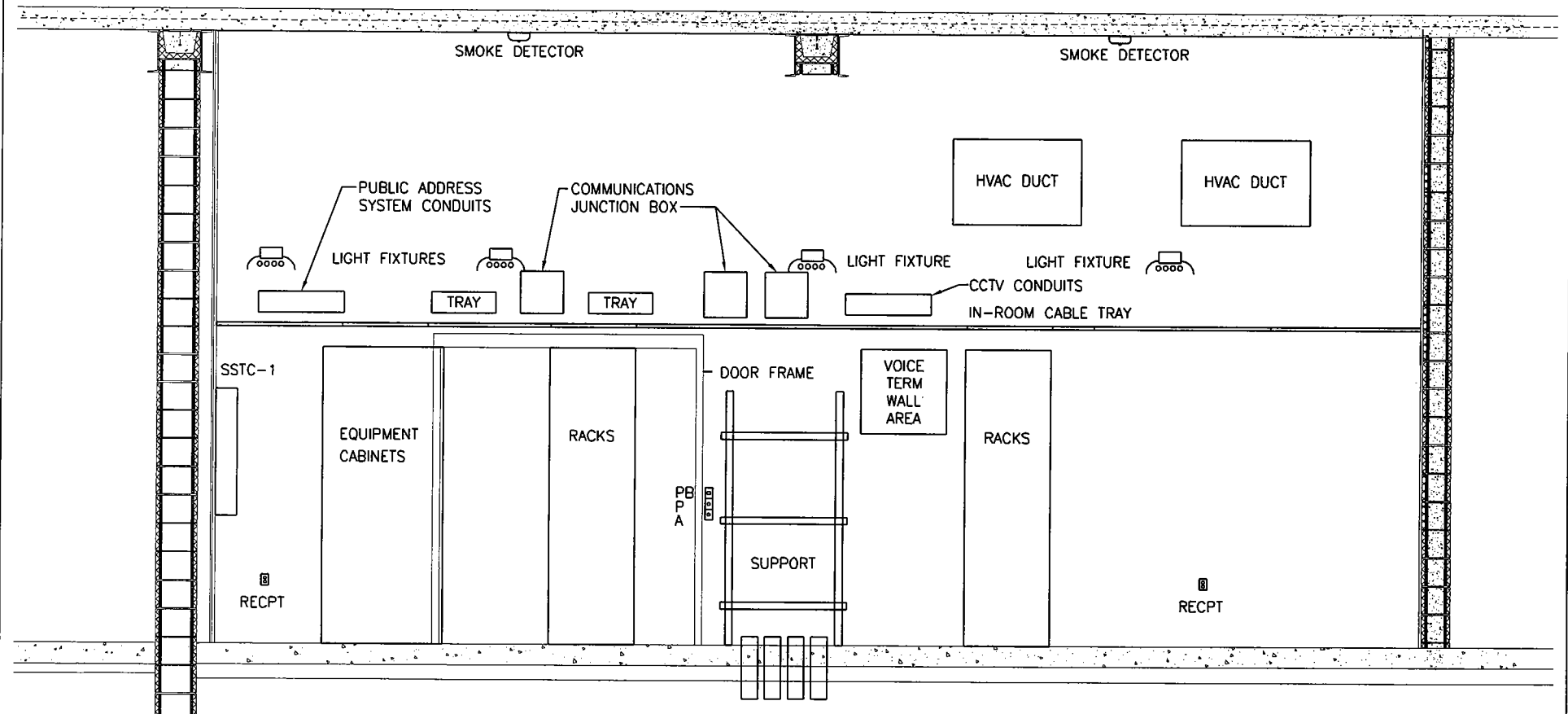


**APPENDIX A**

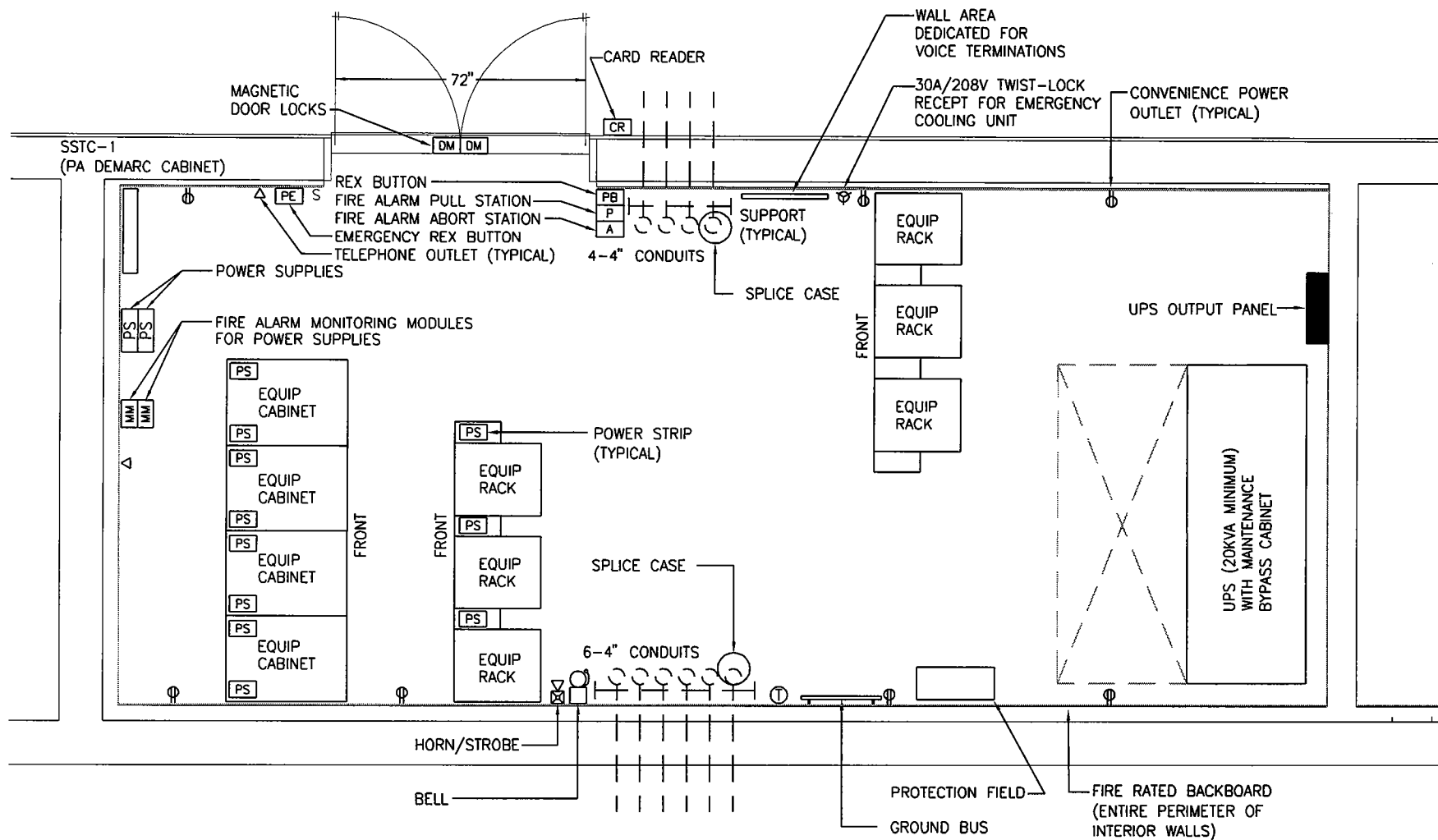
**SAMPLE DRAWINGS  
OF MDF AND IDF ROOMS**



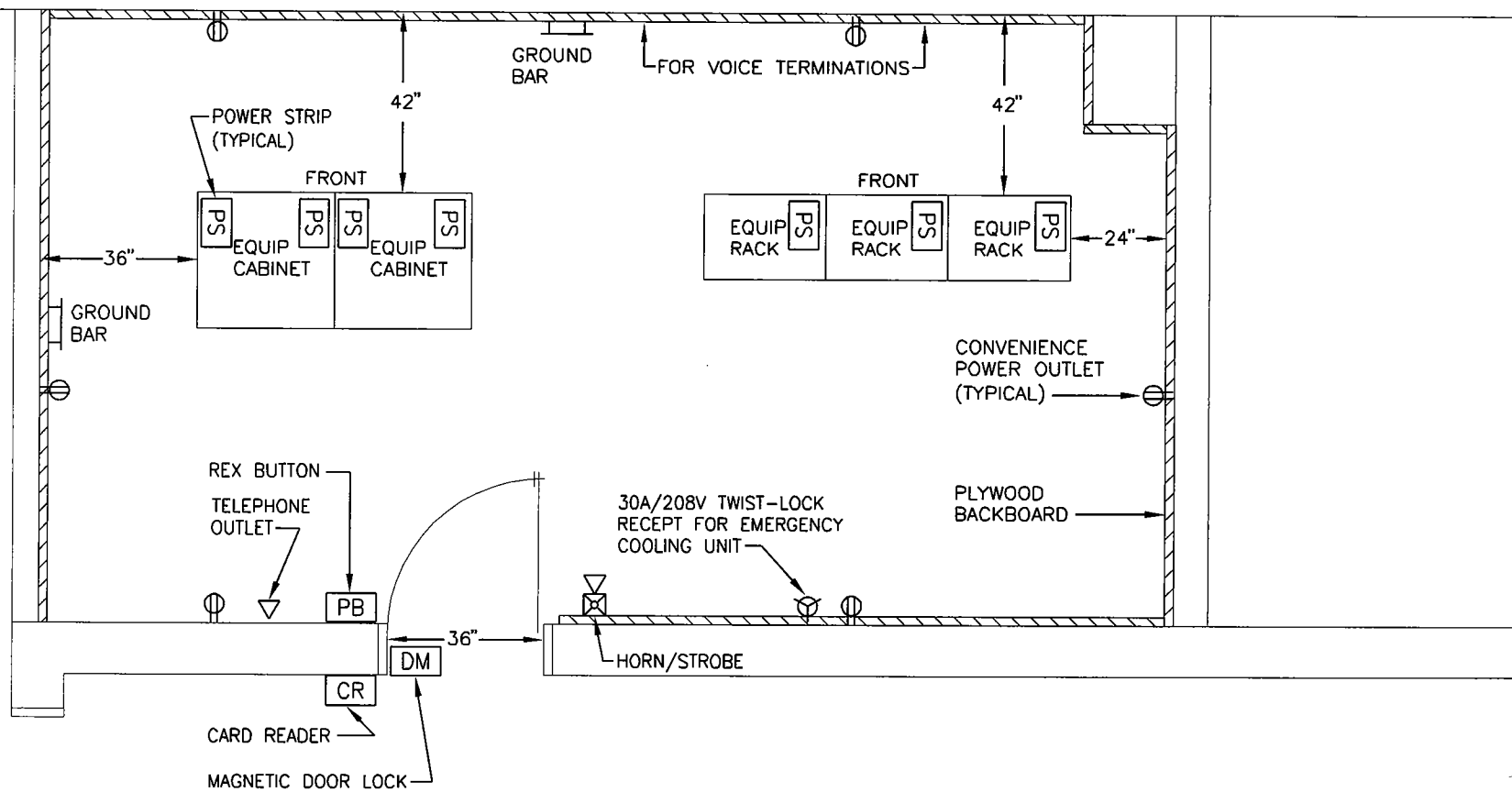
SAMPLE IDF ROOM LAYOUT 2 (IDF-1 RM A126)



SAMPLE MDF ROOM ELEVATION VIEW



SAMPLE MDF ROOM LAYOUT 1



SAMPLE IDF ROOM LAYOUT 1 (IDF-1 RM A126)

# **APPENDIX B**

## **UNIFORM SPECIFICATIONS**

Section 211000 - Water-Based Fire-Suppression Systems

Section 212200 - Clean-Agent Fire Extinguishing System (to be added)

Section 238123 - Computer Room Air Conditioning Units

Section 270528 - Telecommunications Pathways

Section 271100 - Telecommunications Room Fittings

Section 271300 - Communications Backbone Cabling

Section 271500 - Communications Horizontal Cabling

## SECTION 211000 - WATER-BASED FIRE-SUPPRESSION SYSTEMS

**NOTE: THE ARCHITECT/ENGINEER TO PROVIDE THE ADDITIONAL SECTIONS IN THIS SPECIFICATION.**

### PART 2 - PRODUCTS

#### 2.1 FIRE PROTECTION

##### A. Description.

1. Communication Rooms shall be equipped with preaction sprinkler system consisting of preaction valve, galvanized piping on dry side of the system, controls, compressor and accessories. Packaged type preaction valve and cabinet shall be provided.
2. Preaction system shall be double interlock system to admit water to sprinkler piping upon operation of both detection devices and automatic sprinklers.

#### 2.2 STEEL PIPE AND FITTINGS

##### A. Threaded-End, Standard-Weight (Schedule 40) Steel Pipe: ASTM A 53/A 53M, hot-dip galvanized where indicated and with factory- or field-formed threaded ends.

1. Cast-Iron Threaded Flanges: ASME B16.1.
2. Malleable-Iron Threaded Fittings: ASME B16.3.
3. Gray-Iron Threaded Fittings: ASME B16.4.
4. Steel Threaded Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M or ASTM A 106, Schedule 40, seamless steel pipe hot-dip galvanized where indicated. Include ends matching joining method.
5. Steel Threaded Couplings: ASTM A 865 hot-dip galvanized-steel pipe where indicated.

##### B. Plain-End, Standard-Weight (Schedule 40) Steel Pipe: ASTM A 53/A 53M, hot-dip galvanized-steel pipe where indicated.

1. Steel Welding Fittings: ASTM A 234/A 234M, and ASME B16.9 or ASME B16.11.
  2. Steel Flanges and Flanged Fittings: ASME B16.5.
- C. Grooved-End, Standard-Weight (Schedule 40) Steel Pipe: ASTM A 53/A 53M, hot-dip galvanized where indicated and with factory- or field-formed, roll-grooved ends.
1. Grooved-Joint Piping Systems:
    - a. Grooved-End Fittings: UL-listed, ASTM A 536, ductile-iron casting with OD matching steel-pipe OD.
    - b. Grooved-End-Pipe Couplings: UL 213 and AWWA C606, rigid pattern, unless otherwise indicated; gasketed fitting matching steel-pipe OD. Include ductile-iron housing with keys matching steel-pipe and fitting grooves, rubber gasket listed for use with housing, and steel bolts and nuts.

## 2.3 SPRINKLER SPECIALTY FITTINGS

- A. Sprinkler specialty fittings shall be UL listed or FMG approved, with 175-psig (1200-kPa) minimum working-pressure rating, and made of materials compatible with piping.
- B. Sprinkler Drain and Alarm Test Fittings: Cast- or ductile-iron body; with threaded or locking-lug inlet and outlet, test valve, and orifice and sight glass.
- C. Sprinkler Branch-Line Test Fittings: Brass body with threaded inlet, capped drain outlet, and threaded outlet for sprinkler.
- D. Sprinkler Inspector's Test Fitting: Cast- or ductile-iron housing with threaded inlet and drain outlet and sight glass.
- E. Drop-Nipple Fittings: UL 1474, adjustable with threaded inlet and outlet, and seals.
- F. Dry-Pipe-System Fittings: UL listed for dry-pipe service.

## 2.4 LISTED FIRE-PROTECTION VALVES

- A. Valves shall be UL listed or FMG approved, with 175-psig (1200 kPa) minimum pressure rating.



B. Butterfly Valves: UL 1091.

1. NPS 2 (DN 50) and Smaller: Bronze body with threaded ends.
2. NPS 2-1/2 (DN 65) and Larger: Ductile-iron body; flanged or grooved ends.

C. Gate Valves: UL 262, OS&Y type.

1. NPS 2 (DN 50) and Smaller: Bronze body with threaded ends.
2. NPS 2-1/2 (DN 65) and Larger: Cast-iron body with flanged ends.

## 2.5 SPECIALTY VALVES

A. Sprinkler System Control Valves: UL listed or FMG approved, cast- or ductile-iron body with flanged or grooved ends, and 175-psig (1200-kPa) minimum pressure rating.

## 2.6 SPRINKLERS

A. Sprinklers shall be UL listed or FMG approved, with 175-psig (1200-kPa) minimum pressure rating.

B. Automatic Sprinklers: With heat-responsive element complying with the following:

1. UL 199, for nonresidential applications.

C. Sprinkler Types and Categories: Nominal 1/2-inch (12.7-mm) orifice for "Ordinary" temperature classification rating, unless otherwise indicated or required by application.

D. Sprinkler types, features, and options as follows:

1. Upright sprinklers.

E. Sprinkler Finishes: Chrome plated.

## 2.7 ALARM DEVICES

A. Alarm-device types shall match piping and equipment connections.

- B. Pressure Switch: UL 753, electrical-supervision-type, water-flow switch with retard feature. Include single-pole, double-throw, normally closed contacts and design that operates on rising pressure and signals water flow.
- C. Valve Supervisory Switch: UL 753, electrical, single-pole, double-throw switch with normally closed contacts. Include design that signals controlled valve is in other than fully open position.

## 2.8 PRESSURE GAGES

- A. Description: UL 393, 3-1/2- to 4-1/2-inch-diameter, dial pressure gage with range of 0 to 250 psig (0 to 1725 kPa) minimum.
  - 1. Water System Piping: Include caption "WATER" or "AIR/WATER" on dial face.
  - 2. Air System Piping: Include[ retard feature and] caption "AIR" or "AIR/WATER" on dial face.

- 2.9 PREACTION SYSTEM: UL listed, FM approved, double interlocked, supervised system, using an electrically controlled deluge valve on a pneumatically pressurized automatic sprinkler system. The system piping shall be pneumatically pressurized for supervisory purposes only. If the system piping or sprinkler is damaged, supervisory pressure will reduce and an alarm shall be actuated.

Actuation of solenoid valve in the system shall not open the deluge valve. Fusing of a sprinkler head must also happen in order to operate the pneumatic actuator included in the valve trim, depressurize the priming chamber and opening the main valve.

The pre-action system shall be pre-trimmed, pre-wired and factory tested for field installation. Components shall be installed in heavy gage, red cabinet. The system shall include control panel, tank less air compressor and dry contacts to communicate with building automation system.

## SECTION 21 22 00 – CLEAN-AGENT FIRE EXTINGUISHING SYSTEM

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

#### 1.2 SUMMARY

- A. This Section includes the following:

1. FM 200 Extinguishing System.

#### 1.3 DESCRIPTION OF WORK

- A. Design and installation of an engineered FM 200 total flooding, gaseous agent, fire suppression system as manufactured by Fenwal Fire Systems.
- B. Drawings: The contract drawings indicate the general arrangements of the areas to receive FM 200 protection. Contractor is to review all drawings so that all items affecting the operation of the fire detection/FM200 suppression system (such as equipment location, air diffusers, damper closures, and door openings) are considered in the design of the engineered system.

#### 1.4 QUALITY ASSURANCE

- A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto (latest edition):

1. National Fire Protection Association (NFPA) Standards:

No. 2001 Clean Agent Fire Extinguishing Systems

No. 70 National Electric Code

No. 72 National Fire Alarm Code

2. Factory Mutual Systems (FM) Publication  
Factory Mutual Approval Guide
3. Underwriters Laboratories, Inc. (UL) Publication  
Fire Protection Equipment Directory with quarterly supplements.
4. National Electrical Manufacturers Association (NEMA) Publication  
Enclosures for Industrial Controls and Systems
5. Industrial Risk Insurers Interpretive Guide (Detection and Controls)
6. US Environmental Protection Agency, Protection of Stratospheric Ozone  
59 FR 13044, March 18, 1994 (Final SNAP Ruling)
7. Requirements of the Authority Having Jurisdiction (AHJ)

## 1.5 REQUIREMENTS

- A. This installation shall be made in strict accordance with the drawings, specifications and applicable National Fire Protection Association Standards. All equipment and devices used shall be listed in both the UL Fire Equipment Directory and the Factory Mutual Approval Guide.
- B. Design and installation of the FM 200 suppression system shall be in strict accordance with the following guidelines and regulatory agencies:
  1. NFPA 2001 Clean Agent Fire Extinguishing Systems.
  2. NFPA 72 National Fire Alarm Code, Latest Edition.
  3. NFPA 70 National Electric Codes, Latest Edition.
  4. Americans with Disabilities Act, Title 24, Latest Edition.

## 1.6 GENERAL

- A. Furnish all engineering design and materials for a complete FM 200 suppression system including charged FM 200 storage cylinders, spare cylinders, piping, valves, nozzles, wiring, and all other equipment necessary for a complete operational system.

B. Major system components shall be produced by Fenwal Fire Systems, and shall be installed by an authorized Fenwal Fire System distributor certified for the design and installation and service of FM 200 suppression systems.

C. FM 200 Design and System Requirements:

1. Release of FM 200 agent shall be accomplished by an electrical output from the control panel to solenoid operated releasing devices and shall be in accordance with the requirements set forth in the current edition of the National Fire Protection Association Standard 2001.

2. System Checkout, Owner Training and Acceptance:

Upon completion of installation, a meeting shall be held at the site with the Contractor, Equipment supplier and Owner personnel. The Contractor shall familiarize Owner's personnel with the system components, system functions, and recommended procedures. At this time, a functional test of the system will be demonstrated. (A room integrity test shall be conducted in accordance with NFPA 2001.) The Contractor shall provide the necessary personnel and instruments to conduct this test. The Contractor will provide the Owner with a complete operational and maintenance manual as well as a written summary of any function test conducted. The Contractor shall be capable of conducting semiannual system inspections and maintenance of the system in accordance with NFPA Standard 2001.

The following shall be included in the Contractor's quotation:

- a. Duration of training.
- b. Location of training (on site if feasible).
- c. Material covered and training aids available.

3. Installation:

All work shall be completed in a high degree of workmanship and in compliance with current NFPA Standard 2001, 70, 72, 75 and local codes. All openings shall be sealed at time of system installation to prevent leakage and maintain system integrity.

4. Interlock:

- a. Control panel shall interlock with HVAC system to close motor operated damper before releasing agent.
- b. Control panel shall interlock with Honeywell Fire Alarm System and ADT CASS System to open door upon activation of system.

- D. Verified Detection: Devices located in single zone. Sound alarm on activating single-detection device, and discharge extinguishing agent on actuating second-detection device.

## 1.7 SUBMITTAL

- A. The following shall be submitted in accordance with the requirements of Division 1 for approval within 21 days of award and prior to delivery of materials:
  - 1. Material and equipment information shall include manufacturer's catalog cut sheet and technical data for each component or device used in the system. This shall include, but not be limited to, the following:
    - a. Agent Storage Cylinders;
    - b. Mounting Brackets;
    - c. Discharge Nozzles;
    - d. Piping Isometrics;
    - e. Flow Calculations;
    - f. Manual Stations;
    - g. Detection Devices; and
    - h. Alarm Devices.
- B. Provide information outlining the warrant of each component or device used in the system.
- C. Provide information outlining the operation and maintenance procedures that will be required of the Owner. This information shall explain any special knowledge or tools the Owner will be required to employ and all spare parts that should be readily available.
- D. Drawings shall indicate locations, installation details and operation details of all equipment associated with the FM 200 system. Floor plans shall be provided showing equipment locations, piping, point-to-point wiring and other details as required. Floor plans shall be drawn to a scale of not less than  $\frac{1}{4}" = 1'-0"$ . Elevations, cross sections and other details shall be drawn to a larger scale as required. Isometric piping layouts shall be provided with the shop drawings. In addition, point-to-point electrical layout drawings shall be provided.

- E. Sample Special Warranty: Submit copies for approval, of extinguishing systems manufacturer's warranty stating obligations, remedies, limitations and exclusions before purchasing or supplying products.

## PART 2 - PRODUCTS

### 2.1 PIPE MATERIAL – FM 200 SYSTEM

- A. System piping shall be of non-combustible materials having physical and chemical characteristics such that its integrity under stress can be predicted with reliability.
- B. Piping materials shall be black steel pipe, Schedule 40, conforming to ASTM A-53A ERW or ASTM A-106A seamless.
- C. Piping joints shall be suitable for the design conditions and shall be selected with consideration of joint tightness and mechanical strength.
- D. Fittings beyond the orifice union/nipple shall be black, 300 lb. Class fittings conforming to ANSI B-16-3. Ordinary cast iron fittings shall not be used.
- E. All piping shall comply with NFPA 2001.
- F. Piping shall be installed in accordance with good commercial practice to the appropriate codes, securely supported with UL Listed hangers and arranged with close attention to the design layout since deviations may alter the design flow performance as calculated.
- G. Piping shall be bracketed within 12 inches of all discharge nozzles.
- H. All piping shall be reamed, blown clear and swabbed with appropriate solvent to remove mill varnish and cutting oils before assembly.
- I. Multi-outlet fittings other than tees shall not be permitted.
- J. Assembly of all joints shall conform to the appropriate standards. Threaded pipe joints shall utilize Teflon tape applied to the male threads only.

### 2.2 GENERAL REQUIREMENTS

- A. The name of the manufacturer and the serial numbers shall appear on all major components.

## 2.3 GENERAL MATERIALS - ELECTRICAL

- A. All electrical enclosures, raceways and conduits shall be employed in accordance with applicable codes and intended use and contain only those electrical circuits associated with the fire detection and control system and shall not contain any circuit that is unrelated to the system.
- B. Unless specifically provided otherwise in each case, all conductors shall be enclosed in rigid steel conduit.
- C. Any conduit or raceway exposed to weather or other similar conditions shall be properly sealed and installed to prevent damage. Provisions for draining and/or drying shall be employed.
- D. NEMA rating and/or electrically hazardous classifications shall be observed and any equipment or materials installed must meet or exceed the requirements of service.
- E. All wire terminations shall be made with crimp terminals unless the device at the termination is designed for bare wire terminations.
- F. All electrical circuits shall be numerically tagged with suitable devices at the terminating point and/or splice. All circuit numbers shall correspond with the installation drawings.

## 2.4 EXTINGUISHING SUB-SYSTEMS

- A. The system shall be designed to provide a minimum 7 percent volume concentration of extinguishing agent. The system shall be capable of meeting the performance parameters in the National Fire Protection Association Standard 2001. The extinguishing system shall include the following components:
  - 1. Agent storage container with valve.
  - 2. Discharge nozzle(s).
  - 3. Solenoid or Initiator operated releasing device.
  - 4. Mounting bracket(s).
  - 5. FM-200 agent.
- B. The FM-200 agent shall be stored in a cylindrical storage container. This container shall be capable of being filled in one-pound increments of FM-200. The FM-200 discharge shall be activated by an output directly from the control panel, which will activate the solenoid in the releasing device. FM-200 agent is stored in the container as a liquid, having a natural vapor pressure of 66.4 psia at 77° F. To aid release and



distribution, the container shall be superpressurized to 360 psig at 70° F with dry nitrogen.

- C. All agent storage containers shall be activated by either an electrical manual discharge station or the automatic cross-zoned detection circuitry described above.
- D. FM-200 storage cylinders shall be provided with a safety rupture disc. An increase in internal pressure due to high temperature shall rupture the safety disc and allow the contents to vent before the rupture pressure of the container is reached. The contents shall not be vented through the discharge piping and nozzles. FM-200 containers shall be equipped with a pressure gauge to display internal pressures. The gauge shall be an integral part of the container and shall be color-coded for fast referencing of pressure readings.
- E. A low pressure switch shall be provided as standard equipment on the agent storage container(s). A decrease in pressure will cause the normally open contacts to close, indicating a trouble condition at the control panel.
- F. Discharge nozzles shall be used to disperse the FM-200. The nozzles shall be brass with female threads. The nozzle used shall be provided with pipe threads that correspond to the nozzle size. The nozzle used shall be FM Approved and UL Listed.
- G. The extinguishing agent shall be FM-200 (Heptafluoropropane).

## 2.5 DETECTION DEVICES

- A. Description: Comply with NFPA 2001 and NFPA 72, and include the following types:
  - 1. Ionization Detectors: Comply with UL 268, dual-chamber type, having sampling and referencing chambers, with smoke-sensing element.
  - 2. Photoelectric Detectors: Comply with UL 268, consisting of LED light source and silicon photodiode receiving element.
  - 3. Remote Air-Sampling Detector System: Includes air-sampling pipe network, a laser-based photoelectric detector, a sample transport fan, and a control unit.
    - a. Comply with UL 268 and NRTL listed, operating at 24-V dc, nominal.
    - b. Pipe Network: CPVC tubing connects control unit with calibrated sampling holes.
    - c. Smoke Detector: Particle-counting type with continuous laser beam. Sensitivity adjustable to a minimum of four preset values.

- d. Sample Transport Fan: Centrifugal type, creating a minimum static pressure of 0.05-inch wg at all sampling ports.
- e. Control Unit: Multizone unit as indicated on Drawings. Provides same system power supply, supervision, and alarm features as specified for the control panel plus separate trouble indication for airflow and detector problems.
- f. Signals to the Central Fire Alarm Control Panel: Any type of local system trouble is reported to the central fire alarm control panel as a composite "trouble" signal. Alarms on each system zone are individually reported to the central fire alarm control panel as separately identified zones. Coordinate with Honeywell for interface with Honeywell Fire Alarm System.

## 2.6 MANUAL STATIONS

- A. General Description: Surface FMG approved or NRTL listed, with clear plastic hinged cover, 120-V ac or low voltage compatible with controls. Include contacts for connection to control panel.
- B. Manual Release: "MANUAL RELEASE" caption, and red finish. Unit can manually discharge extinguishing agent with operating device that remains engaged until unlocked.
- C. Abort Switch: "ABORT" caption, momentary contact, with green finish.
- D. EPO Switch: "EPO" caption, with yellow finish.

## 2.7 SWITCHES

- A. Description: FMG approved or NRTL listed, where available, 120-V ac or low voltage compatible with controls. Include contacts for connection to control panel.
  - 1. Low-Agent Pressure Switches: Pneumatic operation.
  - 2. Power Transfer Switches: Key-operation selector, for transfer of release circuit signal from main supply to reserve supply.
  - 3. Door Interlock: Electrical interlock with ADT CASS System to release door upon activation of system.

## 2.8 ALARM DEVICES

- A. Description: FMG approved or NRTL listed, low voltage, and surface mounting, unless otherwise indicated.
- B. Bells: Minimum 6-inch diameter.
- C. Horns: 90 to 94 dBA.
- D. Strobe Lights: Translucent lens, with "FIRE" or similar caption.

## PART 3 - EXECUTION

### 3.1 SYSTEM DESCRIPTION AND OPERATION

- A. The system shall be an FM-200 total flooding, gaseous, clean agent, fire suppression system designed to provide a uniform concentration of FM-200 to the protected area.
  - 1. The amount of FM-200 to be provided shall be the amount required to obtain a uniform (minimum) concentration as required by the design manual for ten (10) minutes. Take into consideration such factors as unclosable openings (if any), "rundown" time of fans, time required for dampers to close (and requirements for any additional dampers), and any other feature of the facility that could affect concentration. The design concentration shall be by volume at 70° F.

### 3.2 FM-200 SUPPRESSION SYSTEM

- A. FM-200 fire suppression system shall be of the engineered, permanently piped, fixed nozzle type with all pertinent components provided by Fenwal Fire Systems.
- B. All agent storage cylinders shall be centrally located as vertical, free standing cylinders with wall and/or floor mounted retaining brackets.

### 3.3 FLOW CALCULATIONS

- A. Computerized verification of flow calculations shall be submitted for each FM-200 fire suppression system and include the following data as a minimum:
  - 1. Quantity of agent per nozzle.
  - 2. Type of nozzle.

3. Pressure at nozzle (psi).
4. Nozzle body nominal pipe size (inch).
5. Number and size of cylinders.
6. Total agent.
7. Pipe size per pipe section.
8. Number, size and type of fitting per pipe section.
9. Actual length per pipe section (feet).
10. Equivalent length per pipe section (feet).
11. Discharge time (seconds).

#### 3.4 SYSTEM CHECKOUT AND TESTING

- A. The completed installation shall be inspected by factory authorized and trained personnel. The inspection shall include a full operational test of all components per the equipment manufacturer's recommendations, including fan tests of room.
- B. Inspection shall be performed in the presence of the Owner's representative, Engineer's representative, insuring authority and/or the local authority having jurisdiction.
- C. All mechanical and electrical components shall be tested according to the manufacturer's recommended procedure to verify system integrity.

#### 3.5 FIELD QUALITY CONTROL

- A. Inspection shall include a complete checkout of the detection/control system and certification of cylinder pressure. A written report shall be filed with the Owner.

#### 3.6 AS BUILT DRAWING

- A. As-built drawings shall be provided by the Contractor (6 copies) indicating the installation details. All routing of piping, electrical conduit and accessories shall be noted.
- B. Equipment installation and maintenance manuals shall be provided in addition to the as-built drawings.

#### 3.7 COMMISSIONING

- A. Prior to final acceptance, the Contractor shall provide operational training in all concepts of the system to the Owner's key personnel. Training shall consist of:
  - 1. Control system operation.
  - 2. Trouble procedures.
  - 3. Abort procedures.
  - 4. Emergency procedures.
  - 5. Safety requirements.
  - 6. Demonstration of the system (excluding FM-200 release).
- B. The quantity of agent shall reflect the actual design quantity of FM-200 agent.
- C. A functional test shall be completed prior to the Room Integrity test consisting of detection, release, alarm, accessories related to the system, control unit and a review of the cylinders, piping, fittings, hangers and cylinder pressure.
- D. Room integrity tests shall be conducted. Tests shall be conducted by the Contractor, FM-200 equipment manufacturer or FM-200 manufacturer's representative in the presence of the Owner's representative. Such tests shall be made only after the control system has been tested satisfactorily.
- E. Test procedures shall be recommended by the equipment manufacturer and/or the FM-200 equipment supplier.
- F. If test results indicate that the holding time can not be maintained, the Contractor shall determine and correct the cause of failure. The Contractor shall then conduct a second room integrity test at no additional cost to the Owner.
- G. As a condition of final acceptance, the Contractor shall provide operational training to the Owner's personnel. The training sessions shall include emergency procedures, abort functions, system control panel operation, trouble procedures and safety requirements.

### 3.8 WARRANTY

- A. FM-200 system components furnished under this contract shall be guaranteed against defect in design, material and workmanship for the full warranty time which is standard with the manufacturer and/or supplier but not less than two (2) years from the date of system acceptance. In addition, the installing contractor must guarantee the system

against false actuation or leakage due to faulty equipment, design or workmanship for a period of two (2) years from final acceptance. In the event of FM200 agent leakage or system discharge from any of the above conditions, the installing contractor shall completely recharge and recondition the system at no cost to the Owner.

## PART 4 – MEASUREMENT

### 4.1 METHOD OF MEASUREMENT

- A. No separate measurement shall be made for work under this section.

## PART 5 – PAYMENT

### 5.1 BASIS OF PAYMENT

- A. No separate payment will be made for work under this section. The cost of the work described in this section shall be included in the applicable bid item or lump sum contract price.
- B. Costs include all labor, material, services, and equipment necessary to complete the work in every respect.

END OF SECTION 21 22 00

## SECTION 238123 - COMPUTER ROOM AIR-CONDITIONING UNITS

**NOTE: THE ARCHITECT/ENGINEER TO PROVIDE THE ADDITIONAL SECTIONS IN THIS SPECIFICATION.**

### PART 2 - PRODUCTS

#### 2.1 CEILING-MOUNTING UNITS

##### A. Summary

1. These specifications describe requirements for an environmental control system. The system shall be designed to control temperature and relative humidity conditions within the room.
2. System shall be supplied with ETL listing according to UL 1995.

##### B. Quality Assurance

1. The specified system shall be factory tested before shipment. Testing shall include, but shall not be limited to: Quality Control Checks, "HiPot" Test (two times rated voltage plus 1000 volts, per NRTL agency requirements), and Metering Calibration Tests. The system shall be designed and manufactured according to world class quality standards. The manufacturer shall be ISO 9001 certified.

#### 2.2 PRODUCT - CEILING MOUNTED UNITS

- A. General: All material and equipment used shall be standard components, regularly manufactured and available - not customer-designed especially for individual projects. All hardware systems and components shall have been thoroughly tested and proven in actual use prior to installation.

1. Provide drip pan and condensate pump for any units installed inside room.

- B. Evaporator Cabinet Construction: The cabinet and chassis shall be constructed of heavy gauge galvanized steel with baked enamel finish. Mounting brackets shall be factory attached to the cabinet. Cabinet interior shall be insulated with 1/2-inch thick duct liner.

- C. Air Distribution: The air distribution system shall be constructed with a quiet, direct-drive fan assembly equipped with double-inlet blower, self-aligning ball bearings, and lifetime lubrication. Fan motor shall be permanent-split capacitor, high efficiency type,

equipped with two speeds for air flow modulation. Dehumidification shall utilize the lower fan speed.

- D. Microprocessor Control: The control system shall be microprocessor based. The wall-mounted control enclosure shall include a 2-line by 16 character LDC display providing continuous display of operating status and alarm condition. An 8-key membrane keypad for setpoint/program control, unit on/off, and fan speed shall be located below the display.

Temperature and humidity sensors shall be located in the wallbox.

1. Monitoring: The LCD display shall provide an on/off indication, fan speed indication, operating mode indication (cooling, heating, humidifying, dehumidifying) and current day, time, temperature and humidity indication. The monitoring system shall be capable of relaying unit operating parameters and alarms to the monitoring system. Provide network interface card (NIC) for units to communicate directly to BAS (Johnsons, Metasys System).
2. Control Setpoint Parameters:
  - a. Temperature Setpoint 65-85°F (18 to 29°C).
  - b. Temperature Sensitivity 1 to 5°F (1 to 3°C).
  - c. Humidity Setpoint 20-80% RH.
  - d. Humidity Sensitivity 1 to 10% RH.
3. Unit Controls
  - a. Compressor Short-Cycle Control: The control system shall prevent compressor short-cycling by a 3 minute timer from compressor stop to the next start.
  - b. Common Alarm and Remote On/Off: A common alarm relay shall provide a contact closure to a remote alarm device. Two (2) terminals shall also be provided for remote on/off control. Individual alarms shall be "enabled" or "disabled" from reporting to the common alarm.
  - c. Setback Control: The control shall be programmable on a daily basis or on a 5 day/2 day program schedule. It shall be capable of accepting 2 programs per day.
  - d. Temperature Calibration: The control shall include the capabilities to calibrate the temperature and humidity sensors and adjust the sensor response delay time from 1 to 90 seconds. The control shall be capable of displaying temperature values in °F or °C.



- e. System Auto Restart: For start-up after power failure, the system shall provide automatic restart with a programmable (up to 9.9 minutes in 6-second increments) time delay. Programming can be performed either at the unit or from the central site monitoring system.

#### E. Alarms

- 1. Unit Alarm: The control system shall monitor unit operation and activate an audible and visual alarm in the event of the following factory preset alarm conditions:
  - a. High Temperature
  - b. Low Temperature
  - c. High Humidity
  - d. Low Humidity
  - e. High Water Alarm - Lockout Unit Operation
  - f. High Head Pressure
  - g. Loss of Power
  - h. Compressor Short Cycle
  - i. Humidifier Problem
  - j. Filter Clog
  - k. Water Detected
  - l. Smoke Detected
  - m. Alarm Controls: Each alarm (unit and custom) shall be separately enabled or disabled, selected to activate the common alarm (except for high head pressure).
  - n. Audible Alarm: The audible alarm shall annunciate any alarm that is enabled by the operator.
  - o. Common Alarm: A programmable common alarm shall be provided to interface user selected alarms with a remote alarm device.

#### F. Direct Expansion System Evaporator Components.

1. Direct Expansion Coil: The evaporator section shall include evaporator coil, thermostatic expansion valve, and filter drier.
2. The evaporator coil shall be constructed of copper tubes and aluminum fins. The coil shall be provided with a stainless steel drain pan. Refrigerant flow shall be controlled by an externally equalized thermostatic expansion valve.
3. Chilled Water Coil: The cooling coil shall be constructed of copper tubes and aluminum fins, mechanically attached to the tube. Maximum face velocity of 450 feet per minute. The coil assembly shall be mounted in a stainless steel condensate drain pan, with internally trapped drain line.

G. Air-Cooled Centrifugal Fan Condensing Unit.

1. The condenser coil shall be constructed of copper tubes and aluminum fins. The condensing unit shall be factory charged with refrigerant, sealed, and shall be capable of being connected to the evaporator section directly. The condensing unit shall be mounted directly to the evaporator or mounted remote to the evaporator. Components shall include hermetic scroll compressor, high pressure switch, head pressure control valve and liquid line solenoid valve.

The condensing unit shall be designed for 95°F (35° C) ambient and be capable of operation to -20°F (29° C).

A hot gas bypass circuit shall be provided to ensure operation under low load conditions.

H. Air-Cooled Prop Fan Condensing Unit.

1. The condenser coil shall be constructed of copper tubes and aluminum fins with a direct-drive propeller-type fan, and shall include a scroll compressor, high pressure switch, and Lee-temp receiver. All components shall be factory assembled. No internal piping, brazing, dehydration, or charging shall be required. Condensing unit shall be designed for 95° F (35° C) ambient and be capable of operation to -30° F (-34.4° C).
2. Components shall include scroll compressor, high-pressure switch, Lee-temp refrigerant receiver, head pressure control valve, and liquid line solenoid valve.
3. A hot gas bypass circuit shall be provided to reduce compressor cycling and improve operation under low load conditions.

I Factory Installed Accessories.

1. Steam Generating Humidifier: The environmental control system shall be equipped with a steam generating humidifier that is controlled by the

microprocessor control system. It shall be complete with disposable canister, all supply and drain valves, steam distributor, and electronic controls. The need to change canister shall be annunciated on the microprocessor wall-box control panel. An LED light on the humidifier assembly shall indicate cylinder full, over-current detection, fill system fault, and end of cylinder life conditions.

2. SCR Electric Reheat: The electric reheat shall be low-watt density, 304/304 stainless steel, finned-tubular and shall be capable of maintaining room dry bulb conditions when the system is calling for dehumidification. The reheat section shall include a U.L. approved safety switch to protect the system from overheating.

The SCR (Silicon Controlled Rectifier) controller shall proportionally control the reheat elements to maintain the selected room temperature. The rapid cycling made possible by the SCR controller provides precise temperature control, and the more constant element temperature improves heater life. The unit microprocessor control shall operate the SCR controller, while cooling is locked on.

3. Disconnect Switch, Non-Locking: The non-automatic, non-locking, molded case circuit breaker shall be factory mounted in the high voltage section of the electrical panel. The switch shall be accessible from the front of the unit.
4. Smoke Detector: The smoke detector shall immediately shut down the environmental control system and activate the alarm system when activated. The sensing element shall be located in the return air compartment. Provide contacts to communicate with fire alarm system.

J. Ship-Loose Accessories.

1. Condensate Pump: The condensate pump shall have the minimum capacity of 30 GPH (114 l/h) at 20 ft. head (60 kPa). It shall be complete with integral float switch, pump, motor assembly, and reservoir.
2. Refrigerant Line Sets: Pre-charged refrigerant line sets shall be provided by Liebert in proper lengths for application.
3. Refrigerant Line Sweat Adapter Kit: Provide a sweat adapter kit to permit field brazing of refrigerant line connections.

K. Monitoring System:

1. Provide a complete site monitoring control system. The system architecture shall utilize intelligent distributed monitoring/control modules and have the capability to centrally or remotely communicate to one or more workstations.

2. Gateway Modules: Gateway Modules shall be capable of creating an EIA-485 communication network between the monitoring/control modules and the workstation(s).
3. Monitoring/Control Modules: Monitoring/Control Modules shall be the interface modules between the units, dry contact inputs/outputs, or analog input points, and the Gateway Module. Monitoring/Control Modules will reside on the CMnet. The following types of Monitoring/Control Modules shall be provided as required:
  - a. Unit Interface Modules: Capabilities of the Unit Interface Modules shall include:
    - 1) Twelve (12) module control/monitoring shall have the capacity to interconnect with any combination of twelve (12) Units, Power, UPS, Temperature/Humidity, or Contact Closure units. The 12 module control/monitoring shall communicate directly with the units via EIA-422 communication cable. It shall have a 32 bit architecture and poll four Units simultaneously.
    - 2) Four (4) module control/monitoring shall have the capacity to interconnect with any combination of four (4) Units, Power or UPS units. The four (4) module control/monitoring shall communicate directly with the Units via EIA-3422 communication cable. It shall have a 32 bit architecture and poll four Units simultaneously.
  - b. Input Output Modules: Capabilities of the I/O modules shall include:
    - 1) I/O Module: The I/O 10/0 Module shall have the capability to monitor any combination of ten (10) digital inputs (.5mA maximum current sense), and/or thermistor inputs (10K ohm @ 77 degree F – Precon Type 2), and/or analog input (4-20mA – 24 Vdc loop power, 250 ohm impedance; 0-5Vdc – 10k ohm maximum source impedance). It shall have one physical address. It shall have a 32 bit architecture.

L. System Software

1. General: The system software application code shall be written for Windows 98 or the latest version, not to be confused with application code running the Windows environment.

M. Database Generation: The user shall have the following capabilities to alter the database:

1. Add and delete monitoring/alarm points.
2. Modify point parameters.

3. Restrict user access by assigning user passwords. The system shall have the capability to accept up to thirty-two (32) unique passwords; each may be one of six (10) levels of access.

N. Auto Changer Controller

1. System Description, Functions and Features
  - a. 2 to 8 unit capacity
  - b. 12 Key Keypad
  - c. 4 row X 20 column LCD Display
  - d. Manual Override, Individual Unit.
  - e. Manual Override, All Units
  - f. Power Failure Override
  - g. Sequential Restart on Power Failure Recovery
  - h. Power Failure Recovery
  - i. Automatic Unit Sequencing to Balance Runtime
  - j. Standby Operation
  - k. Emergency Power Operating Mode
  - l. High & Low Temperature Alarms
  - m. High & Low Humidity Alarms
  - n. Temperature Controlled Staging of Units
  - o. Unit Labeling
  - p. Humidity Control Lockout
  - q. Battery Backed Clock
  - r. Non Volatile Memory
  - s. Selectable Degrees F/C Display
  - t. Optional Control Lockout

O. Inputs

1. Common Alarm contact from each Unit (8 total)
2. Room Temperature – Liebert Temp/Humidity Module input (1 total)
3. Room Humidity – Temp/Humidity Module input (1 total)
4. Emergency Power OFF – N.C. Contact input for EPO switch loop
5. Emergency Power Operation or Remote Start/Stop (DIP switch selection) – N.C. Contact input to activate selected mode
6. Power Failure Override – Jumpers to set desired units to run on loss of control power.

P. Outputs

1. Normally Open Contact for each Unit Controlled (8 total)
2. Form C Contact for Common Alarm Output (1 total)
3. Form C Contact for Humidity Control Lockout (1 total)
4. Form C Contact for Optional Control Lockout (1 total)

Q. Communications

1. RS-232 port for Terminal Interface
2. RS-232 port for Modem
  - a. Dial-out on Alarms
  - b. Dial-in Menu/Terminal Operation
3. RS-422 proprietary port for SiteScan Interface

## SECTION 270528 –TELECOMMUNICATIONS PATHWAYS

**NOTE: THE ARCHITECT/ENGINEER TO PROVIDE THE ADDITIONAL SECTIONS IN THIS SPECIFICATION.**

### 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/EIA-569-A.

#### 2.2 CABLE TRAYS

##### A. Cable tray installations shall be the primary pathway method used for extension of backbone cable plant between Telecommunication Room’s (TR’s):

1. Comply with EIA/TIA 570.
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. Trays shall be hot dip galvanized steel, lass B material. All fittings and supports shall be hot dip galvanized steel. 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.
7. Manufacturers: M.P. Husky, T.J. Cope and B-Line Systems
8. Cable Tray Materials: Metal, suitable for indoors, and protected against corrosion by electroplated zinc galvanizing, complying with ASTM B 633, Type 1, not less than 0.000472 inch thick.

## 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 Outside Plant Telecommunication Pathways are:
    - a. Trade Size 4 Inch PVC type C or Galvanized Steel/Iron Pipe
    - b. Trade Size 2 Inch PVC type C or Galvanized Steel/Iron Pipe
    - c. Trade Size 1 Inch PVC type C or Galvanized Steel/Iron Pipe
  2. Typical conduit trade sizes used in Inside Plant Telecommunication Pathways are:
    - a. Trade Size ¾ Inch EMT
    - b. Trade Size 1 Inch EMT
    - c. Trade Size 1 ½ Inch EMT
    - 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 UNDERGROUND DUCT BANKS

### A. Underground Duct Banks, Manholes/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.

### B. Duct Material:

1. Typical conduit (Duct) trade sizes used in Outside Plant Telecommunication Pathways are:
  - a. Trade Size 4 Inch PVC type C or Galvanized Steel/Iron Pipe

### C. Telecommunication Handholes and Manholes ( A.K.A. Maintenance Holes)

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 Manholes:
  - a. Shall not be used by lighting and power cable plant
  - b. Used for Telecommunication cable pulling and splicing
  - c. Manhole covers and frames shall be load rated for expected traffic load.
  - d. Standard Manhole Configurations:
    - 1) Type A
    - 2) Type J
    - 3) Type V
    - 4) Application specific design as field and cable density/routing conditions require.
  - e. Typical Manhole Corrosion Resistant Accessories:
    - 1) Sump
    - 2) Ladder
    - 3) Cable Rack/Ladder
    - 4) Pulling Eyes
    - 5) 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.

## 2.5 INNERDUCTS

- A. Contractor shall install two types of innerduct. Outside plant innerduct shall be installed in UG conduits and duct banks. 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.
  3. Outside Plant Inner Ducts shall be 1.00-inch, 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 manholes to interconnection cabinets within buildings.
  - d. Innerduct reel lengths shall be provided as necessary to insure that ducts are continuous; one piece runs from manhole/handhole to manhole/handhole. No innerduct connectors will be allowed between manholes/handholes.
  - 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.
- 4. At Building entrances locations, innerduct shall be extended into racking infrastructure and securely fasten to prevent pull back into the conduit systems.
  - 5. In manholes planned for cable pull through, (non-pull point for cable) innerduct shall be properly racked and secure to minimize congestion in the manholes. In manholes 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.
  - 6. At each manhole and cable entrance to the facility, the inner ducts shall be labeled to indicate cable (s) supported inside the innerduct.
  - 7. Design Selection: Carlon, Integral or equal.

## 2.6 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

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

## 2.7 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:
    - a. Each bar shall be installed with isolated standoff mounts.

- b. Minimal bar size is 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.

## 2.8 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."

## 2.9 CABLE MANAGEMENT SYSTEM

- A. The BWI Cable Management system and methods required for compliance with the system is under development by MAA OAT at the time of this document development. Contact MAA OAT for guidance on cable management requirements, cable identification schemes and labeling conventions.

## SECTION 271100 – TELECOMMUNICATIONS ROOM FITTINGS

**NOTE: THE ARCHITECT/ENGINEER TO PROVIDE THE ADDITIONAL SECTIONS IN THIS SPECIFICATION.**

### 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 fit-out 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/EIA-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 Cable Trays:

1. Refer to Telecommunication Pathways Standard Section 270528:
2. All communications rooms shall be equipped with cable runway systems which encircle the rooms. This cable runway system shall be configured as shown on the drawings. Furnish and install complete runway system including but not limited to the following hardware:
  - a. Cable runway system shall be 18" wide with rung spacing of 9".
3. The runway system shall be made of rectangular steel tubing rated to support a minimum of 25-lbs. /linear foot.
4. The system shall include:
  - a. Runway stringers
  - b. Vertical 45 & 90-degree bends for height transitions.
  - c. Horizontal 45 & 90-degree bends for direction transitions.
  - d. Transition hardware for interface to IDF to IDF cable tray.
  - e. Grounding Kit
  - f. Ladder for vertical cable support
  - g. Radii runway drop-outs for transition to racks and cabinets.
  - h. Runway attachment hardware and fittings for wall and ceiling attachment.
  - i. Finish shall be UL classified yellow zinc dichromate.

## 2.3 BACKBOARDS (WALL LININGS)

### A. Backboards:

1. AC grade plywood, 3/4 by 48 by 96 inches (19 by 1220 by 2440 mm) mounted vertically.
2. Backboards shall be free of surface defects such as knots and cracks.
3. Paint each backboard with two coats of white fire retardant intumescent paint.



4. Coordinate with electrical power and other trades for light switch, power outlet and other fixture locations prior to placement of backboards.
5. Comply with requirements in Division 06 Section "Rough Carpentry" for plywood backing panels.

## 2.4 EQUIPMENT RACKS AND CABINETS

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

## 2.5 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.

## 2.6 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.

## 2.7 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:
    - a. Each bar shall be installed with isolated standoff mounts.
    - b. Minimal bar size is ¼" 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 equal.

## 2.8 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. Coordinate with MAA OAT for labeling scheme

## 2.9 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.

## 2.10 TELECOMMUNICATION ROOM (TR) BUILD-OUT

A. Telecommunications rooms indicated on the project drawings shall be built-out to support the intended use of the rooms. In addition to the equipment specifically mentioned defined in this and other Sections. The rooms shall be equipped with the following hardware and materials in configurations as shown on the drawings.

1. Plywood equipment mounting backboards. backboards shall be sufficiently anchored to support expected lifetime loading. Install with eight-foot length oriented vertically. Backboards shall meet or exceed the following requirements:
  - a. Backboards shall be 8'x 4'x  $\frac{3}{4}$ " AC grade plywood
  - b. Backboards shall be free of surface defects such as knots and cracks.
  - c. Paint each backboard with two coats of white fire retardant intumescent paint.
  - d. Coordinate with electrical power and other trades for light switch, power outlet and other fixture locations prior to placement of backboards

2. Cabling restraints and routes: Each backboard associated with cable terminations shall be provisioned with industry standard, cable restraint hardware. Provide sufficient quantities to assure cables routed on backboards are restraint at intervals not exceeding 1 foot. All cables shall be routed parallel and perpendicular to communication room floors. A minimum 10-foot maintenance slack for each copper backbone cable shall be allowed for in the routes prior to termination. Two types of restraints are required for backboards:
  - a. D-Ring type cable restraints shall be utilized for Backbone and horizontal cabling on the backboards.
  - b. Spindles and/or wire managers for voice cross-connect wiring.
3. Patch Cable Raceways: Each TR shall be furnished with raceways dedicated to inter-rack/cabinet routing of patch cables. The raceway shall be specifically design to support the transition of Cat 6 UTP and fiber optic cable between cable ladders, adjacent racks and cabinets. Patch cable raceways shall be provided over each rack and cabinet identified in the project drawings. Each cabinet and rack shall be furnished with a support patch cable raceway drop.
  - a. Design selection: ADC Fiber-Guide System or approved equal.
  - b. Patch Cable Raceway system shall include:
    - 1) 4-inch wide straight sections
    - 2) 4-inch to 2 inch junctions
    - 3) Fittings including: Tee's, elbows, vertical duct kits, downspouts, junctions and transitions as required to support patch cable routing in each TR.
    - 4) Raceways cover kits with latched, removable covers.
    - 5) Support kits required to attach raceway to ceilings, walls and to cable ladders and rack/cabinets.
4. Labeling of racks, cabinets and enclosures: Each rack, cabinet and enclosure depicted in the drawings as a portion of this Section's work shall be permanently labeled with engraved black on white laminate defining rack / cabinet / or enclosure identification number and user.

## 2.11 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 PWDS installation shall be provided in a level of quality consistent with other specified items.

## SECTION 271300 –COMMUNICATIONS BACKBONE CABLING

**NOTE: THE ARCHITECT/ENGINEER TO PROVIDE THE ADDITIONAL SECTIONS IN THIS SPECIFICATION.**

### 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, 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
2. Comply with ICEA S-90-661 for mechanical properties.
2. Comply with TIA/EIA-568-B.1 for performance specifications.
3. Comply with TIA/EIA-568-B.2,
4. 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.
5. Copper 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.) Communications, General Purpose: Type CM or CMG.
  - b.) Communications, Plenum Rated: Type CMP, complying with NFPA 262.
  - c.) Communications, Limited Purpose: Type CMX.
  - d.) Multipurpose: Type MP or MPG.
  - e.) Multipurpose, Plenum Rated: Type MPP, complying with NFPA 262.

## 2.2 BACKBONE COPPER CABLING

### A. General:

- 1. Backbone Copper Cabling currently accepted for installation at BWI includes several product types and pair counts suitable for various applications. Typical Copper Backbone cable types include the following:
  - a.) Inside Plant Plenum Rated: Plenum cable shall comply with requirements of the National Electric Code article 800.50 for plenum cable, and shall be marked with CMP designation
  - b.) Inside plant Riser Rated: Riser cable shall comply with requirements of the National Electric Code article 800.50 for riser cable, and shall be marked with CMR designation
  - c.) Outside Plant: Outside Plant cable shall be suitable for installations in underground ducts and/or direct buried.



- B. Inside Plant Backbone Copper Cable shall consist of 24 AWG twisted pair cabling, rated as TIA/EIA Category 3. Individual twisted pairs shall be color coded. Backbone cable with pair counts exceeding 25 Pairs shall be arranged in color coded 25-pair binder groups.
- C. Inside Plant Backbone Copper Cable Manufacturers:
  - 1. Design Selection for Copper Backbone Plenum Cable: Superior Essex CAT 3 CMP or approved equal
- D. Outside Plant (Backbone) Copper Cable shall consist of 24 AWG twisted pair cabling, rated as TIA/EIA Category 3, configured with an overall shield. Individual twisted pairs shall be color coded. Backbone cable with pair counts exceeding 25 Pairs shall be arranged in color coded 25-pair binder groups.”. Outside Plant Copper Backbone cable shall be suitable for under ground installation in conduit or as direct buried cable. Outside plant cable shall be provided as “filled cable” with water penetration/migration protection. Provide pair counts as indicated in project drawings.
- E. Outside Plant Backbone Copper Cable Manufacturers:
  - 1. Design Selection: Superior Essex SealPIC-FSF, (RDUP PE 89) or approved equal

## 2.3. COPPER BACKBONE CABLE TERMINATION HARDWARE

### A. General Requirements for Copper Backbone Cable Termination Hardware:

Backbone copper cable termination systems shall be furnished and installed at each location indicated in the project drawings as follows:

- 1. Inside Plant Copper Backbone Cable Termination Requirements include:
  - a.) Each pair shall be terminated using ADC/Krone 10–pair Series 2 punchdown hardware.
  - b.) Provide punchdown blocks with capacities and in quantities suitable to support the number of pairs included in the cable planned for termination, plus 25 percent spare capacity for future growth.
  - c.) Provide punchdown blocks with color coded labeling strips.
  - d.) Provide punchdown blocks with accessories required for a complete installation and proper cable management.
  - e.) Punchdown blocks and accessories shall be available in two common configurations: Wall Mount or Rack mount.
- 2. Design Selection for Inside Plant Copper Backbone cable:

- a.) ADC/Krone 10-pair termination Series 2 termination system with accessories suitable for wall mounting or rack mounting.
3. Outside Plant Copper Backbone Cable Termination Requirements include:
- a.) Outside Plant Copper Cable shall be terminated with lightning and surge protection hardware, within 50-feet of the cable entrance into a facility. Protection shall comply with NEC.30A, ANSI J-STD-607-A and NFPA 780.
  - b.) Protection Hardware shall provide primary and secondary protection against lightning, inducted current and noise which may ride on the conductors. Primary Protection shall be compliant with and labeled as UL-497 rated. Secondary Protection shall be designed to protect against sneak currents and be compliant with, rated and labeled as UL-497A. Gas type protection modules shall be used.
  - c.) Cable Entrance Protection hardware shall be properly bonded and grounded to local telecommunications ground Busbar.
  - d.) Accessories provided with termination of outside plant copper backbone terminations shall include: Hardware frame, Cable splice enclosures, Tip cables, punchdown blocks for interface to inside plant cable system, and mounting accessories as required for rack or wall mounting.
  - e.) Each pair shall be terminated using ADC Krone 10 Pair Series 2-type punchdown hardware.
  - f.) Provide punchdown blocks with capacities and in quantities suitable to support the number of pairs included in the cable planned for termination, plus 25 percent spare capacity for future growth.
  - g.) Provide punchdown blocks with ADC/Krone type 105 label strips.
  - h.) Provide punchdown blocks with accessories required for a complete installation and proper cable management.
  - i.) Protection and punchdown hardware and accessories shall be available in two common configurations: Wall Mount or Rack mount.
2. Design Selection for Outside Plant Copper Backbone Cable Protection & Termination:
- a.) Commscope AT-9040 connectors loaded with C3B 5-pin modules for the Protection system with accessories suitable for wall mounting or rack mounting
  - b.) Terminate tip cables on Krone 10-pair , Series 2

## 2.4 COPPER CABLE SPLICING

### A. General Copper Splicing.

1. Backbone copper cable splicing includes splicing of new and existing cables at required.
2. Splice enclosures shall support pair counts and cable configurations planned for splicing. Enclosures shall be designed for use in manhole environments and or cable entrance locations. 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.
  - e. Chemically resistant to aviation fuel and Glycol
  - f. Include accessories for copper splicing: which may include splice modules for bridged, straight and half tap, encapsulate, consumables and other items as recommended by the manufacture.
3. Design Selection for Copper OSP Splice Enclosures:
  - a. 3M: Closure 2 type 505 with 710 type splice modules
  - b. Preformed Line Products: Pressurized enclosures with splice modules

## 2.5 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.
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.

### C. Multimode Backbone Fiber Types:

1. 62.5/125-micrometer
    - a. Maximum Attenuation: 3.50 dB/km at 850 nm; 1.5 dB/km at 1300 nm.
    - b. Minimum Modal Bandwidth: 160 MHz-km at 850 nm; 500 MHz-km at 1300 nm.
    - c. Jacket Color: Orange or Black
  2. Multimode Backbone Fiber Cable Configuration
    - a. Strand Count (Typically 6 to 144 strands in 12 fiber units) Early in design process, coordinate with MAA OAT regarding fiber strand counts
    - b. Inside Plant Backbone fiber shall be configured as “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. Multimode 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.
- E. 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 MHz-km at 1550 nm.
  2. Singlemode Backbone Fiber Cable Configuration
    - a. Strand Count (Typically 6 to 144 strands in 12 fiber units) Early in design process, coordinate with MAA OAT regarding fiber strand counts.
    - 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

- F. 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.

## 2.6 BACKBONE CABLE OPTICAL FIBER TERMINATIONS

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

1. General
  - a. Multimode and Singlemode fiber shall be terminated in separate, dedicated rack or wall mount patch panels.
  - b. Rack & Wall Mount Fiber terminations shall include vertical and horizontal cable restraint, organization and support brackets as required for each panel.
  - c. Rack & Wall Mounted Fiber Optic Patch panels shall support a minimum of 24 ports, and include permanent port numbering identification.
  - d. Multimode fiber termination loss shall not exceed .75 dBm
  - e. Singlemode fiber termination loss shall not exceed .50 dBm
2. Multimode Fiber Optic Patch Panels:
  - a. Multimode fiber optic patch panels shall support termination of horizontal fiber optic cable using one of the following approved methods:
    - 1). Field Terminated direct connection using factory approved breakout kits.
    - 2). Termination utilizing factory built, connectorized pigtails and fusion splicing.

- b. Multimode fiber shall be terminated using ceramic ferrule, ST 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. Multimode fiber optic patch panels shall be fully loaded with ST adapters (ports).
- 3. 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 pigtailed 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).
- 4. Design Selection for Fiber Optic Patch Panel products:
  - a. Ortronics ORMMAC 625 Series (minimum of 36 ports)
  - b. Load panels with couplers for :
    - 1.) Singlemode fiber – SC type couplers plates (Ortronics P/N: 615 SC
    - 2.) Multimode fiber – ST type couplers plates (Ortronics P/N: 615 ST

C. 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

## 2.7 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 manhole environments, supporting multiple singlemode and multimode fiber cables. Splice enclosures shall meet or exceed the following
  - g. Tested for compliance with Telcordia GR-771
  - h. RUS Listed
  - i. Properly sized to support strand counts planned for splice
  - j. 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.
  - k. Chemically resistant to aviation fuel and Glycol
  - l. Include accessories for fusion splicing: trays, heat shrink splice protection sleeves, encapsulate and other items as recommended by the manufacture.
4. Design Selection for Fiber Optic OSP Splice Enclosures:
  - c. Corning: SCF-6Cxx-xx-xxx
  - d. AFL: LG-250
  - e. Approved equivalents

## 2.8 IDENTIFICATION METHODS AND LABELING 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 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.

## 2.9 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
    - d. Multimode fiber tested at both 850nm and 1300 nm wavelengths
    - f. Test results documented and submitted in both hard copy and software files.Copper Test Requirements:
    - a. Cable shield –test for isolation from ground



- b. Pairs shall be tested for continuity
  - c. Pairs shall follow sequential counts
  - d. Pairs shall be tested for shorts
  - e. Pairs shall be tested for opens
  - f. Pairs shall be tested for transpositions
  - g. 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.1.
  - D. Factory test UTP cables according to TIA/EIA-568-B.2.
  - E. Factory test multimode optical fiber cables according to TIA/EIA-526-14-A and TIA/EIA-568-B.3.
  - F. Cable will be considered defective if it does not pass tests and inspections.
  - G. Prepare and submit for approval, test results and inspection reports.

**END OF SECTION 271300**

## SECTION 271500 –TELECOMMUNICATIONS HORIZONTAL CABLING

**NOTE: THE ARCHITECT/ENGINEER TO PROVIDE THE ADDITIONAL SECTIONS IN THIS SPECIFICATION.**

### 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 3 CAT6 UTP cables. Two of these cables shall have blue jackets and are terminated for data signaling, the third CAT 6 cable 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:
  - a. Communications, Plenum Rated: Type CMP, complying with NFPA 262.
  - b. 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

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

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.
2. 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 where 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 LABELING 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.

## 2.8 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.
- G. Prepare test and inspection reports.

**END OF SECTION 271500**

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## ***APPENDIX C: ABBREVIATIONS***

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AC	Alternating Current
ACR	Attenuation to Crosstalk Ratio
ADP	Automated Data Processing
ANSI	American National Standards Institute
AWG	American Wire Gauge
CAT	Category
CSA	Canadian Standards Association
dB	Decibel
DCB	Data Communication Branch
EF	Entrance Facility
EIA	Electronic Industries Association
EMI	Electromagnetic Interference
FCC	Federal Communications Commission
HVAC	Heating, Ventilation, and Air Conditioning
ID	Identification
IDC	Insertion Displacement Connector
IDF	Intermediate Distribution Frame
IEEE	Institute of Electrical and Electronics Engineers
ISO	International Organization for Standardization
km	kilometers
LAN	local area network
μm	micrometer
Mbps	Megabits per second
MC	main cross-connect
MDF	Main Distribution Frame
MHz	MegaHertz
NEC	National Electrical Code
NEBS	National Electrical Bell Standards
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Agency
ns	nanosecond
OFNP	Optical Fiber Plenum
OFNR	Optical Fiber Riser
OFN	Optical Fiber, not rated

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OIRM	Office of Information Resource Management
OTDR	Optical Time Domain Reflectometer
TIA	Telecommunications Industries Association
TMGB	Telecommunication Main Grounding Busbar
TR	Telecommunication Room
UL	Underwriter's Laboratory
USOC	Universal Service Order Code
UTP	Unshielded Twisted Pair
WAN	wide area network



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# APPENDIX F

## MARTIN STATE AIRPORT SURVEY CONTROL MANUAL





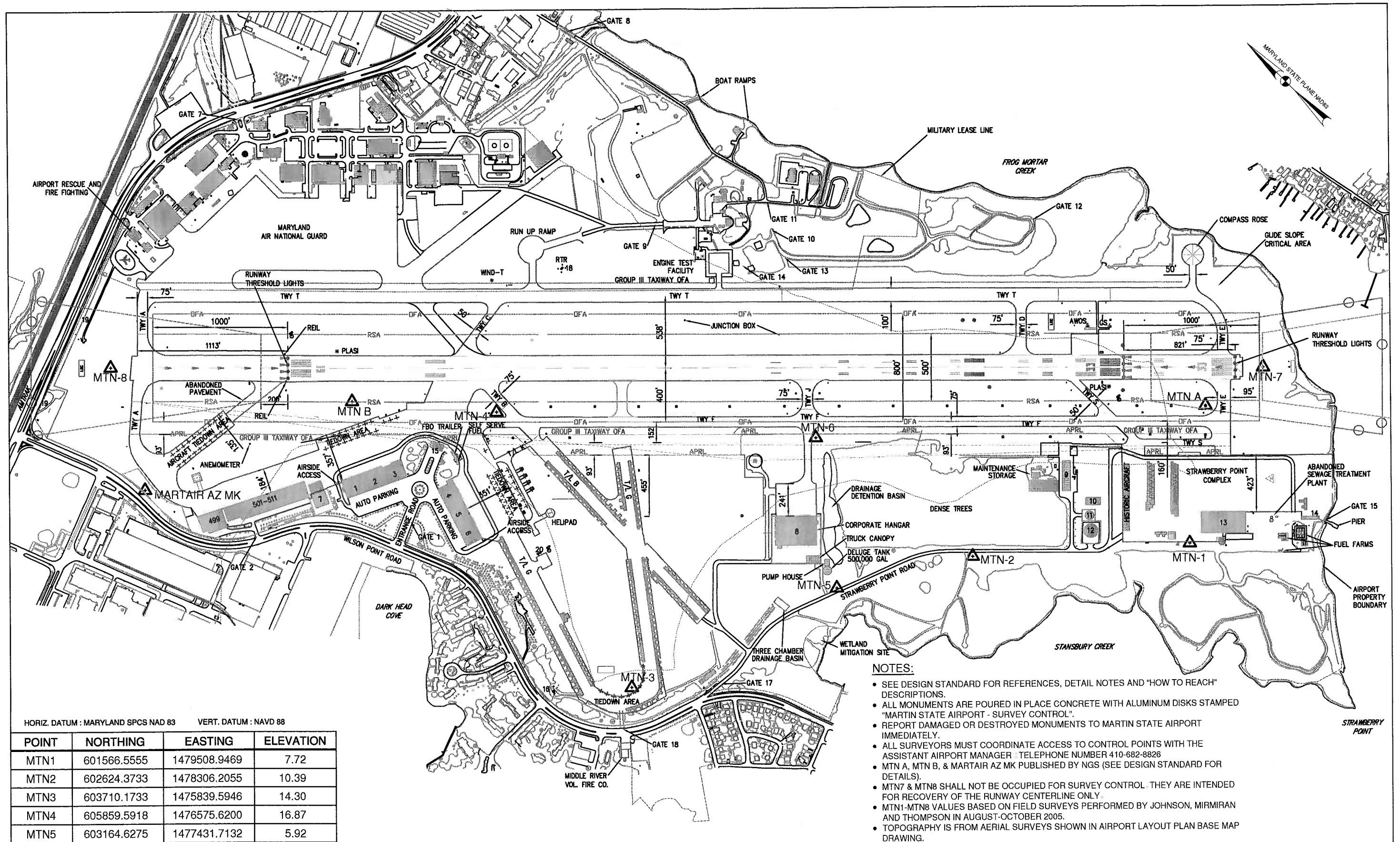
**MARTIN STATE AIRPORT**

## **Survey Control Manual**

**November 11, 2005**

**Important Note:**

**All Surveys Performed at Martin State Airport after November 11, 2005 are to Utilize this Manual and must be tied to the Martin State Airport Survey Control Network.**



HORIZ. DATUM : MARYLAND SPCS NAD 83 VERT. DATUM : NAVD 88

POINT	NORTHING	EASTING	ELEVATION
MTN1	601566.5555	1479508.9469	7.72
MTN2	602624.3733	1478306.2055	10.39
MTN3	603710.1733	1475839.5946	14.30
MTN4	605859.5918	1476575.6200	16.87
MTN5	603164.6275	1477431.7132	5.92
MTN6	604064.3021	1478107.5955	12.90

UNITS : U.S. SURVEY FEET

DESIGNED: DRAWN BY: BRH CHECKED: DKS APPROVED: DAL		REVISION NO.    REVISION DATE    REVISION DESCRIPTION		<b>MARTIN STATE AIRPORT</b> MARYLAND DEPARTMENT OF TRANSPORTATION MARYLAND AVIATION ADMINISTRATION OFFICE OF PLANNING AND ENGINEERING		PROJECT TITLE: SHEET TITLE: <b>SURVEY CONTROL</b>		CONTRACT NO. SCALE: NOT TO SCALE SHEET NO.	
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# MARTIN STATE AIRPORT (MTN) - SURVEY CONTROL DATA

NAME OF STATION: MTN-1

DATE ESTABLISHED: August 2005

## MARYLAND STATE PLANE COORDINATES (NAD 83):

NORTHING (Y):	601566.5555 US ft.	183357.853 m
EASTING (X):	1479508.9469 US ft.	450955.229 m
ORTHOMETRIC HEIGHT (NAVD 88):	7.72 US ft.	2.353 m
CONVERGENCE ANGLE:	0°22'15.1"	
SCALE FACTOR:	0.99997943	
COMBINED SCALE FACTOR:	0.99998425	

## GEOGRAPHIC COORDINATES (NAD 83):

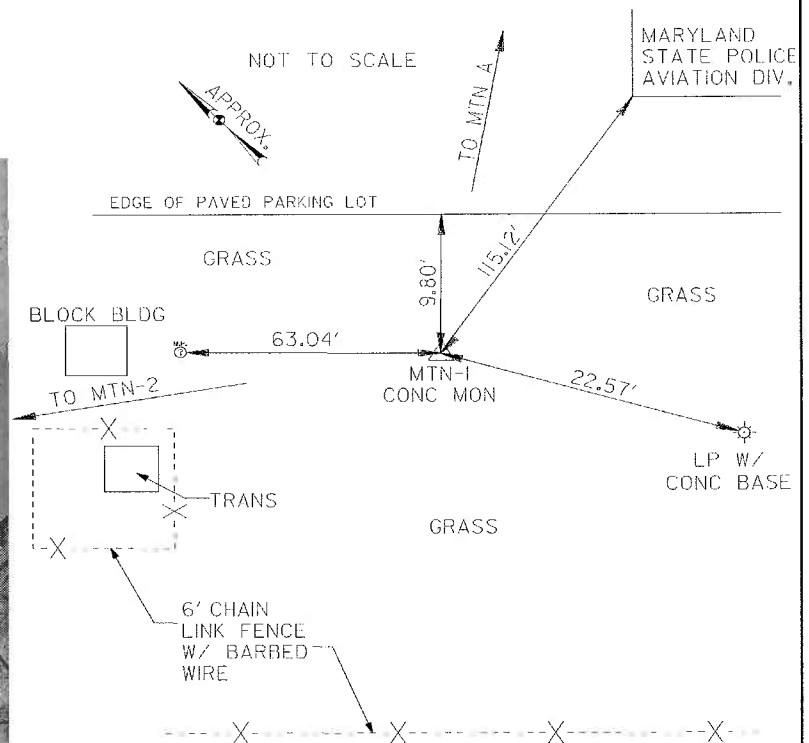
LATITUDE:	39°19'01.04312" (N)	
LONGITUDE:	76°24'32.83307" (W)	
ELLIPSOID HT:	-100.628 US ft.	-30.671 m

## AVAILABLE CONVENTIONAL BACKSIGHT POINTS (FIELD DATA):

POINT	AZIMUTH	DISTANCE (US FT.)	DISTANCE (m)
MTN A	51° 15' 50"	1027.33	313.131
MTN-2	311° 19' 55"	1601.77	488.220

## STATION DESCRIPTION:

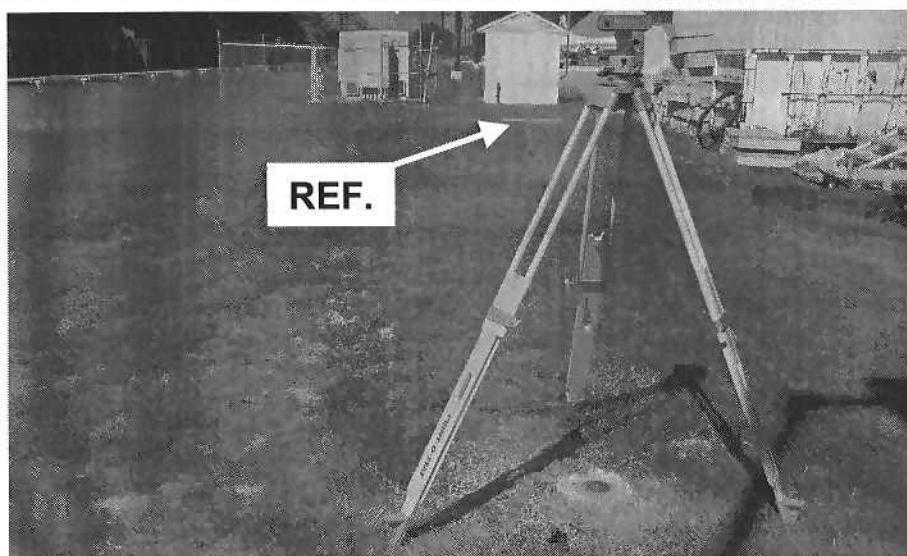
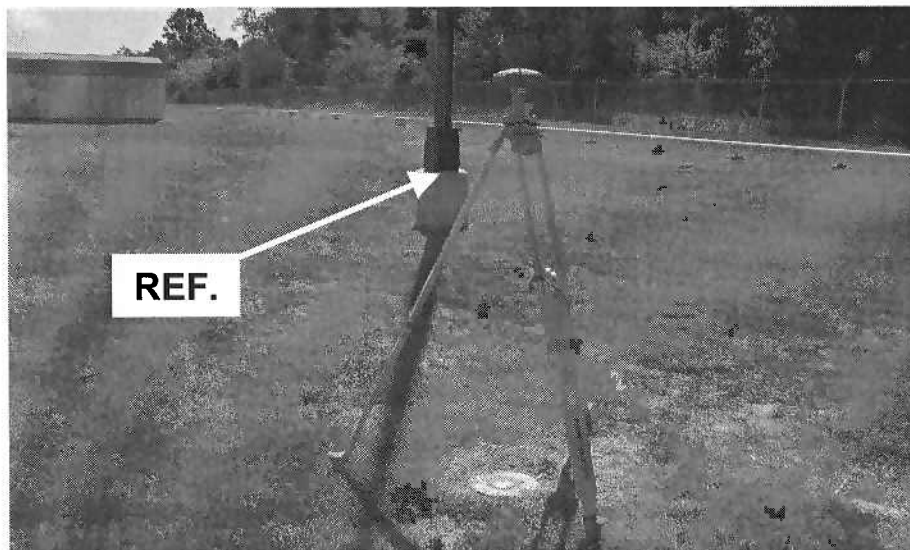
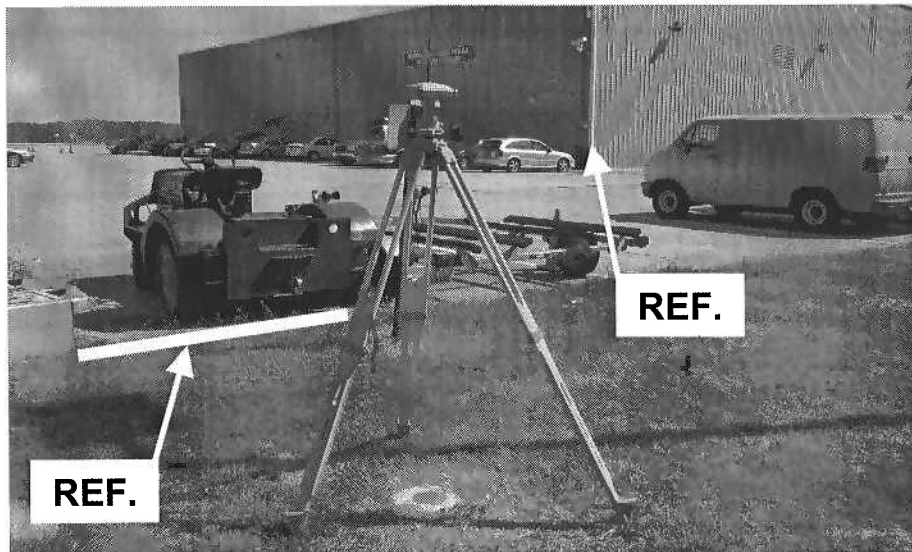
To reach the monument from the traffic circle at MTN airport in front of the air traffic control tower, proceed S to Airside Access point by Hangars 4-6. After passing through the fence, proceed NE to the second Stop sign. Turn right and proceed SE past private plane hangars. Road will curve to the left, bearing North. At the intersection of T/L B and T/L G, turn right and proceed SE to Yield sign. Continue to Stop sign at Strawberry Point Road. Turn left on Strawberry Point Road. Continue past the entrance road to the maintenance shop and the salt dome. Road will turn to the left (North), passing along the back side of the historic aircraft display. Turn right (east) at the end of the road, continue to turn right, heading South along the front of the historic aircraft display. Monument is SW of the SW corner of the Strawberry Point Complex Maryland State Police hangar. Monument is 9.80' SW of the SW edge of paved parking lot, 63.04' SE of manhole in concrete, 22.57' NE of light pole with concrete base.



SURVEYED BY: JMT ENGINEERING

SPARKS, MARYLAND





# MARTIN STATE AIRPORT (MTN) - SURVEY CONTROL DATA

**NAME OF STATION:** MTN-2

**DATE ESTABLISHED:** August 2005

**MARYLAND STATE PLANE COORDINATES (NAD 83):**

NORTHING (Y):	602624.3733 US ft.	183680.276 m
EASTING (X):	1478306.2055 US ft.	450588.633 m
ORTHOMETRIC HEIGHT (NAVD 88):	10.39 US ft.	3.167 m
CONVERGENCE ANGLE:	0°22'05.5"	
SCALE FACTOR:	0.99997983	
COMBINED SCALE FACTOR:	0.99998451	

**GEOGRAPHIC COORDINATES (NAD 83):**

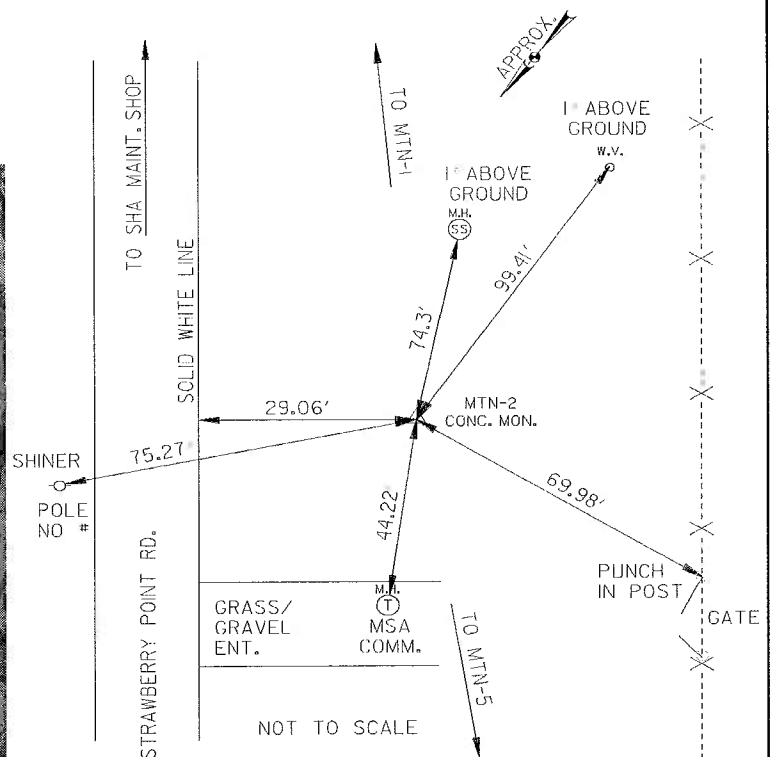
LATITUDE:	39°19'11.57473" (N)	
LONGITUDE:	76°24'48.05001" (W)	
ELLIPSOID HT:	-97.95 US ft.	-29.854 m

**AVAILABLE CONVENTIONAL BACKSIGHT POINTS (FIELD DATA):**

POINT	AZIMUTH	DISTANCE (US FT.)	DISTANCE (m)
MTN-1	131° 19' 55"	1601.78	488.224
MTN-5	301° 42' 27"	1027.94	313.317

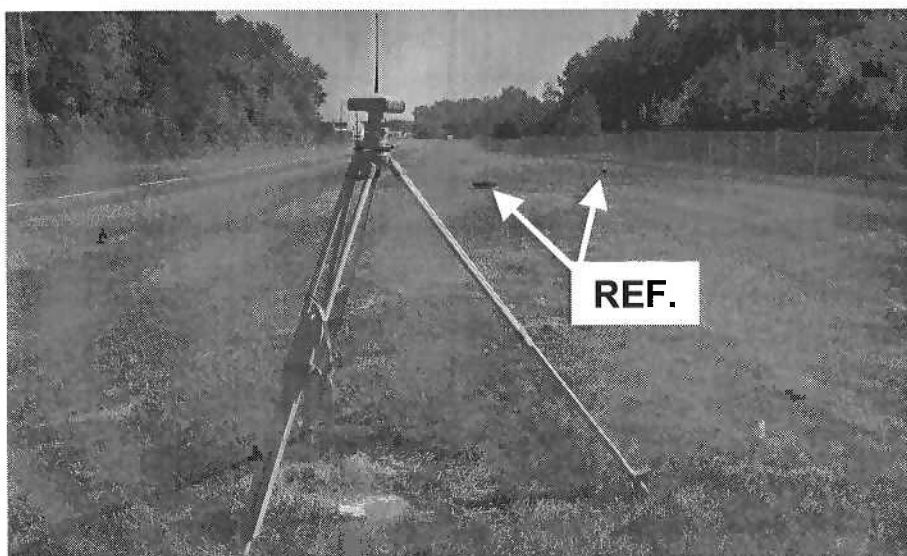
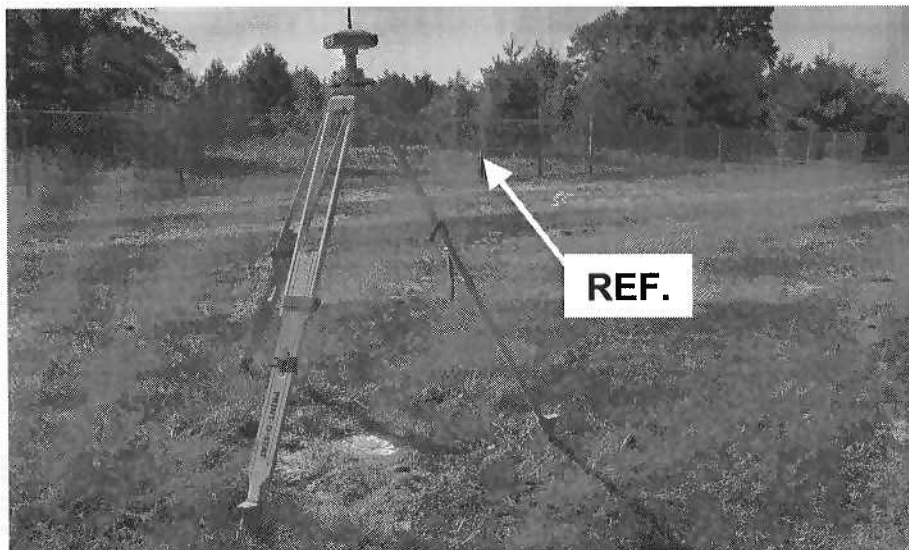
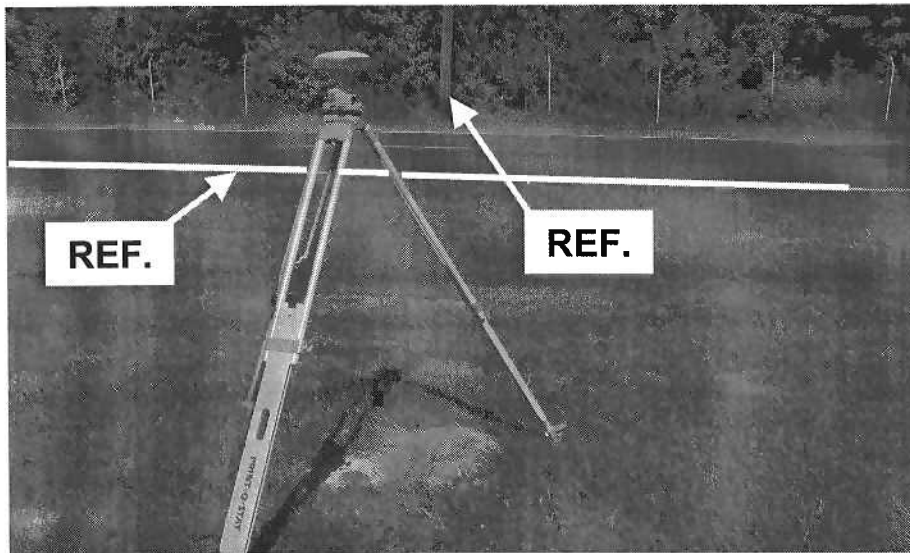
**STATION DESCRIPTION:**

To reach the monument from the traffic circle at MTN airport in front of the air traffic control tower, proceed S to Airside Access point by Hangars 4-6. After passing through the fence, proceed NE to the second Stop sign. Turn right and proceed SE past private plane hangars. Road will curve to the left, bearing North. At the intersection of T/L B and T/L G, turn right and proceed SE to Yield sign. Continue to Stop sign at Strawberry Point Road. Turn left on Strawberry Point Road. Proceed 1874 feet (0.35 mi.). Continue past the pump house and water tank to a gravel/grass lane and the station on the right. Monument is located 29.06' SW of SW edge of Strawberry Point Road, 74.3' N of Sanitary Sewer manhole 1' above ground, 99.41' N of water valve 1' above ground, 69.98' E of punch mark in southern gate post, 44.22' S of communications manhole in grass/gravel drive, 75.27' SW of nail and shiner in pole with no number.



**SURVEYED BY:** JMT ENGINEERING

**SPARKS, MARYLAND**



# MARTIN STATE AIRPORT (MTN) - SURVEY CONTROL DATA

NAME OF STATION: MTN-3

DATE ESTABLISHED: August 2005

## MARYLAND STATE PLANE COORDINATES (NAD 83):

NORTHING (Y):	603710.1733 US ft.	184011.229 m
EASTING (X):	1475839.5946 US ft.	449836.808 m
ORTHOMETRIC HEIGHT (NAVD 88):	14.30 US ft.	4.359 m
CONVERGENCE ANGLE:	0°21'45.9"	
SCALE FACTOR:	0.99998024	
COMBINED SCALE FACTOR:	0.99998473	

## GEOGRAPHIC COORDINATES (NAD 83):

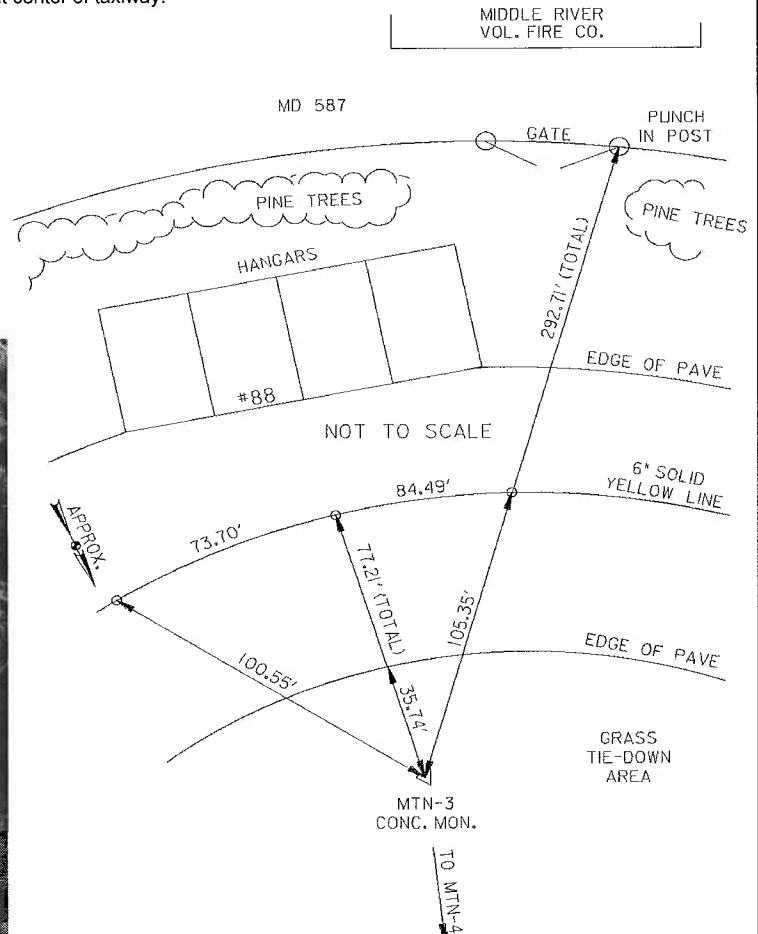
LATITUDE:	39°19'22.46174" (N)	
LONGITUDE:	76°25'19.34850" (W)	
ELLIPSOID HT:	-93.995 US ft.	-28.650 m

## AVAILABLE CONVENTIONAL BACKSIGHT POINTS (FIELD DATA):

POINT	AZIMUTH	DISTANCE (US FT.)	DISTANCE (m)
MTN-4	18° 54' 10"	2272.00	692.507

## STATION DESCRIPTION:

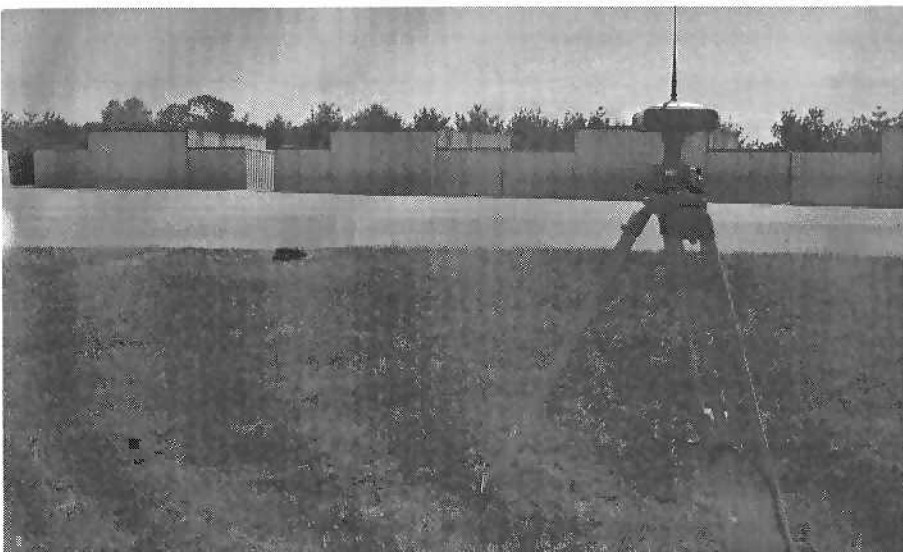
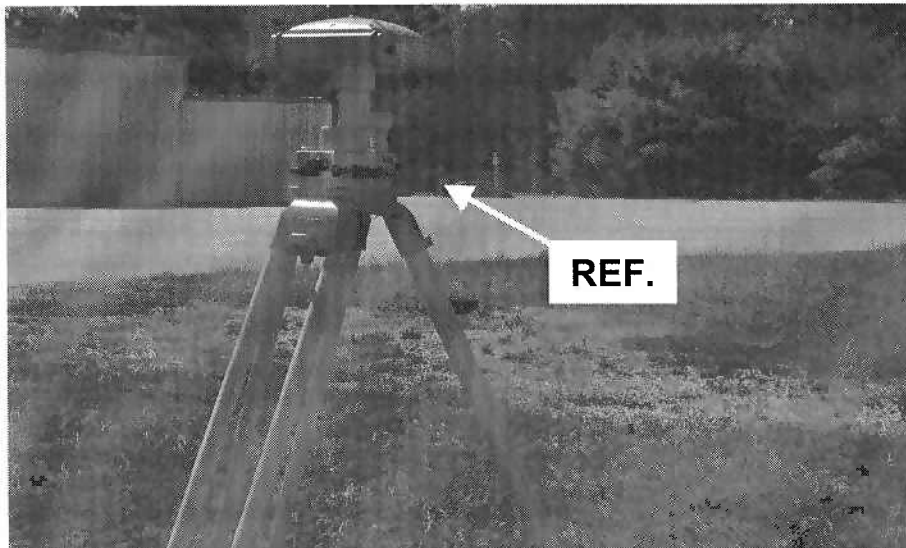
To reach the monument from the traffic circle at MTN airport in front of the air traffic control tower, proceed S to Airside Access point by Hangars 4-6. After passing through the fence, proceed NE to the second Stop sign. Turn right and proceed SE past private plane hangars. Where the road curves to the left, the station is on the left between aircraft tiedowns. Monument is 292.71' NE of punch mark in western gate post to MD 587, 105.35' NE of MAG Nail on same line, set in solid yellow line at center of taxiway, 77.21' N of MAG Nail set in solid yellow line at center of taxiway in line with Hanger #88, 35.74' N of N edge of taxiway on same line, 100.55' NW of MAG Nail set in solid yellow line at center of taxiway.



SURVEYED BY: JMT ENGINEERING

SPARKS, MARYLAND





# MARTIN STATE AIRPORT (MTN) - SURVEY CONTROL DATA

NAME OF STATION: MTN-4

DATE ESTABLISHED: August 2005

## MARYLAND STATE PLANE COORDINATES (NAD 83):

NORTHING (Y):	605859.5918 US ft.	184666.373 m
EASTING (X):	1476575.6200 US ft.	450061.149 m
ORTHOMETRIC HEIGHT (NAVD 88):	16.87 US ft.	5.142 m
CONVERGENCE ANGLE:	0°21'51.9"	
SCALE FACTOR:	0.99998104	
COMBINED SCALE FACTOR:	0.99998542	

## GEOGRAPHIC COORDINATES (NAD 83):

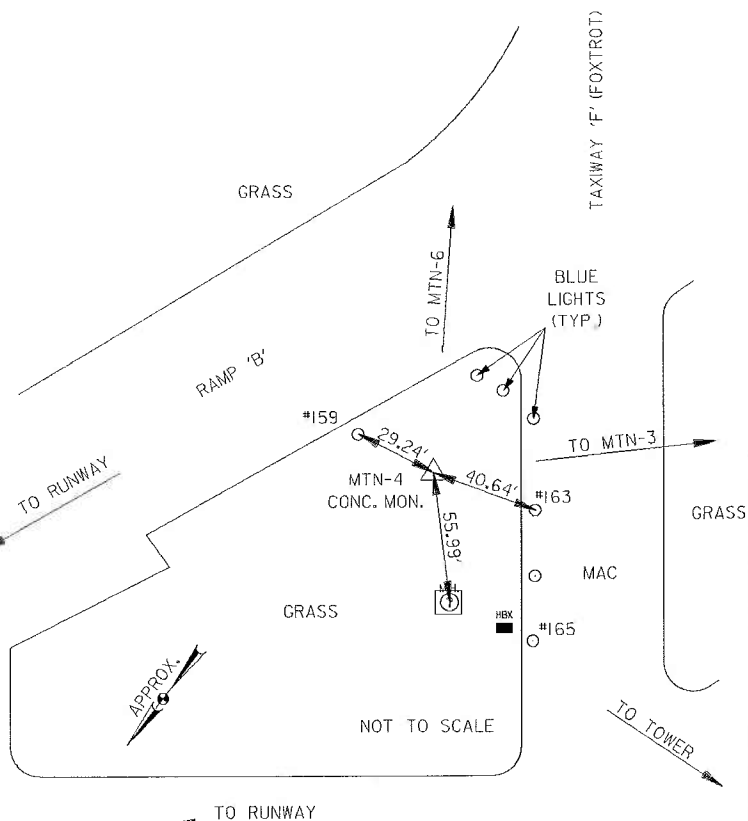
LATITUDE:	39°19'43.65932" (N)	
LONGITUDE:	76°25'09.80871" (W)	
ELLIPSOID HT:	-91.422 US ft.	-27.865 m

## AVAILABLE CONVENTIONAL BACKSIGHT POINTS (FIELD DATA):

POINT	AZIMUTH	DISTANCE (US FT.)	DISTANCE (m)
MTN B	318° 58' 21"	1076.78	328.203
MTN-3	198° 54' 10"	2271.98	692.499
MTN-6	139° 31' 29"	2360.13	719.369
MTN A	134° 20' 41"	5222.32	1591.765
MARTAIR AZ MK	302° 12' 00"	2675.15	815.387

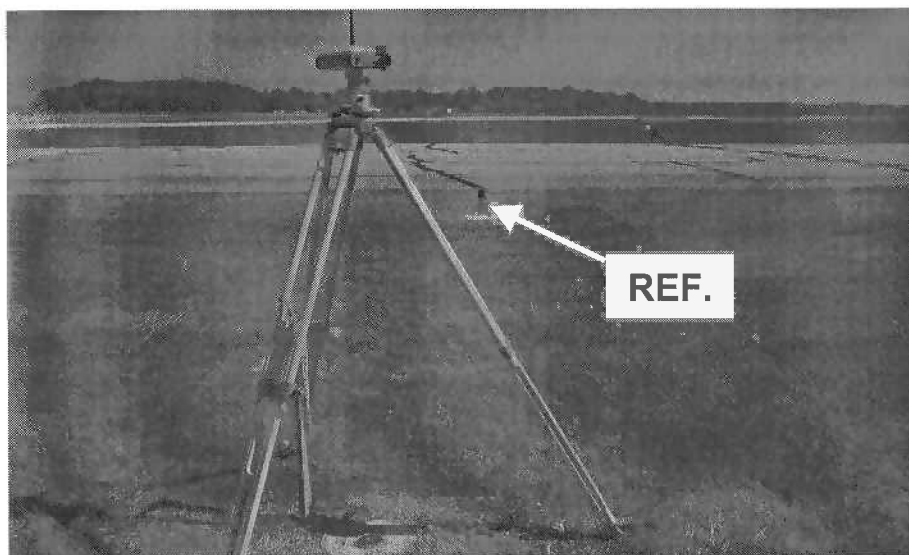
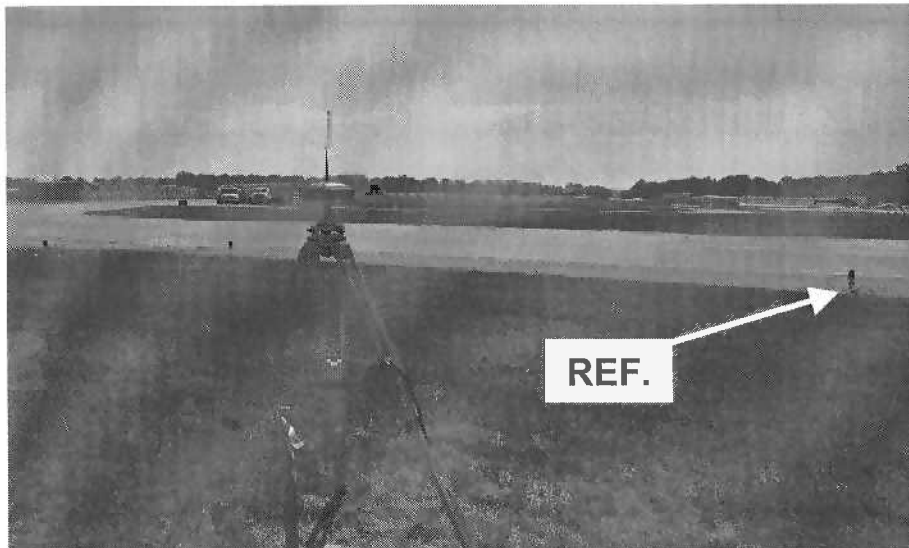
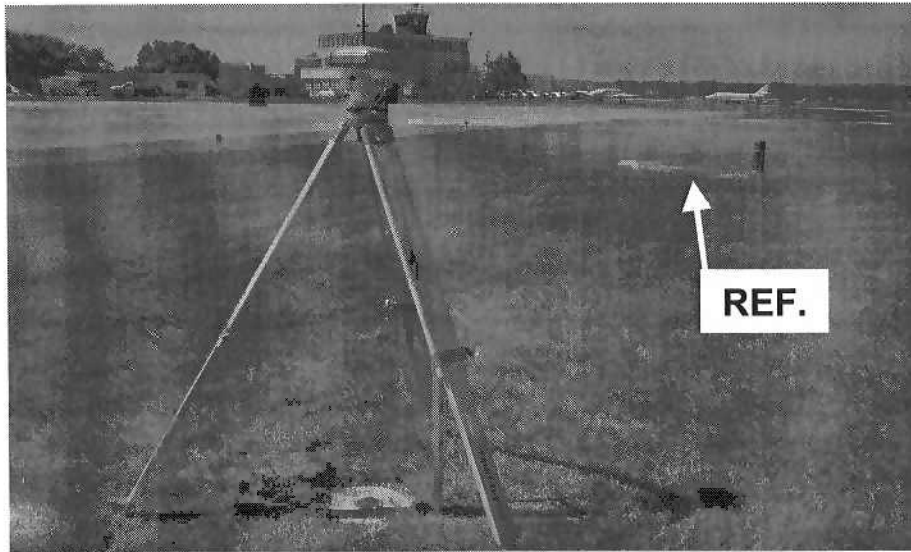
## STATION DESCRIPTION:

To reach the monument from the traffic circle at MTN airport in front of the air traffic control tower, proceed S to Airside Access point by Hangars 4-6. After passing through the fence, proceed NE to the second Stop sign. Turn left and pass in front of the helicopter hangar. Proceed to small triangular grass island next to Taxiway B in front of the air-traffic control tower and station on the right. Permission must be granted from Tower Control to cross Taxiway 'F' on foot (must park and walk out to MTN-4). Monument is 29.24' SW of ground light #159, 40.64' NE of ground light #163, and 55.99' from center of manhole in concrete.


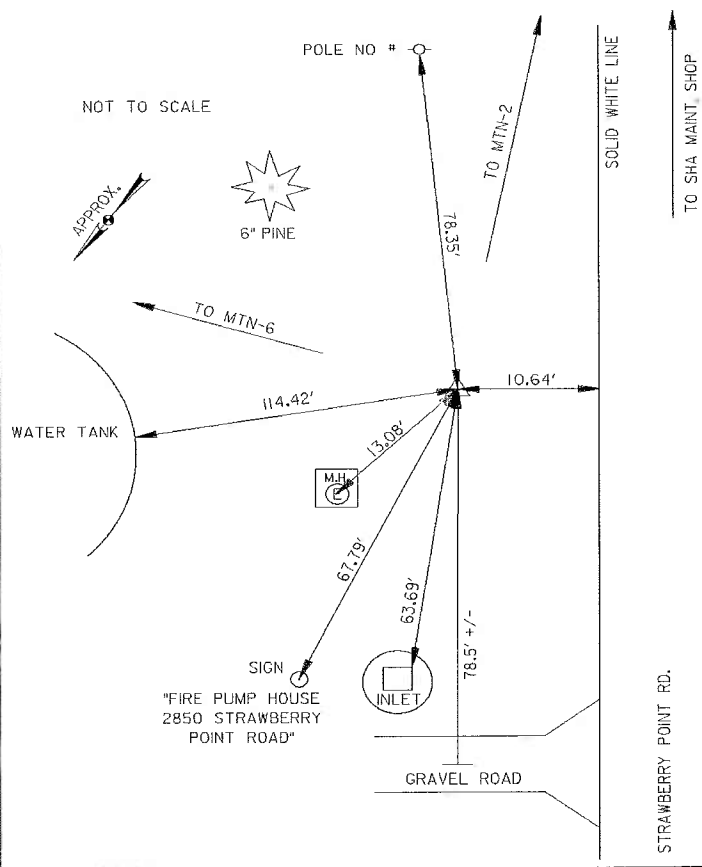


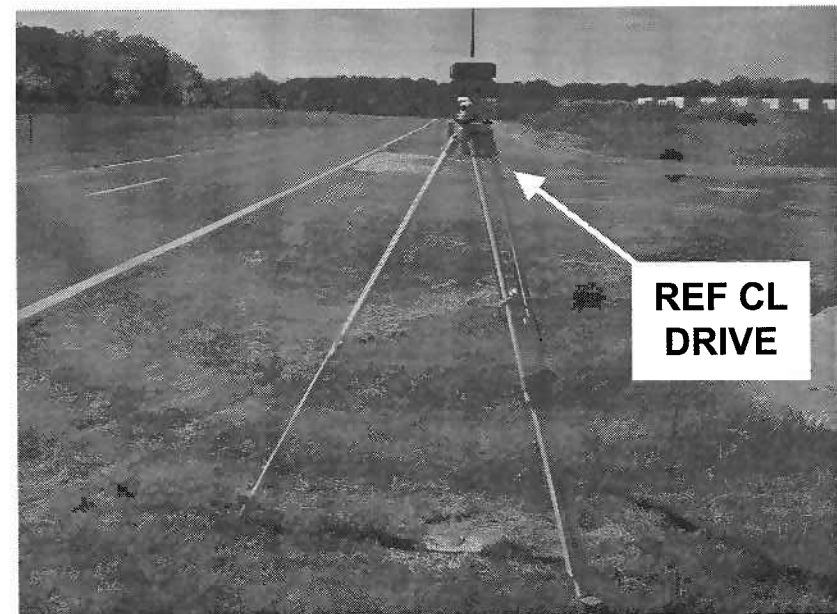
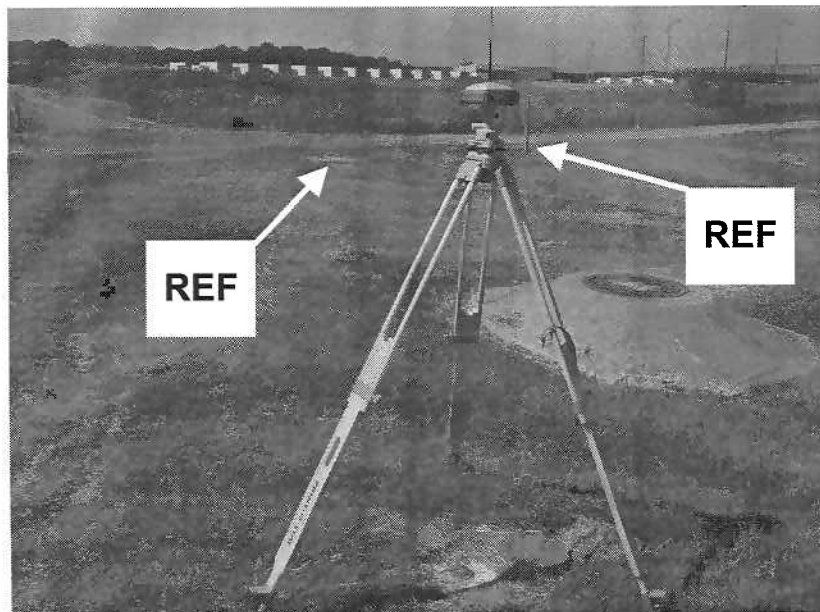
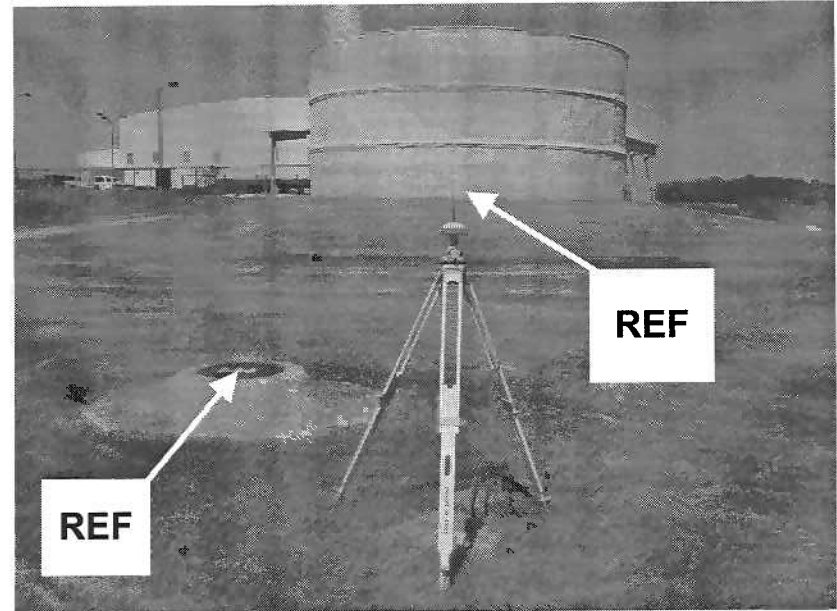
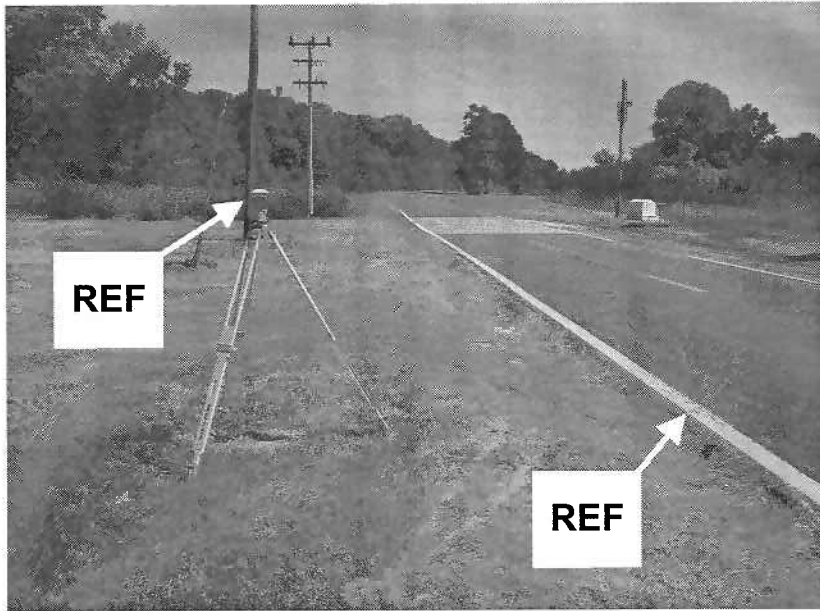
SURVEYED BY: JMT ENGINEERING

SPARKS, MARYLAND



# MARTIN STATE AIRPORT (MTN) - SURVEY CONTROL DATA

NAME OF STATION: MTN-5		DATE ESTABLISHED: August 2005	
<b>MARYLAND STATE PLANE COORDINATES (NAD 83):</b>			
NORTHING (Y):	603164.6275 US ft.	183844.946 m	
EASTING (X):	1477431.7132 US ft.	450322.087 m	
ORTHOMETRIC HEIGHT (NAVD 88)	5.92 US ft.	1.804 m	
CONVERGENCE ANGLE:	0°21'58.6"		
SCALE FACTOR:	0.99998003		
COMBINED SCALE FACTOR:	0.99998493		
<b>GEOGRAPHIC COORDINATES (NAD 83):</b>			
LATITUDE:	39°19'16.96973" (N)		
LONGITUDE:	76°24'59.13338" (W)		
ELLIPSOID HT:	-102.401 US ft.	-31.212 m	
<b>AVAILABLE CONVENTIONAL BACKSIGHT POINTS (FIELD DATA):</b>			
<b>POINT</b>	<b>AZIMUTH</b>	<b>DISTANCE (US FT.)</b>	<b>DISTANCE (m)</b>
MTN-6	36° 54' 57"	1125.30	342.991
MTN-2	121° 42' 27"	1027.93	313.314
<b>STATION DESCRIPTION:</b>			
<p>To reach the monument from the traffic circle at MTN airport in front of the air traffic control tower, proceed S to Airside Access point by Hangars 4-6. After passing through the fence, proceed NE to the second Stop sign. Turn right and proceed SE past private plane hangars. Road will curve to the left, bearing North. At the intersection of T/L B and T/L G, turn right and proceed SE to Yield sign. Continue to Stop sign at Strawberry Point Road. Turn left on Strawberry Point Road. Proceed 819 feet (0.16 mi.) to station the left. Station is located approximately 78.5 feet past the centerline of gravel/grass road (entrance to fire pump house/water tank). Monument is 63.69' SE of drop inlet in concrete near edge of gravel road, 67.79' SE of sign (Fire Pump House 2850 Strawberry Point Road), 114.42' S of face of water tower, 78.35' NW of guy pole with no number, and 10.64' NE of NE edge of Strawberry Point Road.</p>			
<div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="text-align: center;">  <p>PHOTOGRAPH OF MONUMENT</p> </div> <div> <p>NOT TO SCALE</p>  <p>Diagram illustrating the station location relative to various landmarks and roads.</p> </div> </div>			
SURVEYED BY: JMT ENGINEERING		SPARKS, MARYLAND	





# MARTIN STATE AIRPORT (MTN) - SURVEY CONTROL DATA

**NAME OF STATION:** MTN-6

**DATE ESTABLISHED:** August 2005

**MARYLAND STATE PLANE COORDINATES (NAD 83):**

<b>NORTHING (Y):</b>	604064.3021 US ft.	184119.168 m
<b>EASTING (X):</b>	1478107.5955 US ft.	450528.096 m
<b>ORTHOMETRIC HEIGHT (NAVD 88)</b>	12.90 US ft.	3.932 m
<b>CONVERGENCE ANGLE:</b>	0°22'04.0"	
<b>SCALE FACTOR:</b>	0.99998036	
<b>COMBINED SCALE FACTOR:</b>	0.99998493	

**GEOGRAPHIC COORDINATES (NAD 83):**

<b>LATITUDE:</b>	39°19'25.8188" (N)	
<b>LONGITUDE:</b>	76°24'50.45958" (W)	
<b>ELLIPSOID HT:</b>	-95.427 US ft.	-29.086 m

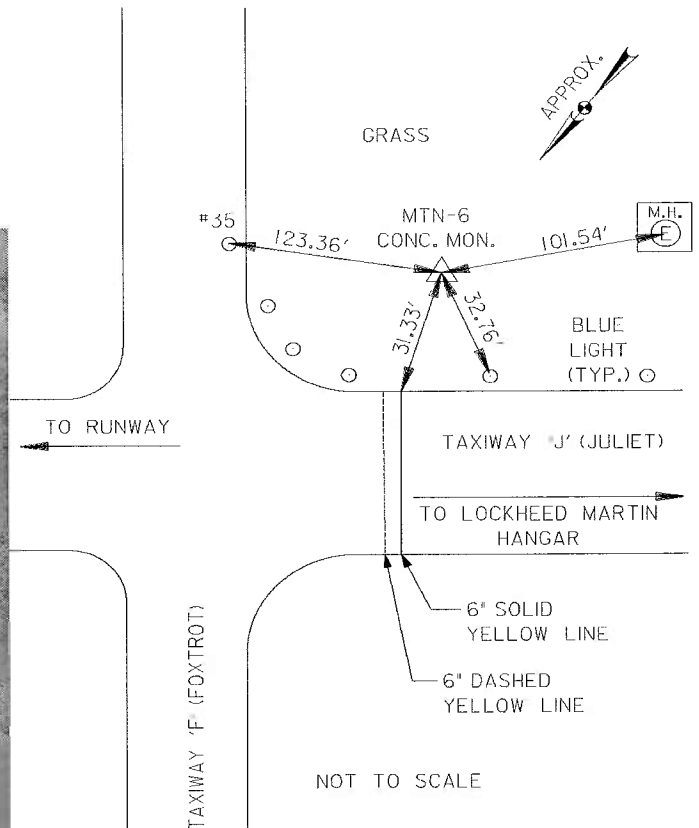
**AVAILABLE CONVENTIONAL BACKSIGHT POINTS (FIELD DATA):**

<u>POINT</u>	<u>AZIMUTH</u>	<u>DISTANCE (US FT.)</u>	<u>DISTANCE (m)</u>
MTN A	130° 06' 04"	2879.72	877.740
MTN-5	216° 54' 57"	1125.29	342.989
MTN-4	319° 31' 29"	2360.15	719.375
MTN-B	319° 21' 07"	3436.89	1047.566

**STATION DESCRIPTION:**

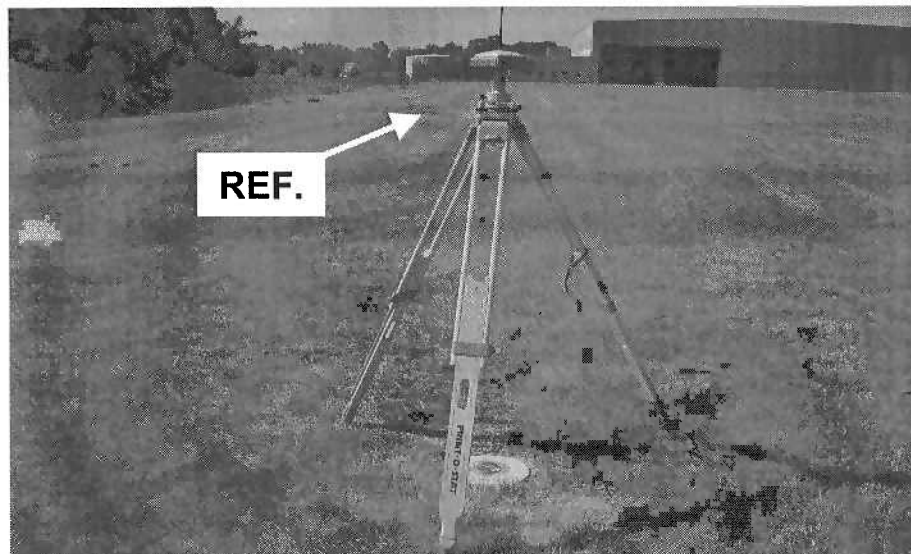
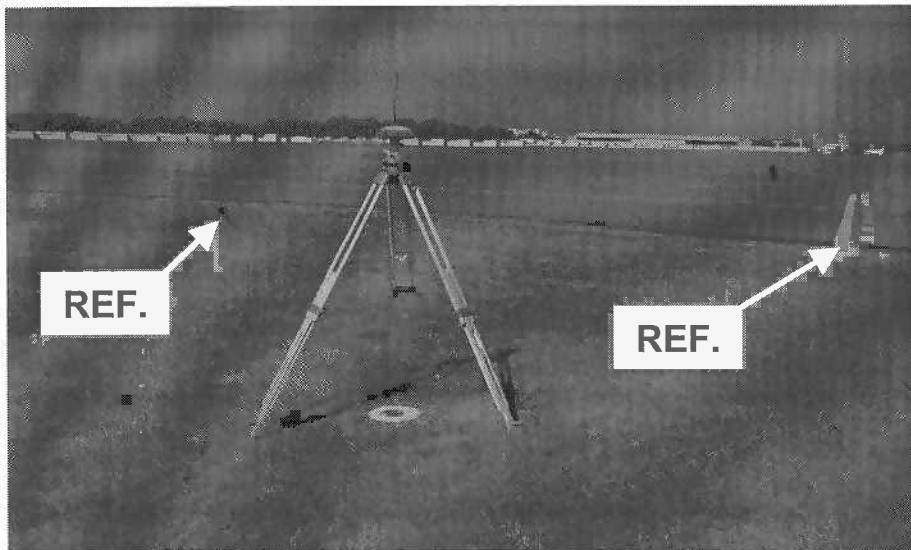
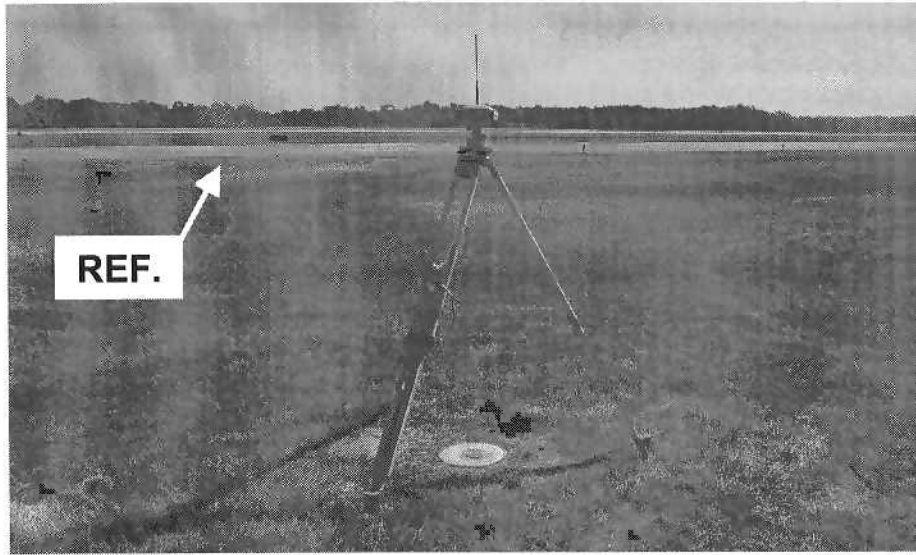
To reach the monument from the traffic circle at MTN airport in front of the air traffic control tower, proceed S to Airside Access point by Hangars 4-6. After passing through the fence, proceed NE to the second Stop sign. Turn right and proceed SE past private plane hangars. Road will curve to the left, bearing North. At the intersection of T/L B and T/L G, turn right and proceed SE to Yield sign. Continue to Stop sign at Strawberry Point Road. Turn left on Strawberry Point Road. Continue to the pump house and water tank on the left. Turn left into gravel lane. Park at pump house. Walk along fence and wetlands area to Taxiway F and the station on the right. Station is near the intersection of Taxiway F, Taxiway J, and the entrance road to Lockheed Martin's hangar/facility. Monument is 123.36' W of taxiway light #35, 101.54' NE of center of electric manhole 0.5' above ground, 32.76' SE of ground way light with no number, 31.33' S of S end 6" solid yellow line on Taxiway 'J'.

**\*Monument is outside the APRL. Access to this monument by way of Taxiway "F" requires airport tower permission.**



**SURVEYED BY:** JMT ENGINEERING

**SPARKS, MARYLAND**



# MARTIN STATE AIRPORT (MTN) - SURVEY CONTROL DATA

NAME OF STATION: MTN-7

DATE ESTABLISHED: August 2005

**MARYLAND STATE PLANE COORDINATES (NAD 83):**

NORTHING (Y):	US ft.	m
EASTING (X):	US ft.	m
ORTHOMETRIC HEIGHT (NAVD 88):	US ft.	m
CONVERGENCE ANGLE:		
SCALE FACTOR:		
COMBINED SCALE FACTOR:		

**GEOGRAPHIC COORDINATES (NAD 83):**

LATITUDE:	(N)	
LONGITUDE:	(W)	
ELLIPSOID HT:	US ft.	m

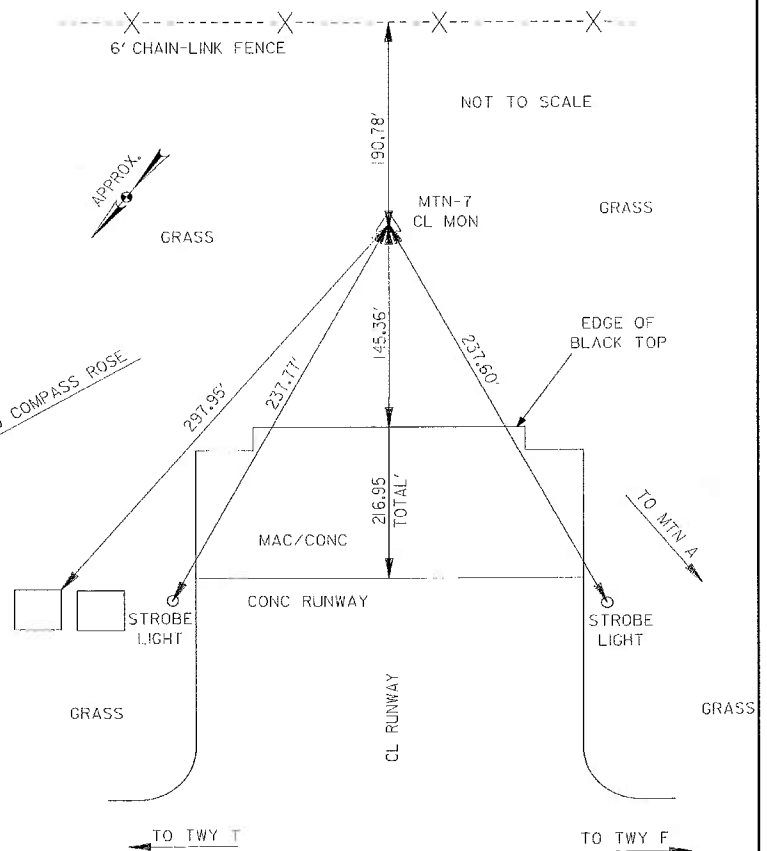
**AVAILABLE CONVENTIONAL BACKSIGHT POINTS (FIELD DATA):**

POINT	AZIMUTH	DISTANCE (US FT.)	DISTANCE (m)
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**STATION DESCRIPTION:**

**\*SHALL NOT BE OCCUPIED FOR SURVEY CONTROL.  
THIS POINT IS INTENDED FOR RECOVERY OF THE  
RUNWAY CENTERLINE ONLY**

**AT THE 33 END OF THE RUNWAY**



SURVEYED BY: JMT ENGINEERING

SPARKS, MARYLAND



# MARTIN STATE AIRPORT (MTN) - SURVEY CONTROL DATA

NAME OF STATION: MTN-8

DATE ESTABLISHED: August 2005

## MARYLAND STATE PLANE COORDINATES (NAD 83):

NORTHING (Y):	US ft.	m
EASTING (X):	US ft.	m
ORTHOMETRIC HEIGHT (NAVD 88)	US ft.	m
CONVERGENCE ANGLE:		
SCALE FACTOR:		
COMBINED SCALE FACTOR:		

## GEOGRAPHIC COORDINATES (NAD 83):

LATITUDE:	(N)	
LONGITUDE:	(W)	
ELLIPSOID HT:	US ft.	m

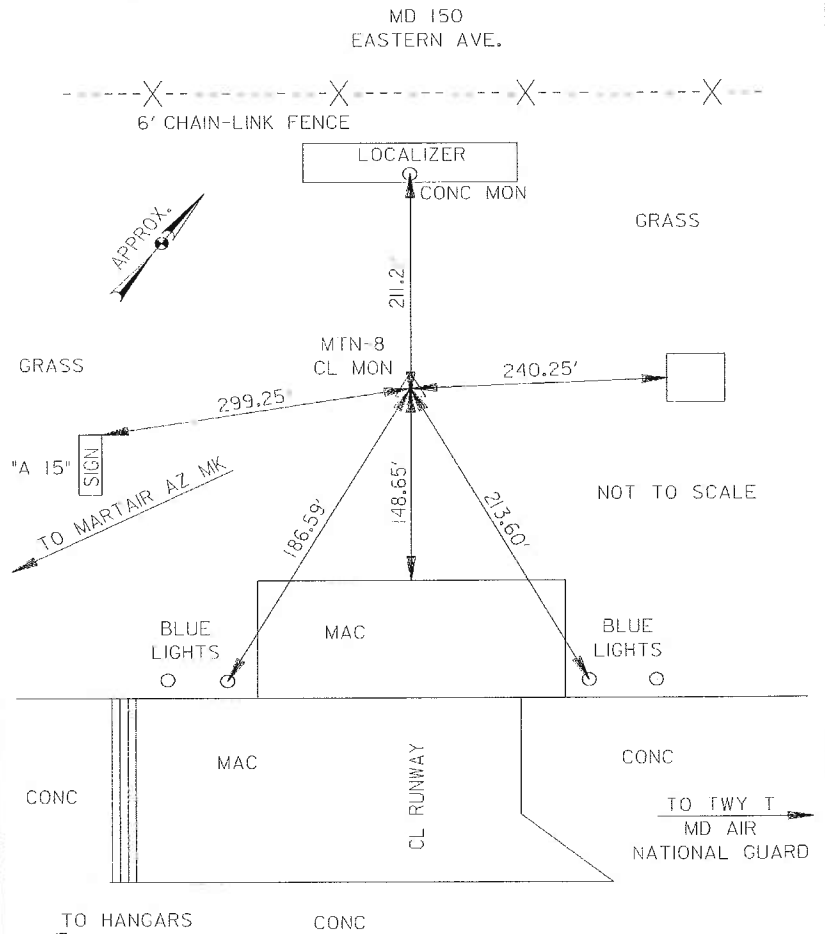
## AVAILABLE CONVENTIONAL BACKSIGHT POINTS (FIELD DATA):

POINT	AZIMUTH	DISTANCE (US FT.)	DISTANCE (m)
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## STATION DESCRIPTION:

**\*SHALL NOT BE OCCUPIED FOR SURVEY CONTROL.  
THIS POINT IS INTENDED FOR RECOVERY OF THE  
RUNWAY CENTERLINE ONLY**

**AT THE 15 END OF THE RUNWAY**



SURVEYED BY: JMT ENGINEERING

SPARKS, MARYLAND

# MARTIN STATE AIRPORT (MTN) - SURVEY CONTROL DATA

NAME OF STATION: MARTAIR AZ MK

DATE ESTABLISHED: 1985

NGS PID: JV6476

## MARYLAND STATE PLANE COORDINATES (NAD 83):

NORTHING (Y):	607285.0956 US ft.	185100.8676 m
EASTING (X):	1474311.9473 US ft.	449371.18 m
ORTHOMETRIC HEIGHT (NAVD 88):	20.71 US ft.	6.311 m
CONVERGENCE ANGLE:	0°21'33.9"	
SCALE FACTOR:	0.99998159	
COMBINED SCALE FACTOR:	0.99998578	

## GEOGRAPHIC COORDINATES (NAD 83):

LATITUDE:	39 19 57.88957 (N)	
LONGITUDE:	076 25 38.50226 (W)	
ELLIPSOID HT:	-87.54 US ft.	-26.681 m

## AVAILABLE CONVENTIONAL BACKSIGHT POINTS (FIELD DATA):

POINT	AZIMUTH	DISTANCE (US FT.)	DISTANCE (m)
MTN B	111° 29' 52"	1673.275	510.015
MTN-4	122° 12' 00"	2675.150	815.387

## STATION DESCRIPTION:

SEE NGS DATASHEETS ATTACHED

HORZ ORDER - B

VERT ORDER - THIRD

ELLIP ORDER - FOURTH CLASS II



SURVEYED BY: JMT ENGINEERING

SPARKS, MARYLAND

# DATASHEETS

1 National Geodetic Survey, Retrieval Date = NOVEMBER 8, 2005

JV6476 \*\*\*\*\*

JV6476 PACS - This is a Primary Airport Control Station.

JV6476 DESIGNATION - MARTAIR AZ MK

JV6476 PID - JV6476

JV6476 STATE/COUNTY- MD/BALTIMORE

JV6476 USGS QUAD - MIDDLE RIVER (1985)

JV6476

JV6476 \*CURRENT SURVEY CONTROL

JV6476

JV6476\* NAD 83(1991)- 39 19 57.88957(N) 076 25 38.50226(W) ADJUSTED

JV6476\* NAVD 88 - 6.311 (meters) 20.71 (feet) ADJUSTED

JV6476

JV6476 X - 1,159,303.234 (meters) COMP

JV6476 Y - -4,802,017.867 (meters) COMP

JV6476 Z - 4,020,941.106 (meters) COMP

JV6476 LAPLACE CORR- -2.64 (seconds) DEFLEC99

JV6476 ELLIP HEIGHT- -26.67 (meters) (08/09/02) GPS OBS

JV6476 GEOID HEIGHT- -32.99 (meters) GEOID03

JV6476 DYNAMIC HT - 6.308 (meters) 20.70 (feet) COMP

JV6476 MODELED GRAV- 980,107.4 (mgal) NAVD 88

JV6476

JV6476 HORZ ORDER - B

JV6476 VERT ORDER - THIRD

JV6476 ELLP ORDER - FOURTH CLASS II

JV6476

JV6476.This mark is at Martin State Airport (MTN)

JV6476

JV6476.The horizontal coordinates were established by GPS observations

JV6476.and adjusted by the National Geodetic Survey in March 1998.

JV6476

JV6476.The orthometric height was determined by differential leveling

JV6476.and adjusted by the National Geodetic Survey in February 1998.

JV6476

JV6476.The X, Y, and Z were computed from the position and the ellipsoidal ht.

JV6476

JV6476.The Laplace correction was computed from DEFLEC99 derived deflections.

JV6476

JV6476.The ellipsoidal height was determined by GPS observations

JV6476.and is referenced to NAD 83.

JV6476

JV6476.The geoid height was determined by GEOID03.

JV6476

JV6476.The dynamic height is computed by dividing the NAVD 88

JV6476.geopotential number by the normal gravity value computed on the

JV6476.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45

JV6476.degrees latitude (g = 980.6199 gals.).

JV6476

JV6476.The modeled gravity was interpolated from observed gravity values.

JV6476

JV6476; North East Units Scale Factor Converg.

JV6476;SPC MD - 185,100.867 449,371.180 MT 0.99998159 +0 21 33.9  
JV6476;SPC MD - 607,285.09 1,474,311.95 sFT 0.99998159 +0 21 33.9  
JV6476;UTM 18 - 4,354,674.286 376,980.708 MT 0.99978633 -0 54 17.3  
JV6476

JV6476! - Elev Factor x Scale Factor = Combined Factor  
JV6476!SPC MD - 1.00000418 x 0.99998159 = 0.99998577  
JV6476!UTM 18 - 1.00000418 x 0.99978633 = 0.99979051  
JV6476

JV6476: Primary Azimuth Mark Grid Az  
JV6476:SPC MD - MARTAIR 111 32 54.8  
JV6476:UTM 18 - MARTAIR 112 48 46.0  
JV6476

JV6476|-----|  
JV6476| PID Reference Object Distance Geod. Az |  
JV6476| dddmmss.s |  
JV6476| JV6144 MARTAIR 496.478 METERS 1115428.7 |  
JV6476|-----|  
JV6476

JV6476 SUPERSEDED SURVEY CONTROL  
JV6476

JV6476 ELLIP H (03/24/98) -26.61 (m) GP( ) 4 1  
JV6476 NAD 83(1991)- 39 19 57.88953(N) 076 25 38.50223(W) AD( ) B  
JV6476 ELLIP H (11/22/95) -26.61 (m) GP( ) 1 1  
JV6476 NAD 83(1991)- 39 19 57.88854(N) 076 25 38.50294(W) AD( ) 1  
JV6476 ELLIP H (01/27/92) -26.53 (m) GP( ) 4 1  
JV6476 NAD 83(1986)- 39 19 57.88372(N) 076 25 38.51118(W) AD( ) 1  
JV6476 NAD 27 - 39 19 57.49393(N) 076 25 39.65548(W) AD( ) 1  
JV6476 NAVD 88 (03/24/98) 6.31 (m) 20.7 (f) LEVELING 3  
JV6476 NGVD 29 (11/20/87) 6.3 (m) 21. (f) GPS OBS  
JV6476

JV6476.Superseded values are not recommended for survey control.  
JV6476.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.  
JV6476.See file dsdata.txt to determine how the superseded data were derived.  
JV6476

JV6476\_U.S. NATIONAL GRID SPATIAL ADDRESS: 18SUJ7698154674(NAD 83)

JV6476\_MARKER: DZ = AZIMUTH MARK DISK

JV6476\_SETTING: 7 = SET IN TOP OF CONCRETE MONUMENT

JV6476\_SP\_SET: SET IN TOP OF CONCRETE MONUMENT

JV6476\_STAMPING: MARTAIR 1985

JV6476\_MARK LOGO: NGS

JV6476\_MAGNETIC: N = NO MAGNETIC MATERIAL

JV6476\_STABILITY: C = MAY HOLD, BUT OF TYPE COMMONLY SUBJECT TO

JV6476+STABILITY: SURFACE MOTION

JV6476\_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR

JV6476+SATELLITE: SATELLITE OBSERVATIONS - October 01, 2002  
JV6476

JV6476 HISTORY - Date Condition Report By  
JV6476 HISTORY - 1985 MONUMENTED NGS  
JV6476 HISTORY - 19860123 GOOD  
JV6476 HISTORY - 19911107 GOOD NGS  
JV6476 HISTORY - 19940902 GOOD NGS  
JV6476 HISTORY - 19950201 GOOD MCCRON  
JV6476 HISTORY - 19961010 GOOD NGS

JV6476 HISTORY - 19970620 GOOD DMW  
JV6476 HISTORY - 19980928 GOOD DMW  
JV6476 HISTORY - 19990902 GOOD MDSHA  
JV6476 HISTORY - 20020929 GOOD JCLS  
JV6476 HISTORY - 20021001 GOOD JCLS

JV6476

JV6476 STATION DESCRIPTION

JV6476

JV6476'DESCRIBED BY NATIONAL GEODETIC SURVEY 1985 (RGP)

JV6476'THE STATION IS LOCATED ABOUT 16 KM (10 MI) EAST FROM THE APPROXIMATE

JV6476'CENTER OF BALTIMORE, 5-1/2 KM (3-1/2 MI) SOUTH FROM WHITE MARSH

JV6476'AND 1 KM (1/2 MI) EAST FROM THE APPROXIMATE CENTER OF MIDDLE

JV6476'RIVER.

JV6476'

JV6476'OWNERSHIP--STATE OWNED PROPERTY.

JV6476'

JV6476'NO TO REACH NECESSARY.

JV6476'

JV6476'THE STATION SURFACE MARK IS A STANDARD NGS AZIMUTH MARK DISK

JV6476'STAMPED--MARTAIR--1985 SET IN THE TOP OF A 25 CM (10 INCH)

JV6476'ROUND CONCRETE POST WHICH IS FLUSH WITH THE SURFACE. THE SUB

JV6476'SURFACE DISK IS IDENTICAL TO THE SURFACE MARK AND IT IS SET IN

JV6476'A MASS OF CONCRETE 114 CM (45 INCHES) BELOW THE SURFACE.

JV6476'

JV6476'THE MARK IS LOCATED 67.9 METERS (222.9 FT) EAST FROM THE EAST

JV6476'CORNER OF THE MIDDLE RIVER POST OFFICE, 16.7 METERS (54.7 FT) EAST

JV6476'NORTHEAST FROM THE NORTHEAST CURB OF THE STATE HIGHWAY 587,

JV6476'23.0 METERS (75.6 FT) SOUTHWEST FROM THE EDGE OF A TAXI STRIP AND

JV6476'0.5 METER (1.8 FT) SOUTHEAST FROM A CARSONITE WITNESS POST.

JV6476

JV6476 STATION RECOVERY (1986)

JV6476

JV6476'RECOVERED 1986

JV6476'RECOVERED IN GOOD CONDITION.

JV6476

JV6476 STATION RECOVERY (1991)

JV6476

JV6476'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1991

JV6476'THE STATION IS LOCATED AT THE NW END OF THE INNER TAXIWAY NEAR THE

JV6476'INTERSECTION WITH TAXIWAY A WEST. THE STATION IS 45 FT (13.7 M) SW OF

JV6476'THE CENTERLINE EXTENSION OF THE RAMP AREA TO THE EAST, 74.9 FT (22.8

JV6476'M) WEST OF THE WEST EDGE OF THE TAXIWAY, 135 FT (41.1 M) SW OF THE NW

JV6476'CORNER OF ASPHALT, 180.4 FT (55.0 M) NW OF THE W CORNER OF A SIGN A,

JV6476'AND 18.5 FT (5.6 M) EAST OF A FENCE. THE STATION IS A STANDARD NGS

JV6476'DISK SET IN THE TOP OF A CONCRETE POST FLUSH WITH THE GROUND STAMPED

JV6476'MARTAIR 1985.

JV6476

JV6476 STATION RECOVERY (1994)

JV6476

JV6476'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1994 (RAH)

JV6476'RECOVERED IN GOOD CONDITION.

JV6476'

JV6476'CONTACT MR. JAKE WEST, AIRPORT MANAGER, MARTIN STATE AIRPORT, BOX 20,

JV6476'701 WILSON POINT ROAD, BALTIMORE, MD 21220, PHONE (410) 682-8810.

JV6476'

JV6476'TO REACH THE STATION FROM THE CONTROL TOWER, GO NORTHWESTERLY FOR  
JV6476'0.42 KM (0.25 MI) ALONG AN APRON AND TAXIWAY TO THE STATION ON THE RIGHT.

JV6476'

JV6476'THE STATION IS LOCATED 55.0 M (180.4 FT) NORTHEAST OF THE WEST CORNER  
JV6476'OF A SIGN A, 41.1 M (134.8 FT) SOUTHWEST OF THE NORTHWEST CORNER OF  
JV6476'ASPHALT PAVEMENT, 22.8 M (74.8 FT) WEST IF THE WEST EDGE OF THE  
JV6476'TAXIWAY, 5.6 M (18.4 FT) EAST OF A CHAIN LINK FENCE, AND THE MONUMENT  
JV6476'IS FLUSH WITH THE GROUND.

JV6476'

JV6476'DESCRIBED BY KLF.

JV6476

JV6476 STATION RECOVERY (1995)

JV6476

JV6476'RECOVERY NOTE BY J R MCCRONE JR INCORPORATED 1995 (HAS)

JV6476'RECOVERED AS DESCRIBED.

JV6476

JV6476 STATION RECOVERY (1996)

JV6476

JV6476'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1996 (AJL)

JV6476'RECOVERED AS DESCRIBED.

JV6476

JV6476 STATION RECOVERY (1997)

JV6476

JV6476'RECOVERY NOTE BY DAFT MCCUNE WALKER INCORPORATED 1997 (DMM)

JV6476'RECOVERED AS DESCRIBED.

JV6476

JV6476 STATION RECOVERY (1998)

JV6476

JV6476'RECOVERY NOTE BY DAFT MCCUNE WALKER INCORPORATED 1998 (JMS)

JV6476'RECOVERED IN GOOD CONDITION.

JV6476

JV6476 STATION RECOVERY (1999)

JV6476

JV6476'RECOVERY NOTE BY MARYLAND DOT HIGHWAY ADMINISTRATION 1999 (DMM)

JV6476'RECOVERED AS DESCRIBED

JV6476

JV6476 STATION RECOVERY (2002)

JV6476

JV6476'RECOVERY NOTE BY JOHN CHANCE LAND SURVEYS INC 2002 (MRY)

JV6476'RECOVERED IN GOOD CONDITION.

JV6476

JV6476 STATION RECOVERY (2002)

JV6476

JV6476'RECOVERY NOTE BY JOHN CHANCE LAND SURVEYS INC 2002

JV6476'RECOVERED IN GOOD CONDITION.

\*\*\* retrieval complete.

Elapsed Time = 00:00:00

# MARTIN STATE AIRPORT (MTN) - SURVEY CONTROL DATA

NAME OF STATION: MTN A

DATE ESTABLISHED: 1989

NGS PID: AA9279

## MARYLAND STATE PLANE COORDINATES (NAD 83):

NORTHING (Y):	602209.3862 US ft.	183553.788 m
EASTING (X):	1480310.2956 US ft.	451199.481 m
ORTHOMETRIC HEIGHT (NAVD 88):	5.4 US ft.	1.64 m
CONVERGENCE ANGLE:	0°22'21.5"	
SCALE FACTOR:	0.99997967	
COMBINED SCALE FACTOR:	0.99998459	

## GEOGRAPHIC COORDINATES (NAD 83):

LATITUDE:	39 19 07.34515 (N)	
LONGITUDE:	076 24 22.58368 (W)	
ELLIPSOID HT:	-102.92 US ft.	-31.370 m

## AVAILABLE CONVENTIONAL BACKSIGHT POINTS (FIELD DATA):

POINT	AZIMUTH	DISTANCE (US FT.)	DISTANCE (m)
MTN B	315° 08' 07"	6296.22	1919.092
MTN-6	310° 06' 04"	2879.73	877.743
MTN-4	314° 20' 41"	5222.33	1591.769
MTN-1	231° 15' 50"	1027.35	313.137

## STATION DESCRIPTION:

SEE NGS DATASHEETS ATTACHED

HORZ ORDER - FIRST  
ELLIP ORDER - FOURTH CLASS II



SURVEYED BY: JMT ENGINEERING

SPARKS, MARYLAND

# DATASHEETS

1 National Geodetic Survey, Retrieval Date = NOVEMBER 8, 2005

AA9279 \*\*\*\*\*

AA9279 SACS - This is a Secondary Airport Control Station.

AA9279 DESIGNATION - MTN A

AA9279 PID - AA9279

AA9279 STATE/COUNTY- MD/BALTIMORE

AA9279 USGS QUAD - MIDDLE RIVER (1985)

AA9279

AA9279 \*CURRENT SURVEY CONTROL

AA9279

AA9279\* NAD 83(1991)- 39 19 07.34515(N) 076 24 22.58368(W) ADJUSTED

AA9279\* NAVD 88 - 1.64 (meters) 5.4 (feet) GPS OBS

AA9279

AA9279 X - 1,161,301.923 (meters) COMP

AA9279 Y - -4,802,547.463 (meters) COMP

AA9279 Z - 4,019,732.347 (meters) COMP

AA9279 LAPLACE CORR- -2.19 (seconds) DEFLEC99

AA9279 ELLIP HEIGHT- -31.37 (meters) (08/19/02) GPS OBS

AA9279 GEOID HEIGHT- -33.03 (meters) GEOID03

AA9279

AA9279 HORZ ORDER - FIRST

AA9279 ELLP ORDER - FOURTH CLASS II

AA9279

AA9279.This mark is at Martin State Airport (MTN)

AA9279

AA9279.The horizontal coordinates were established by GPS observations

AA9279.and adjusted by the National Geodetic Survey in April 1998.

AA9279

AA9279.The orthometric height was determined by GPS observations and a

AA9279.high-resolution geoid model.

AA9279

AA9279.GPS derived orthometric heights for airport stations designated as

AA9279.PACS or SACS are published to 2 decimal places. This maintains

AA9279.centimeter relative accuracy between the PACS and SACS. It does

AA9279.not indicate centimeter accuracy relative to other marks which are

AA9279.part of the NAVD 88 network.

AA9279

AA9279.The X, Y, and Z were computed from the position and the ellipsoidal ht.

AA9279

AA9279.The Laplace correction was computed from DEFLEC99 derived deflections.

AA9279

AA9279.The ellipsoidal height was determined by GPS observations

AA9279.and is referenced to NAD 83.

AA9279

AA9279.The geoid height was determined by GEOID03.

AA9279

AA9279; North East Units Scale Factor Converg.

AA9279;SPC MD - 183,553.788 451,199.481 MT 0.99997967 +0 22 21.5

AA9279;SPC MD - 602,209.39 1,480,310.30 sFT 0.99997967 +0 22 21.5

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

AA9279



AA9279! - Elev Factor x Scale Factor = Combined Factor  
AA9279!SPC MD - 1.00000492 x 0.99997967 = 0.99998459  
AA9279!UTM 18 - 1.00000492 x 0.99978094 = 0.99978586

AA9279

AA9279 SUPERSEDED SURVEY CONTROL

AA9279

AA9279 ELLIP H (04/02/98) -31.31 (m) GP( ) 4 2  
AA9279 NAD 83(1991)- 39 19 07.34511(N) 076 24 22.58365(W) AD( ) 1  
AA9279 ELLIP H (11/30/95) -31.31 (m) GP( ) 4 2

AA9279

AA9279.Superseded values are not recommended for survey control.

AA9279.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.

AA9279.See file dsdata.txt to determine how the superseded data were derived.

AA9279

AA9279\_U.S. NATIONAL GRID SPATIAL ADDRESS: 18SUJ7877453088(NAD 83)

AA9279\_MARKER: DD = SURVEY DISK

AA9279\_SETTING: 30 = SET IN A LIGHT STRUCTURE

AA9279\_SP\_SET: SET IN A LIGHT STRUCTURE

AA9279\_STAMPING: MTN A 1989

AA9279\_MARK LOGO: NOS

AA9279\_MAGNETIC: O = OTHER; SEE DESCRIPTION

AA9279\_STABILITY: C = MAY HOLD, BUT OF TYPE COMMONLY SUBJECT TO

AA9279+STABILITY: SURFACE MOTION

AA9279\_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR

AA9279+SATELLITE: SATELLITE OBSERVATIONS - September 02, 1999

AA9279

AA9279 HISTORY	- Date	Condition	Report By
AA9279 HISTORY	- 1989	MONUMENTED	NOS
AA9279 HISTORY	- 19911107	GOOD	NOS
AA9279 HISTORY	- 19940902	GOOD	NGS
AA9279 HISTORY	- 19961010	GOOD	NGS
AA9279 HISTORY	- 19990902	GOOD	MDSHA

AA9279

AA9279 STATION DESCRIPTION

AA9279

AA9279'DESCRIBED BY NATIONAL OCEAN SERVICE 1991

AA9279'THE STATION IS LOCATED AT THE MARTIN STATE AIRPORT SOUTHWEST OF RUNWAY  
AA9279'END 32, AND NORTH OF THE PARALLEL TAXIWAY. THE STATION IS A STANDARD  
AA9279'NOS DISK SET IN THE NE CORNER OF THE INNER CONCRETE SECTION OF A STORM  
AA9279'DRAIN. THE STATION IS 126.6 FT (38.6 M) NW OF THE CENTERLINE OF A  
AA9279'TAXIWAY, 70.7 FT (21.5 M) NNE OF TAXIWAY LIGHT 81, 118.0 FT (36.0 M)  
AA9279'NE OF THE CENTERLINE OF THE PARALLEL TAXIWAY, AND 55.5 FT (16.9 M) SE  
AA9279'OF THE SE CORNER OF A SIGN E. THE DISK IS STAMPED MTN A 1989.

AA9279

AA9279 STATION RECOVERY (1994)

AA9279

AA9279'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1994 (RAH)

AA9279'THE STATION IS LOCATED ABOUT 6.4 KM (3.95 MI) SOUTH-SOUTHEAST OF WHITE  
AA9279'MARSH, 5.3 KM (3.30 MI) NORTHEAST OF ESSEX, AND 4.8 KM (3.00 MI)  
AA9279'SOUTHWEST OF CHASE, NEAR THE NORTHEAST CORNER OF THE INNER CONCRETE  
AA9279'SECTION OF A STORM DRAIN NEAR THE SOUTHEAST END OF THE ACTIVE RUNWAY  
AA9279'14-32. OWNERSHIP- STATE OF MARYLAND. CONTACT MR. JAKE WEST, AIRPORT  
AA9279'MANAGER, MARTIN STATE AIRPORT, BOX 20, 701 WILSON POINT ROAD,

AA9279'BALTIMORE, MD 21220, PHONE (410) 682-8810.

AA9279'

AA9279'TO REACH THE STATION FROM THE CONTROL TOWER, GO SOUTHEAST FOR 1.12 KM  
AA9279'(0.70 MI) ALONG AN APRON AND THE SOUTHERN PARALLEL TAXIWAY TO RUNWAY  
AA9279'14-32 AND THE STATION ON THE LEFT.

AA9279'

AA9279'THE STATION IS LOCATED 38.6 M (126.6 FT) NORTHWEST OF THE CENTERLINE  
AA9279'OF A CONNECTING TAXIWAY, 36.0 M (118.1 FT) NORTHEAST OF THE PARALLEL  
AA9279'TAXIWAY, 21.5 M (70.5 FT) NORTH-NORTHEAST OF A TAXIWAY LIGHT NUMBER  
AA9279'81, AND 16.9 M (55.4 FT) SOUTHEAST OF THE SOUTHEAST CORNER OF A SIGN  
AA9279'E.

AA9279'

AA9279'DESCRIBED BY KLF.

AA9279

AA9279                      STATION RECOVERY (1996)

AA9279

AA9279'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1996 (AJL)

AA9279'RECOVERED AS DESCRIBED.

AA9279

AA9279                      STATION RECOVERY (1999)

AA9279

AA9279'RECOVERY NOTE BY MARYLAND DOT HIGHWAY ADMINISTRATION 1999 (DMM)

AA9279'RECOVERED AS DESCRIBED

\*\*\* retrieval complete.

Elapsed Time = 00:00:00

**MARTIN STATE AIRPORT (MTN) - SURVEY CONTROL DATA**NAME OF STATION: MTN B  
NGS PID: A14374

DATE ESTABLISHED: 1998

**MARYLAND STATE PLANE COORDINATES (NAD 83):**

NORTHING (Y):	606671.9075 US ft.	184913.9672 m
EASTING (X):	1475868.8004 US ft.	449845.7101 m
ORTHOMETRIC HEIGHT (NAVD 88):	16.8 US ft.	5.12 m
CONVERGENCE ANGLE:	0°21'46.3"	
SCALE FACTOR:	0.99998135	
COMBINED SCALE FACTOR:	0.99998573	

**GEOGRAPHIC COORDINATES (NAD 83):**

LATITUDE:	39 19 51.73216 (N)	
LONGITUDE:	076 25 18.73818 (W)	
ELLIPSOID HT:	-91.417 US ft.	-27.864 m

**AVAILABLE CONVENTIONAL BACKSIGHT POINTS (FIELD DATA):**

POINT	AZIMUTH	DISTANCE (US FT.)	DISTANCE (m)
MARTAIR AZ MK	291° 29' 52"	1673.30	510.023
MTN-4	138° 58' 21"	1076.79	328.206
MTN-6	139° 21' 07"	3436.91	1047.572
MTN A	135° 08' 07"	6296.23	1919.095

**STATION DESCRIPTION:**

SEE NGS DATASHEETS ATTACHED

HORZ ORDER - FIRST  
ELLIP ORDER - FOURTH CLASS I

SURVEYED BY: JMT ENGINEERING

SPARKS, MARYLAND

# DATASHEETS

1 National Geodetic Survey, Retrieval Date = NOVEMBER 8, 2005

AI4374 \*\*\*\*\*

AI4374 SACS - This is a Secondary Airport Control Station.

AI4374 DESIGNATION - MTN B

AI4374 PID - AI4374

AI4374 STATE/COUNTY- MD/BALTIMORE

AI4374 USGS QUAD - MIDDLE RIVER (1985)

AI4374

AI4374 \*CURRENT SURVEY CONTROL

AI4374

AI4374\* NAD 83(1991)- 39 19 51.73216(N) 076 25 18.73818(W) ADJUSTED

AI4374\* NAVD 88 - 5.12 (meters) 16.8 (feet) GPS OBS

AI4374

AI4374 X - 1,159,791.391 (meters) COMP

AI4374 Y - -4,802,022.850 (meters) COMP

AI4374 Z - 4,020,793.468 (meters) COMP

AI4374 LAPLACE CORR- -2.55 (seconds) DEFLEC99

AI4374 ELLIP HEIGHT- -27.87 (meters) (10/28/02) GPS OBS

AI4374 GEOID HEIGHT- -33.00 (meters) GEOID03

AI4374

AI4374 HORZ ORDER - FIRST

AI4374 ELLP ORDER - FOURTH CLASS I

AI4374

AI4374.This mark is at Martin State Airport (MTN)

AI4374

AI4374.The horizontal coordinates were established by GPS observations

AI4374.and adjusted by the National Geodetic Survey in March 2000.

AI4374

AI4374.The orthometric height was determined by GPS observations and a

AI4374.high-resolution geoid model.

AI4374

AI4374.GPS derived orthometric heights for airport stations designated as

AI4374.PACS or SACS are published to 2 decimal places. This maintains

AI4374.centimeter relative accuracy between the PACS and SACS. It does

AI4374.not indicate centimeter accuracy relative to other marks which are

AI4374.part of the NAVD 88 network.

AI4374

AI4374.The X, Y, and Z were computed from the position and the ellipsoidal ht.

AI4374

AI4374.The Laplace correction was computed from DEFLEC99 derived deflections.

AI4374

AI4374.The ellipsoidal height was determined by GPS observations

AI4374.and is referenced to NAD 83.

AI4374

AI4374.The geoid height was determined by GEOID03.

AI4374

AI4374; North East Units Scale Factor Converg.

AI4374;SPC MD - 184,913.967 449,845.710 MT 0.99998135 +0 21 46.3

AI4374;SPC MD - 606,671.91 1,475,868.80 sFT 0.99998135 +0 21 46.3

AI4374;UTM 18 - 4,354,477.001 377,450.907 MT 0.99978491 -0 54 04.7

AI4374

AI4374! - Elev Factor x Scale Factor = Combined Factor  
AI4374!SPC MD - 1.00000437 x 0.99998135 = 0.99998572  
AI4374!UTM 18 - 1.00000437 x 0.99978491 = 0.99978928

AI4374

AI4374 SUPERSEDED SURVEY CONTROL

AI4374

AI4374 ELLIP H (03/31/00) -27.86 (m) GP( ) 4 1

AI4374

AI4374.Superseded values are not recommended for survey control.

AI4374.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.

AI4374.See file dsdata.txt to determine how the superseded data were derived.

AI4374

AI4374\_U.S. NATIONAL GRID SPATIAL ADDRESS: 18SUJ7745154477(NAD 83)

AI4374\_MARKER: DD = SURVEY DISK

AI4374\_SETTING: 7 = SET IN TOP OF CONCRETE MONUMENT

AI4374\_SP\_SET: SET IN TOP OF CONCRETE MONUMENT

AI4374\_STAMPING: MTN B 1998

AI4374\_MARK LOGO: MDSHA

AI4374\_MAGNETIC: N = NO MAGNETIC MATERIAL

AI4374\_STABILITY: C = MAY HOLD, BUT OF TYPE COMMONLY SUBJECT TO

AI4374+STABILITY: SURFACE MOTION

AI4374\_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR

AI4374+SATELLITE: SATELLITE OBSERVATIONS - 1998

AI4374

AI4374 HISTORY - Date Condition Report By

AI4374 HISTORY - 1998 MONUMENTED MDSHA

AI4374

AI4374 STATION DESCRIPTION

AI4374

AI4374'DESCRIBED BY MARYLAND DOT HIGHWAY ADMINISTRATION 1998 (DMM)

AI4374'STATION IS LOCATED ON THE MARTIN STATE AIRPORT BETWEEN RUNWAY 15-33

AI4374'AND AN AIRCRAFT TIE-DOWN AREA NEAR HANGAR 2. IT IS 199.8 FT (60.9 M)

AI4374'SSW OF RUNWAY LIGHT 2, 169.2 FT (51.6 M) NE OF THE NE EDGE OF THE

AI4374'TIE-DOWN AREA, 156.0 FT (47.5 M) SW OF THE SW EDGE OF THE RUNWAY,

AI4374'152.7 FT (46.5 M) W OF RUNWAY LIGHT 3, 35.5 FT (10.8 M) N OF A

AI4374'DRAINAGE INLET AND 2.7 FT (0.8 M) SW OF A CARSONITE WITNESS POST.

AI4374'MONUMENT IS A MARYLAND STATE HIGHWAY ADMINISTRATION DISK SET IN THE

AI4374'TOP OF A 12 IN ROUND CONCRETE POST WHICH IS FLUSH WITH THE GROUND.

\*\*\* retrieval complete.

Elapsed Time = 00:00:00

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# APPENDIX G

## RESTROOM DESIGN STANDARDS

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## **TABLE OF CONTENTS**

<b>Executive Summary</b>	<b>1.0</b>
<b>Standard Application</b>	<b>2.0</b>
<b>Design and Layout</b>	<b>3.0</b>
<b>Facility Construction Requirements</b>	<b>4.0</b>
<b>Design Standard Exhibits</b>	<b>Appendix A</b>
<b>Product Cut Sheets</b>	<b>Appendix B</b>

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## 1.0 Executive Summary

The continuous expansion, growth, and modification to the terminal buildings at BWI have resulted in the need for a detailed toilet room design standard. Due to the rate at which additional facilities are required to accommodate the passenger volume at BWI, several projects are designed and constructed simultaneously. A minor issue that has resulted out of the projects is a need to standardize the requirements of the toilet rooms.

Standardizing the toilet rooms throughout the BWI terminal and concourses has several benefits. Unity comforts the passengers and users. Similar equipment is provided which facilitates the ease of maintenance. And finally, it helps with the design reviews to ensure required quality and needs of the facility are provided.

The following Standard provides direction to the designer on:

- Where the Standard applies
- The requirements of the design and layout
  - Code Requirements
  - Family Assist Restrooms
  - Door versus Maze
  - Information to show on the plan view (i.e. waste receptacle location)
- Construction requirements
  - Construction Materials
  - Casework
  - Mirrors
  - Fixtures
  - Mechanical, Electrical and Plumbing
- Process to request Deviation of Standards, and
- Appendices for additional guidance to the designer

While each toilet room layout will vary depending on the space available and site constraints, this standard will help facilitate unity throughout BWI Airport.



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## 2.0 Standard Application

- A. Any toilet room renovated or newly constructed in public space on the departures or arrivals level of the terminal or Piers shall comply with this standard. Toilet rooms constructed in Airline operation areas and tenant space shall comply with the hardware, fixtures, urinals, etc. and other requirements as outlined in this standard to the full extent possible.

## 3.0 Design and Layout

- A. **Code Requirements:** The design of the toilet room shall be in accordance with the most current edition of the applicable codes. The International Building and Plumbing Codes, the Americans with Disabilities Act (ADA), "Accessibility Guidelines for Buildings and Facilities (ADAAG)," and COMAR are applicable, and shall be used for the toilet room designs at BWI Airport.
- B. **Fixture Quantity Calculations:** The designer should consider the proposed services being offered in the immediate vicinity of the toilet room for the basis of fixture quantity calculations. Fixture quantities in renovated toilet rooms shall be in accordance with the current local, state and federal plumbing codes.

When Male and Female toilet rooms are designed immediately adjacent to each other, parity between fixtures shall be in accordance with current building codes and MAA requirements. Currently no requirement exists for parity. Women's toilet rooms shall be provided with as many fixtures as possible.

- C. **Toilet Room Configuration:** The configuration and geometry of toilet rooms will vary depending on the physical constraints in the existing facility for renovated or new toilet room construction. All Toilet rooms shall be designed in accordance with the following guidelines:
  - 1. The entry into high volume toilet rooms should be through a "maze" configuration. The maze should be configured to prevent direct line of sight into the toilet room from the entry corridor. The minimum functional clearance should permit two-way traffic through the maze, and be considerate of travelers with baggage. The minimum allowable clear width is five (5) feet. The maze geometry should consider the traffic volumes expected for the toilet room.

- 
2. Family Assist, single-use, and tenant toilet rooms shall be equipped with a lockable door.
  3. The toilet room geometry should consider the daily maintenance required.
    - a. Designs should permit half of the toilet room to be closed and cleaned while the other half remains open.
    - b. A 3-foot chase is required behind all toilet walls for ease of maintenance. Accessible chases are not required behind lavatories and urinals, although a non-accessible "wet wall" may be required for plumbing line clearance and installation.
    - c. Waste receptacles should be shown on the plans to verify adequate space is available.

**D. Janitorial Closets:**

1. A janitorial closet shall be located immediately adjacent to the toilet room(s). Only one closet is needed per pair of male/female restrooms. One closet is required adjacent to a single stall restroom.
2. The janitorial closet shall be a minimum of 20 square feet with a minimum width of 3 feet in any direction.
3. Closets shall be equipped with:
  - a. Floor mounted mop basin constructed of terrazzo or molded stone.
  - b. One fluorescent lighting fixture operated by a wall switch.
  - c. Single gang electrical outlet installed in accordance with code (i.e. GFCI).
  - d. A mop strip over the basin with multiple clips for hanging equipment.
  - e. Threaded hose connection with an anti-siphon backflow preventer.
4. Hot water heaters are NOT to be installed in the Janitorial Closets.
5. Minimal storage is required in the janitorial closet. The designer should verify the location of the nearest bulk storage location to verify if additional storage should be provided at the designed location.
6. Access to the closet shall be from the common public corridor. Locks for the door should be in accordance with the requirements of this document.

- 
7. Waterproofing of floor shall be designed per section 4.0 B. Floors.

#### 4.0 Facility Construction Requirements

- A. The facility construction requirements provided below should be followed for all public toilet rooms. Private toilet rooms that are maintained and used by tenant personnel only should follow the requirements for the hardware, fixtures, urinals, etc. and other requirements as outlined in this standard to the full extent possible. Deviation of standards should be noted filing appropriate forms. (See Appendix D for the forms)
- B. **Floors:** The floors can be either ceramic tile or terrazzo. The material shall match the existing corridor material. If the existing corridor does not consist of ceramic tile or terrazzo, then ceramic tile is preferred. The tile should be 12" x 12" with a non-slip finish. The grout should be non-absorbent and dark. The floors should be sloped to the extent possible to promote drainage. Floor drains are required for each bank of fixtures. The floor drains should be located in non-walking areas. The castings and grates for the drains should be stainless steel. Drains are to be installed per the current Plumbing Code. No check valve type drains are to be provided.
- C. **Walls:** The walls should be constructed of concrete masonry units (CMU) when costs and structural integrity allow. CMU walls offer greater durability and impact resistance, and better anchorage for fixtures, stalls and accessories. Other approved wall construction would consist of 20-gauge metal studs with 5/8" marine grade plywood and cement board. Use of the stud wall construction should be reviewed and approved by the MAA. The wall finish should be ceramic tile from floor to ceiling. The cove base should be extended as high as possible off the floor. The tile size should match the floor. The grout for the walls should be light colored. The grout lines of the wall shall match the grout lines of the floor.
- D. **Crash Protection:** crash rails should be provided along the entrance hall walls. The material should be a high impact resistant extruded rigid plastic. The corners should have full-height corner guards from the floor to the ceiling. All guards should be mechanically fastened for ease of replacement when needed.
- E. **Ceiling:** The height of the ceiling should be nine feet (9'-0") above finish floor, unless constrained by existing conditions. The ceiling material is preferred to be gypsum wallboard with access panels. The access panels should be 16" x 16", minimum and key-lockable. The keys shall have best

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key core to match airport standards. The finish on the gypsum ceiling is to be painted semi-gloss enamel. If an excessive number of access panels are required, an acoustic tile ceiling is permitted. Tile ceilings should consist of 2' x 2' moisture resistant panels, aluminum pre-painted suspension grid and tiles with an anti-micro bacterial coatings. A restroom with both gypsum and acoustic panel ceiling is acceptable.

F. **Doors:** Doors are required for the Family Assist, single use, and tenant restrooms. The janitorial closets and the chase entry locations should also have doors. The doors should be hollow metal seamless with welded frames. The hardware should be in accordance with Appendix B, and Appendix C of this restroom design standard.

1. Hinges should be stainless steel ball bearing type.
2. Door Lever should be type required by ADA. The lever should be of a type that returns to door face, to avoid possibility of catching fire hoses in an emergency situation.
3. Locks should be keyed to MAA master key system. The locks should be equipped with Best Lock Company interchangeable cores.
4. Closers should be delayed action closing type.

G. **Casework:** At multi-user locations, the countertops should be solid surface material with drop-in self-rimming lavatories, integral back and end splashes. The countertops should be linear and set at a constant height. The height should be in accordance with current ADA requirements. Under lavatory guards should be provided at each lavatory to prevent the potential scalding to users due to hot piping. (Appendix C-Finishes)

H. **Partitions:** Stalls are required at multi-user toilet rooms with water closets. Do not install urinals screens. The stall partition should be stainless steel with honeycomb cores. Additional reinforcement should be provided for grab bars, toilet paper holders and other accessories. The partitions should be floor supported unless otherwise approved.

Stall doors shall be attached to partitions with continuous stainless steel piano hinges - top and bottom pivot hinges are not acceptable.

The locking mechanism should be the latch type. No piston in hole type latch. Doors are required to have automatic returns. Typical stall doors should swing

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in towards the toilet. For the ADA toilets the doors need to swing out. (See Appendix C-Partitions)

The wall-mounted side of the partition should be a continuous connection rather than a point-mounting bracket.

No coat hooks are to be placed on the partitions or the door. Locate hooks on rear wall. The coat hook attachment should be reinforced to the extent possible. Hooks should be located so the automatic flusher sensor is not blocked.

- I. **Accessories:** The toilet accessories apply to public toilet rooms only.
1. **Mirrors** should be located above the vanity running the full length in multi-user toilet rooms. In single use or Family Assist restrooms, only a wall mounted individual mirror is required. Mirrors can be tilted if required by the ADA. A minimum of one independent full height mirror is required in each multi-use toilet room. All mirrors should be placed away from the main entrance and in a location that would permit reflective view into the room. Mirrors should be constructed of tempered glass. (See Exhibits, A-19, A-22, & A-23)
  2. **Soap dispensers** should be liquid soap dispensing type. They are required to be wall mounted with adhesive material. One dispenser is required between each sink. Coordinate with MAA Building maintenance for acceptable manufacturer per vendor contract. (See Exhibits A-22, A-23)
  3. **Paper towel dispensers** shall be coordinated with MAA Building maintenance for acceptable manufacturer per vendor contract. Do not specify electric hand dryers.
  4. **Toilet paper holders** shall be coordinated with MAA Building maintenance for acceptable manufacturer per vendor contract. Provide one at each water closet.
  5. **Waste receptacles** are to be 32 gallon, round freestanding unit with large top opening and grey in color. Wastes receptacles should be located immediately adjacent to the towel dispensers and of sufficient quantities. Where possible, provide a recessed nook to permit the receptacles space without taking away any traffic floor area. Waste receptacles are to be located on the plan view of the restroom in the construction documents.
  6. **Sanitary napkin disposal** receptacles should be provided in each stall of the women's toilet room. Receptacles should be free standing and not

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attached to the partitions. Coordinate with MAA Building maintenance for acceptable manufacturer per vendor contract.

7. **Sanitary napkin dispensers** should be located in the women's and Family Assist restrooms. Coordinate with MAA Building maintenance for acceptable manufacturer per vendor contract.
  8. **Toilet seat cover dispensers** are required in the toilet rooms. They are not required in each stall and should be wall-mounted type. The automatic toilet seat cover dispenser is not to be specified. Coordinate with MAA Building maintenance for acceptable manufacturer per vendor contract.
  9. **Air Fresheners** shall be located in all restrooms. A minimum of one should be provided for the Family Assist restroom. The location and number of fresheners in the multiple-user restrooms is at the discretion of the designer. Coordinate with MAA Building maintenance for acceptable manufacturer per vendor contract.
  10. **Grab bars** are required in the ADA toilet stall. Grab bars should have slip resistant gripping surface.
  11. **Handbag shelves** are not to be provided in multiple-user toilet rooms.
  12. **Baby changing stations** and related countertops and sinks are to be provided in each male and female multi-use toilet room and Family Assist restroom. The changing table should be within 4 feet of the countertop and sink. Baby changing equipment shall be Koala Bear Care, or approved equal. A sign is required within each multiple-user restroom indicating the location of the baby changing station.
- J. **Signage:** The toilet room signage should be in accordance with the terminal standards. Icons are to be used to designate male and female toilet rooms. Directional signs are required in public toilet room areas. Signs shall be installed at the toilet room entrance including blade-type signage. ADA compliant wall mounted signage is to be provided at each toilet room. (See Exhibits A-11, A-12, A-12A)
- K. **Lighting:** Lighting design and illumination levels should be in accordance with current lighting standards and codes. Lighting fixtures consistent with the MAA design standards, and should be 2 x 2 with parabolic lens and respective luminaire type. Alcove lighting above sinks and urinals shall have an egg-crate type parabolic diffuser. Flat translucent sheet diffusers are not acceptable.

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- L. **Ventilation:** The ventilation should exceed published mechanical standards by ten percent. The toilet room should be designed to have lower pressure than the public corridor to prevent fumes from escaping.
- M. **Acoustics:** All toilet rooms should be sound proof. This is to be performed by constructing walls from the floor to roof deck/floor above.
- N. **Fire Alarm and Emergency Lighting:** All public rooms need to comply with current building codes for fire alarm notification and emergency lighting requirements.
- O. **Plumbing Fixtures:** The plumbing fixtures shall have the following requirements for all toilet rooms constructed. (See Appendix C-Fixtures)
1. Lavatories for Family Assist and single use restrooms are to be wall mounted with trim and controls. Lavatories for multi-use toilet rooms are to be countertop mounted drop-in self-rimming with trim and controls. All sinks are to be cast iron. The mixing valves should be located in the walls (not the ceiling). The maximum temperature setting should be in accordance with applicable code. Automatic presence sensors are required at each lavatory.
  2. Urinals are to be wall mounted with trim and controls on the flushometer. Wing-walls are required on the urinals. Automatic presence sensors are required at each urinal. The sensor shall be equipped with the ability to manual flush in the event the sensor is malfunctioning.
  3. Water closets are to be wall mounted with trim and controls. Automatic presence sensors are required at each water closet. Comply with current ADA requirements for accessible toilet stalls. The sensor shall be equipped with the ability to manual flush in the event the sensor is malfunctioning.
  4. Mop basins are to be floor mounted with trim, controls and plumbing accessories.
  5. Floor drains should be self-priming and properly flashed for leak prevention (pertains to Janitorial closet as well).
  6. General control requirements for all toilet rooms:
    - a. All controls are to be automatic and hard wired.
    - b. Limit the number of fixtures on a single transformer to reduce multiple fixture outages.

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c. Provide scald protection at all lavatories.

P. **Shower Compartments:** Shower compartments are not to be placed in multi-use, Family Assist, or single-use public toilet rooms. When shower compartments are required, they shall meet the following standards: (See Appendix C-Fixtures)

1. Designed in accordance with current ADA requirements.
2. The compartment should be a prefabricated solid surface material.
3. Each compartment should have grab bars, soap dish or dispenser, a shower seat, and a heavy-duty curtain rod.
4. The mixing valve should be in the wall.
5. The showerhead should be slide type (up and down). Head is not to be placed on the back wall.
6. A floor drain is to be installed in front of the shower when installing an ADA accessible shower stall.

Q. **Lockers:** Lockers are not to be placed in multi-use, Family Assist, or single use public toilet rooms. The type, size and material are at the discretion of the designer. All lockers shall have removable legs with base filler (no concrete bases for ease of renovation). Attaching lockers to the wall or to the floor is to be approved by MAA. The lockers and locks will not be provided by MAA. ADA requirements must be maintained in locker areas.

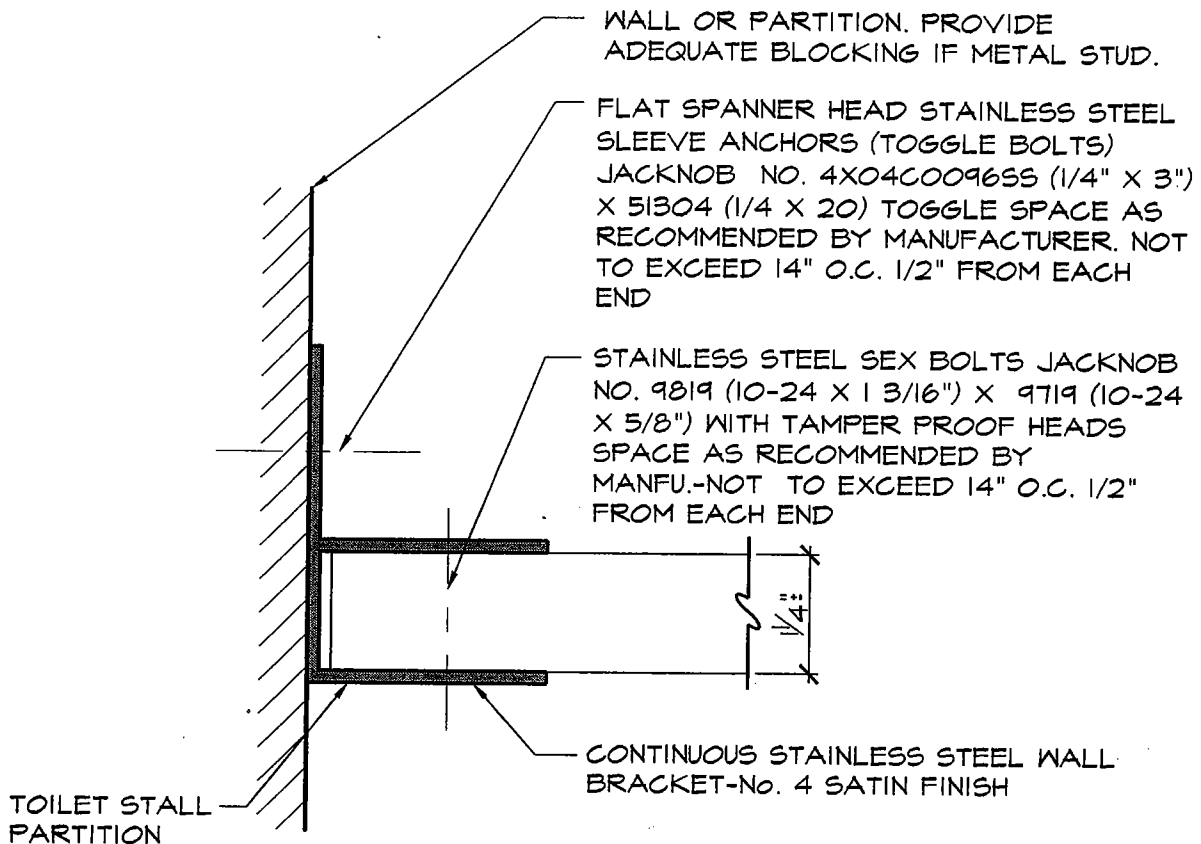
R. **Sanitary Lines:** All restroom fixtures should drain by gravity to the sanitary piping system. If existing conditions prohibit gravity flow then lift station/ejector pits are to be included in the design. Lift stations and ejector pits should be located outside the footprint of the building structure the restroom is within. In addition, secondary containment of the lift station and ejector pit should be considered to limit overflow into adjacent areas during system failure.



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### **APPENDIX A – DESIGN STANDARD EXHIBITS**

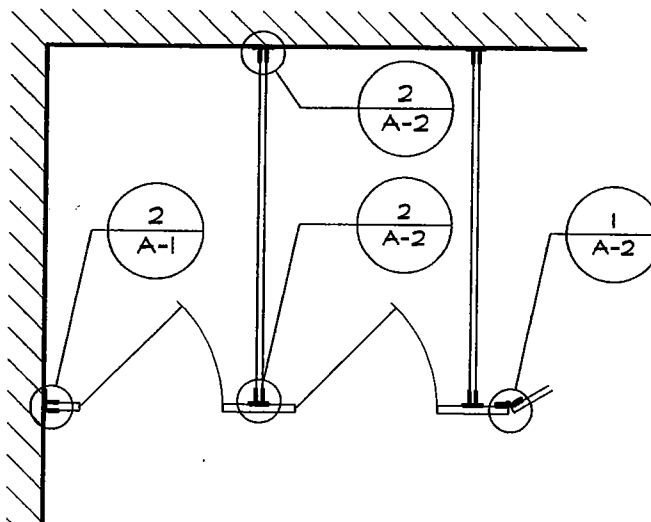
A-1	TOILET STALL AND DETAILS
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A-3	SAMPLE LAYOUT – WOMEN’S ROOM
A-4	LIGHT COVE DETAILS
A-5	SECTION THROUGH LAVATORIES
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ONE-EAR BRACKET:

- NO. 304 STAINLESS STEEL
- JACKNOB No. 2349-18 GA. X 57"

**2**  
A-1 **TYPICAL PILASTER-WALL ANCHOR**  
NOT TO SCALE



**1**  
A-1 **REFERENCE PLAN-TOILET STALLS**  
NOT TO SCALE

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PROJECT TITLE

**RESTROOM DESIGN STANDARDS**

SHEET TITLE

**TOILET STALL AND DETAILS**

SCALE

**AS NOTED**

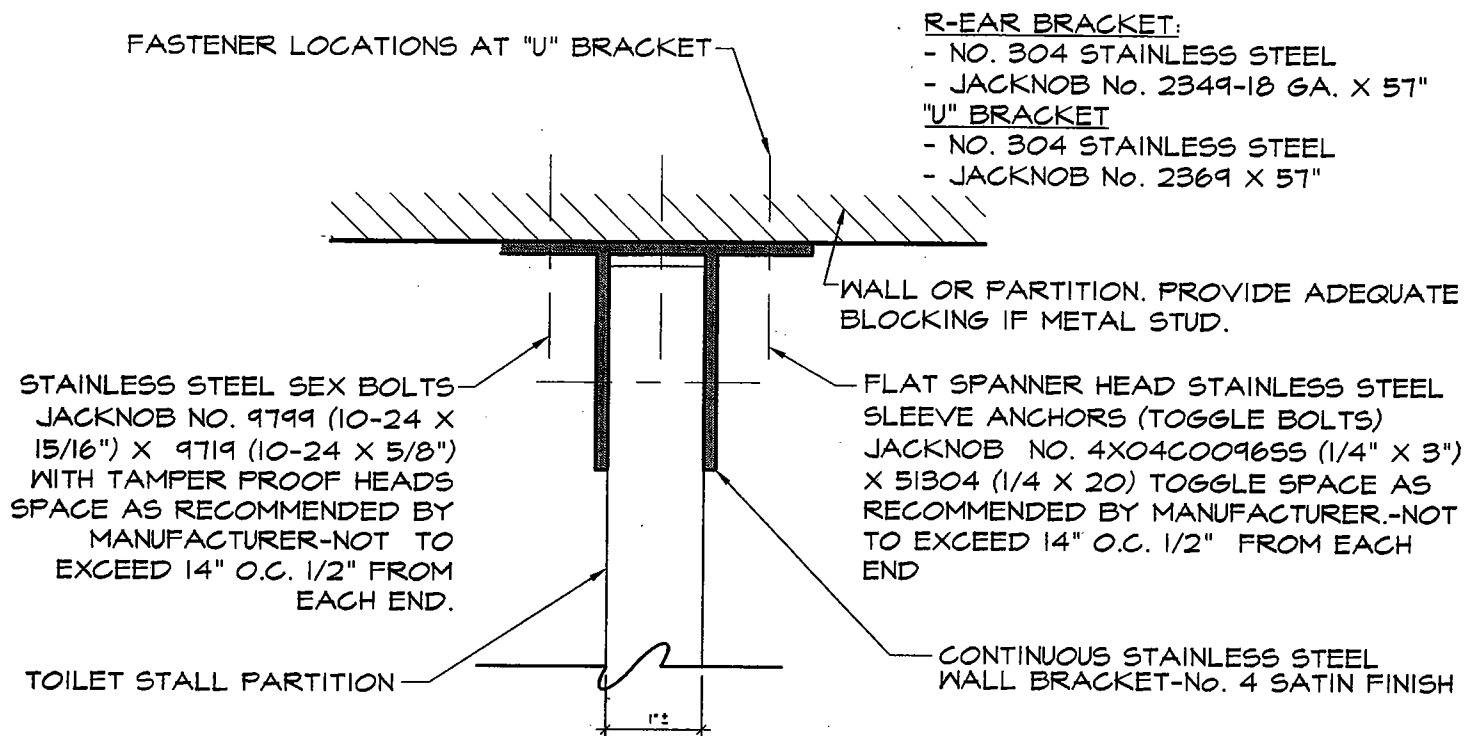
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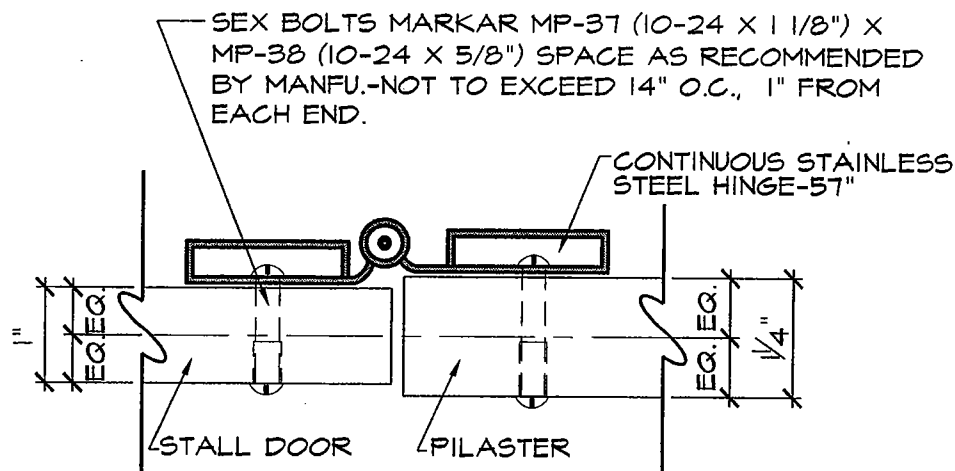
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**TASK 1314.20**

**EXHIBIT A-1**

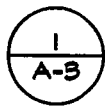
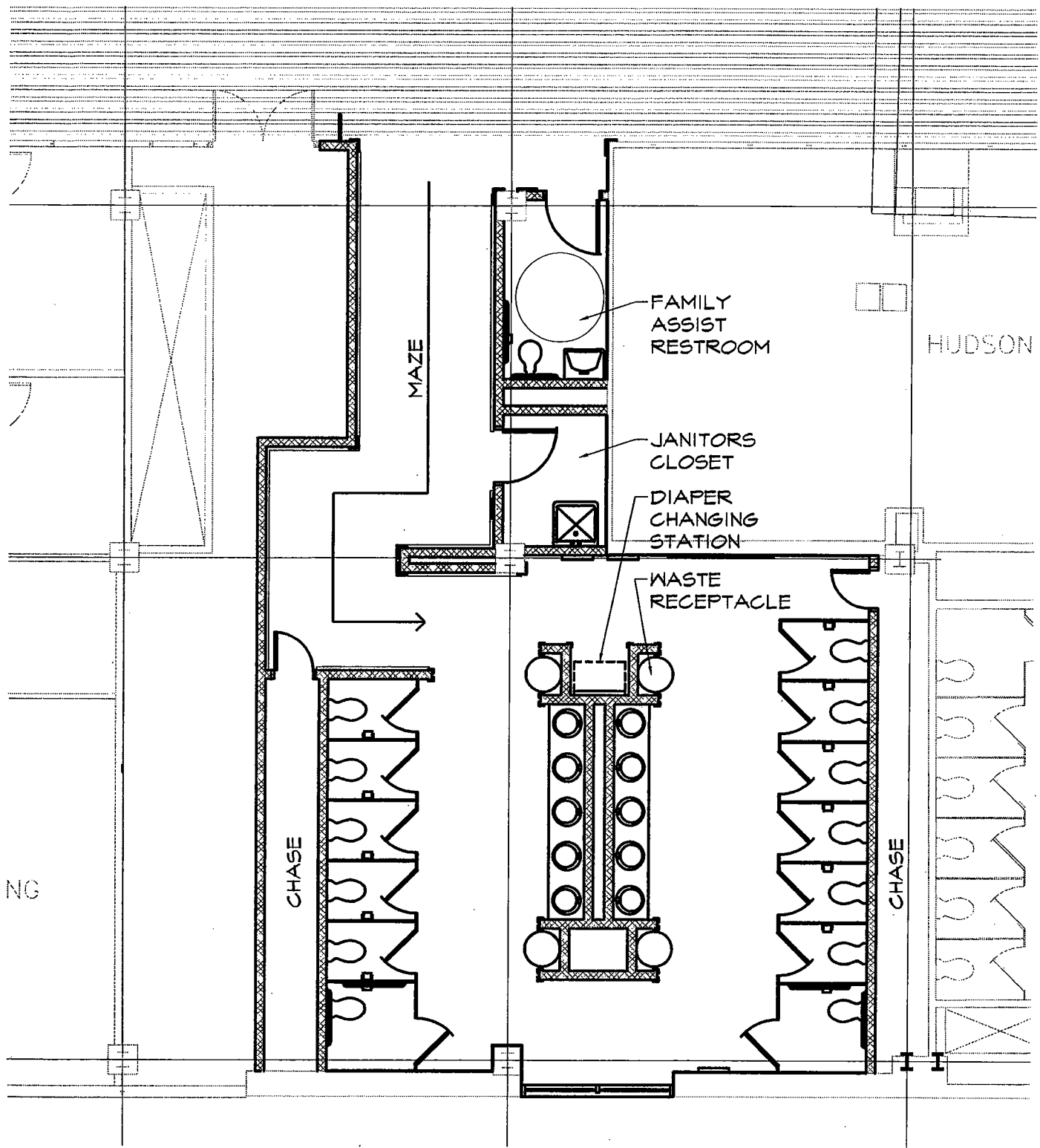


**2**  
**A-2** **TYPICAL STALL PARTITION ANCHOR**  
 NOT TO SCALE



**HINGE:**  
 - MARKAR PRODUCTS INC.  
 - NO. FS-901-TP BHMA 630-14 GA.  
 - NO. 304 STAINLESS STEEL

**1**  
**A-2** **TYPICAL STALL DOOR**  
 NOT TO SCALE



# SAMPLE LAYOUT - WOMEN'S ROOM

NOT TO SCALE



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RESTROOM DESIGN STANDARDS

SHEET TITLE

SAMPLE LAYOUT - WOMEN'S ROOM

SCALE

AS NOTED

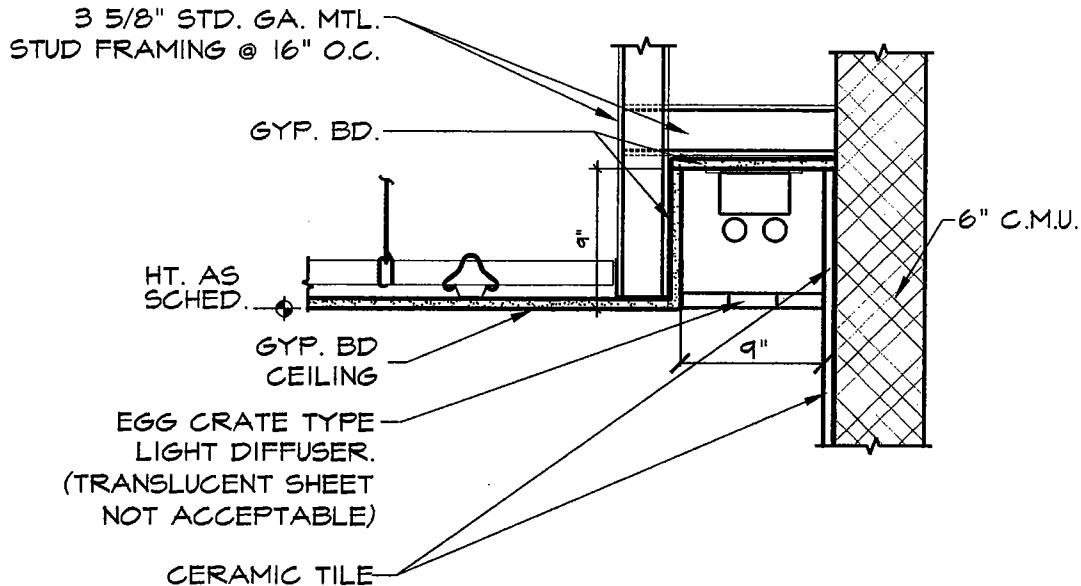
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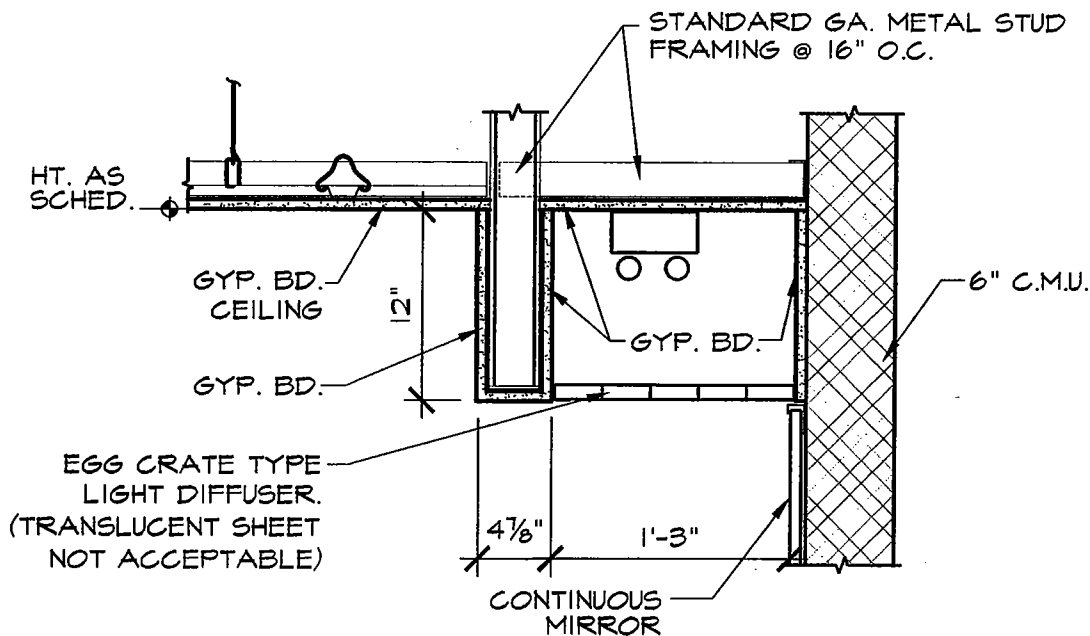
PROJECT NO.

TASK 1314.20

EXHIBIT A-3



**2**  
A-4 **LIGHT COVE DETAIL ABOVE WATER CLOSET**  
NOT TO SCALE



**1**  
A-4 **LIGHTING COVE ABOVE LAVATORIES & URINALS**  
NOT TO SCALE

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PROJECT TITLE

**RESTROOM DESIGN STANDARDS**

SHEET TITLE

**LIGHT COVE DETAILS**

SCALE

**AS NOTED**

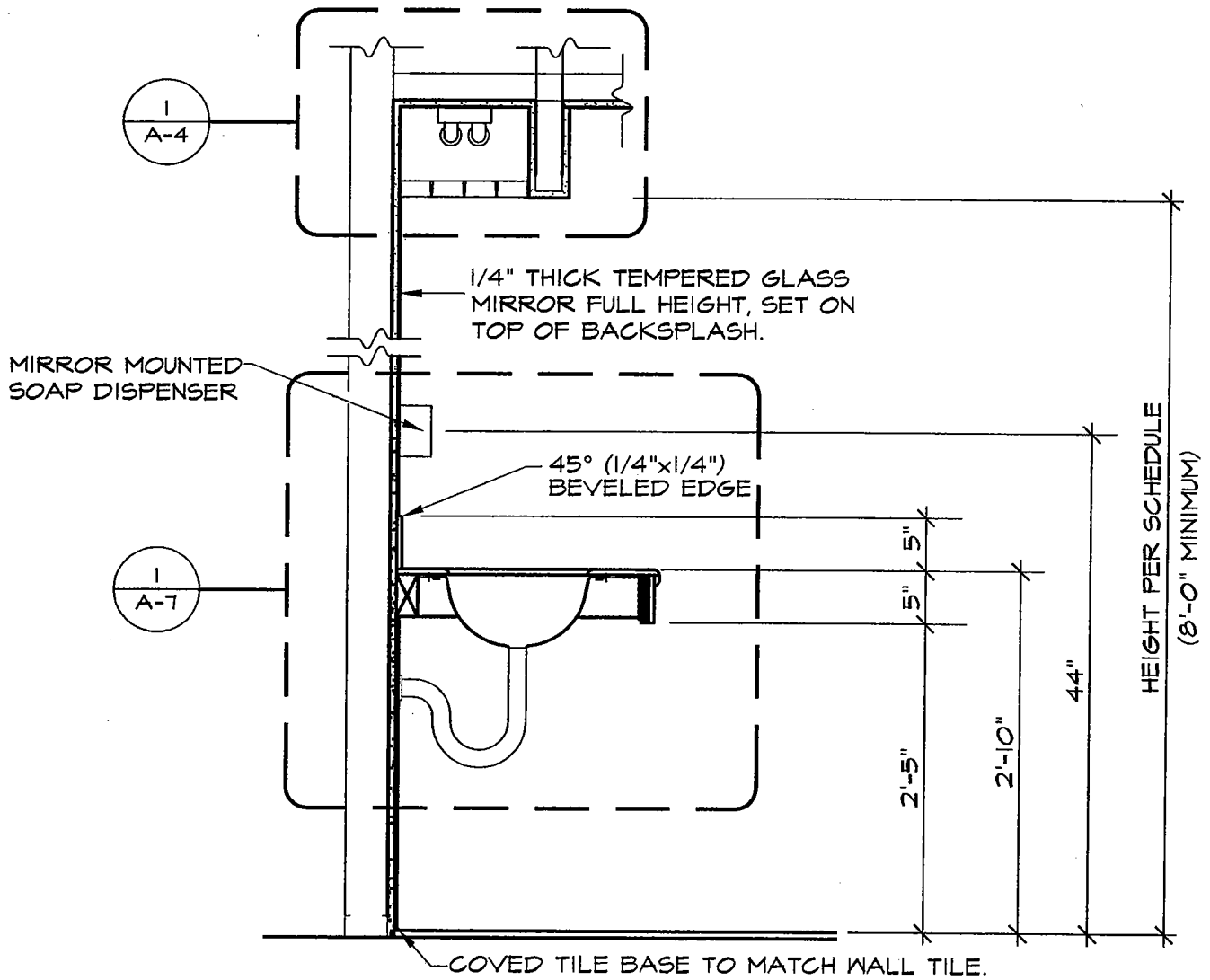
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**MAY 2004**

PROJECT NO.

**TASK 1314.20**

**EXHIBIT A-4**



1  
A-5

## SECTION THROUGH LAVATORIES

NOT TO SCALE

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PROJECT TITLE

RESTROOM DESIGN STANDARDS

SHEET TITLE

SECTION THROUGH LAVATORIES

SCALE

AS NOTED

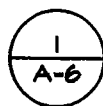
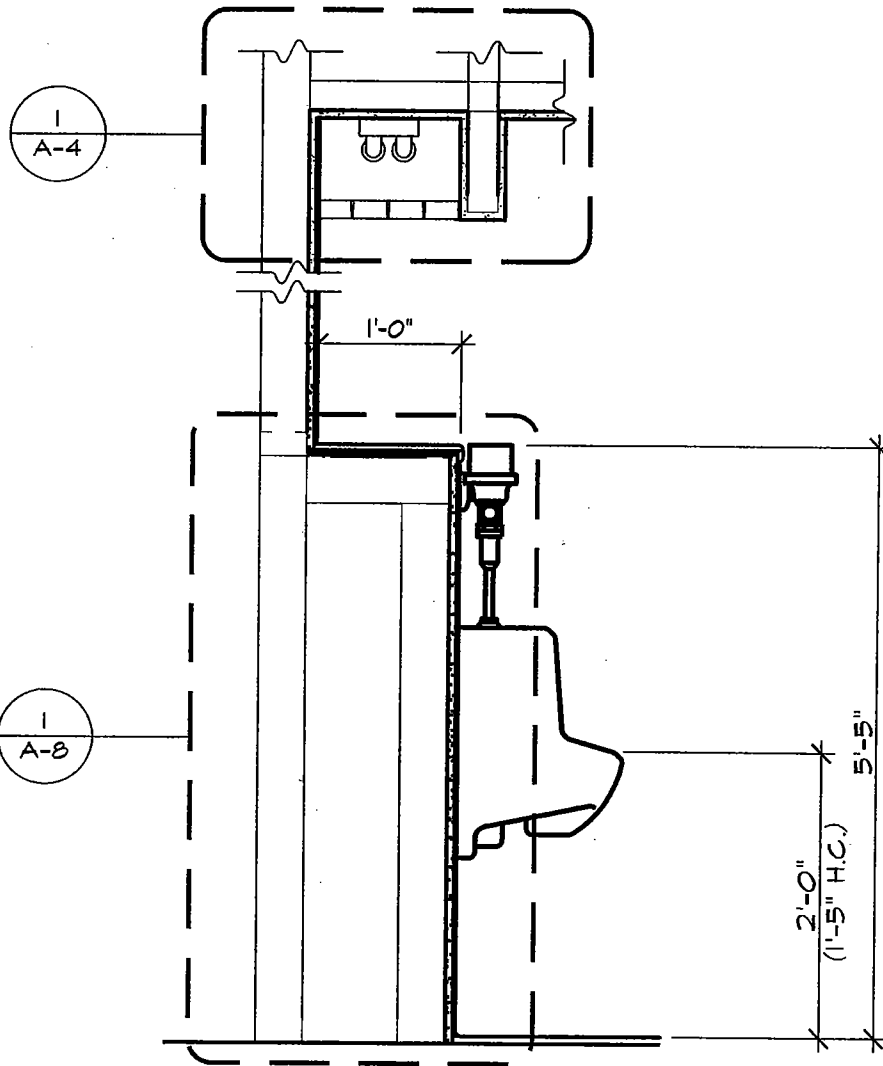
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PROJECT NO.

TASK 1314.20

EXHIBIT A-5



## SECTION THROUGH URINAL SHELF

NOT TO SCALE



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PROJECT TITLE

RESTROOM DESIGN STANDARDS

SHEET TITLE

SECTION THROUGH URINAL SHELF

SCALE

AS NOTED

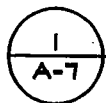
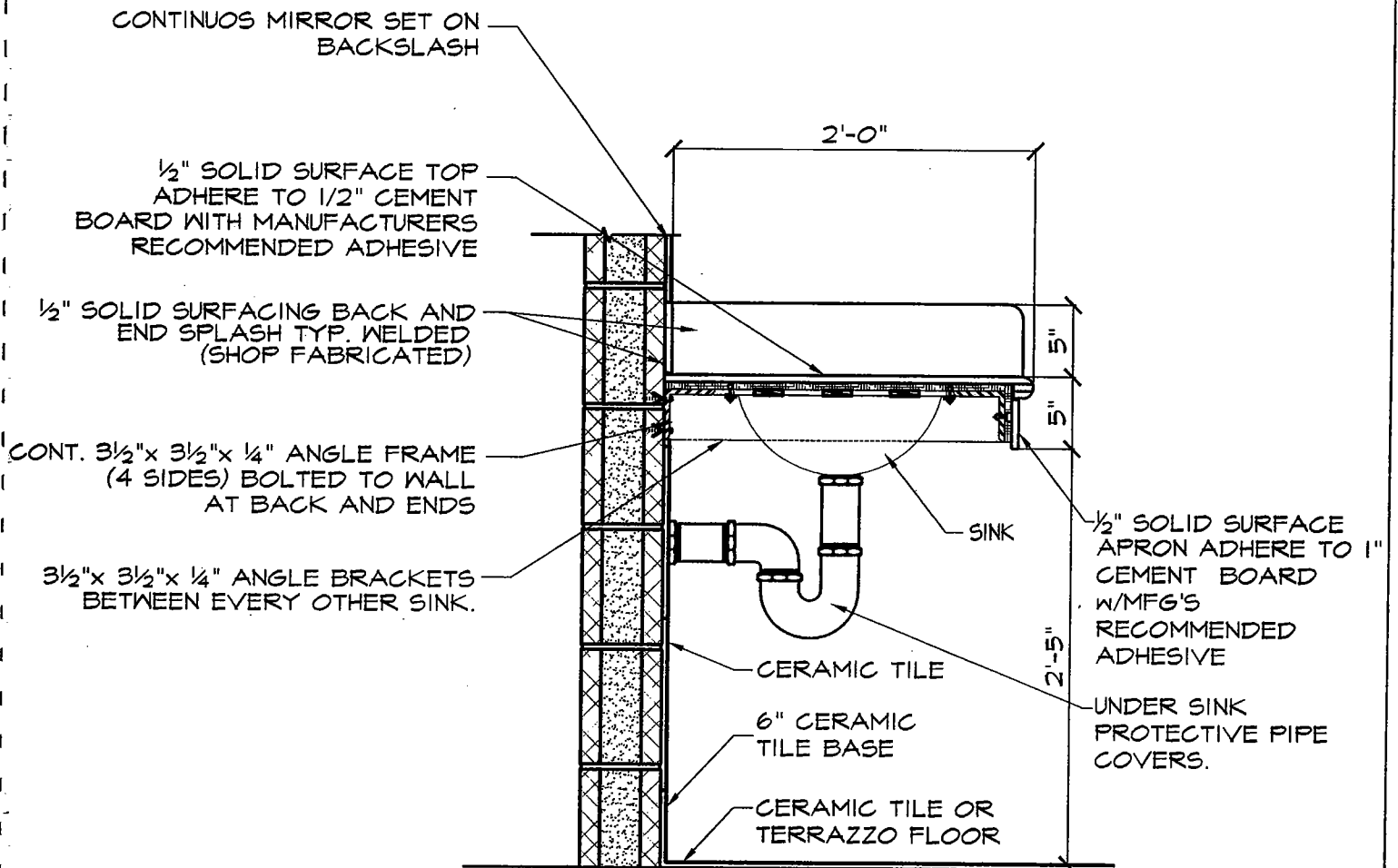
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MAY 2004

PROJECT NO.

TASK 1314.20

EXHIBIT A-6



## LAVATORY COUNTERTOP

NOT TO SCALE

NOTE: FINAL COUNTER STRUCTURE REQUIREMENTS TO BE VERIFIED BASED ON WALL CONSTRUCTION, ANCHORING & LENGTH OF VANITY COUNTER.



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PROJECT TITLE

RESTROOM DESIGN STANDARDS

SHEET TITLE

LAVATORY COUNTERTOP

SCALE

AS NOTED

DATE

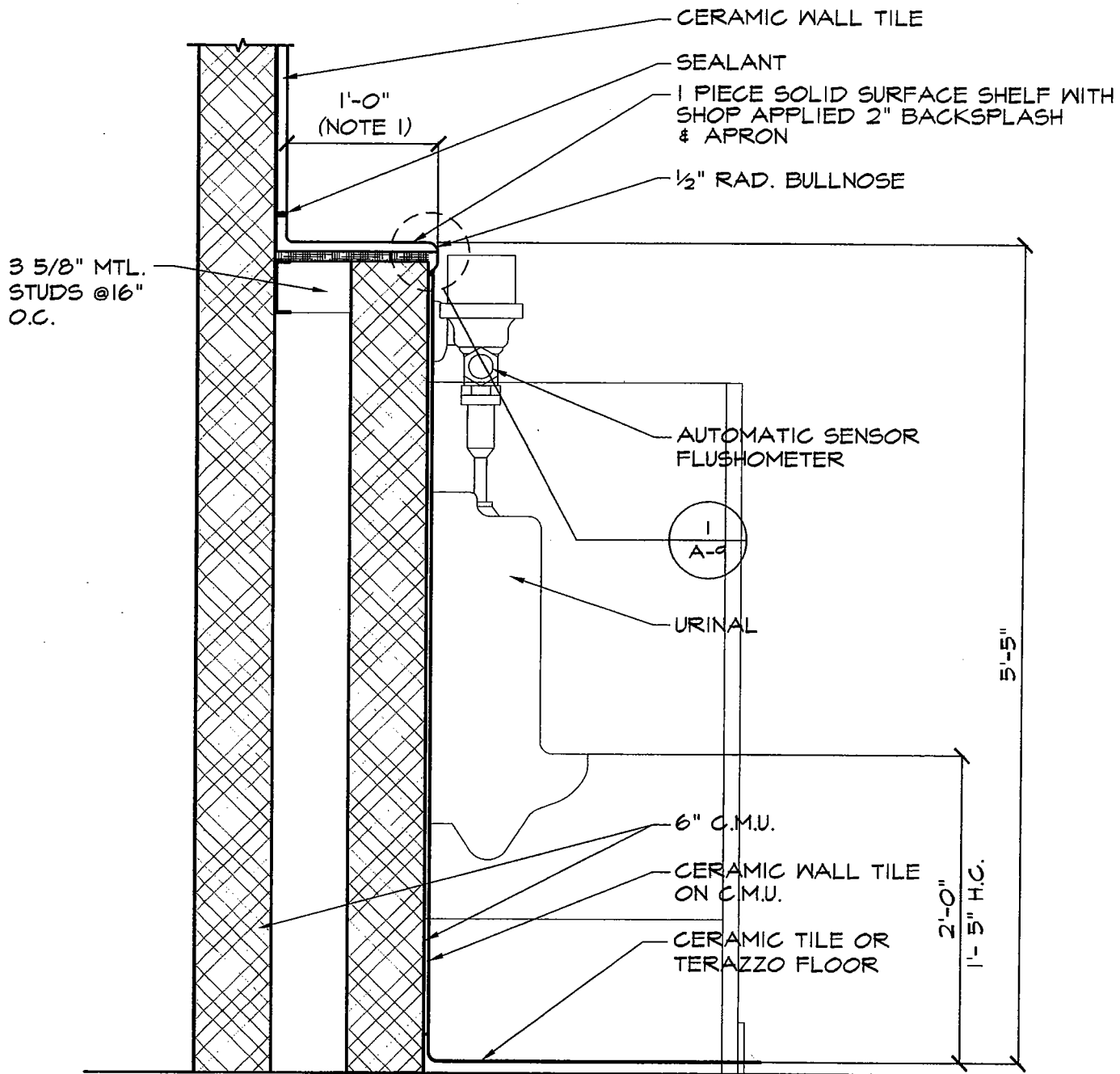
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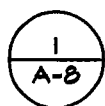
TASK 1314.20

EXHIBIT A-7





NOTE 1: COORDINATE FINAL DIMENSION REQUIREMENTS WITH URINAL CARRIAGE.



## URINAL WALL & SHELF

NOT TO SCALE

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PROJECT TITLE

RESTROOM DESIGN STANDARDS

SHEET TITLE

URINAL WALL & SHELF

SCALE

AS NOTED

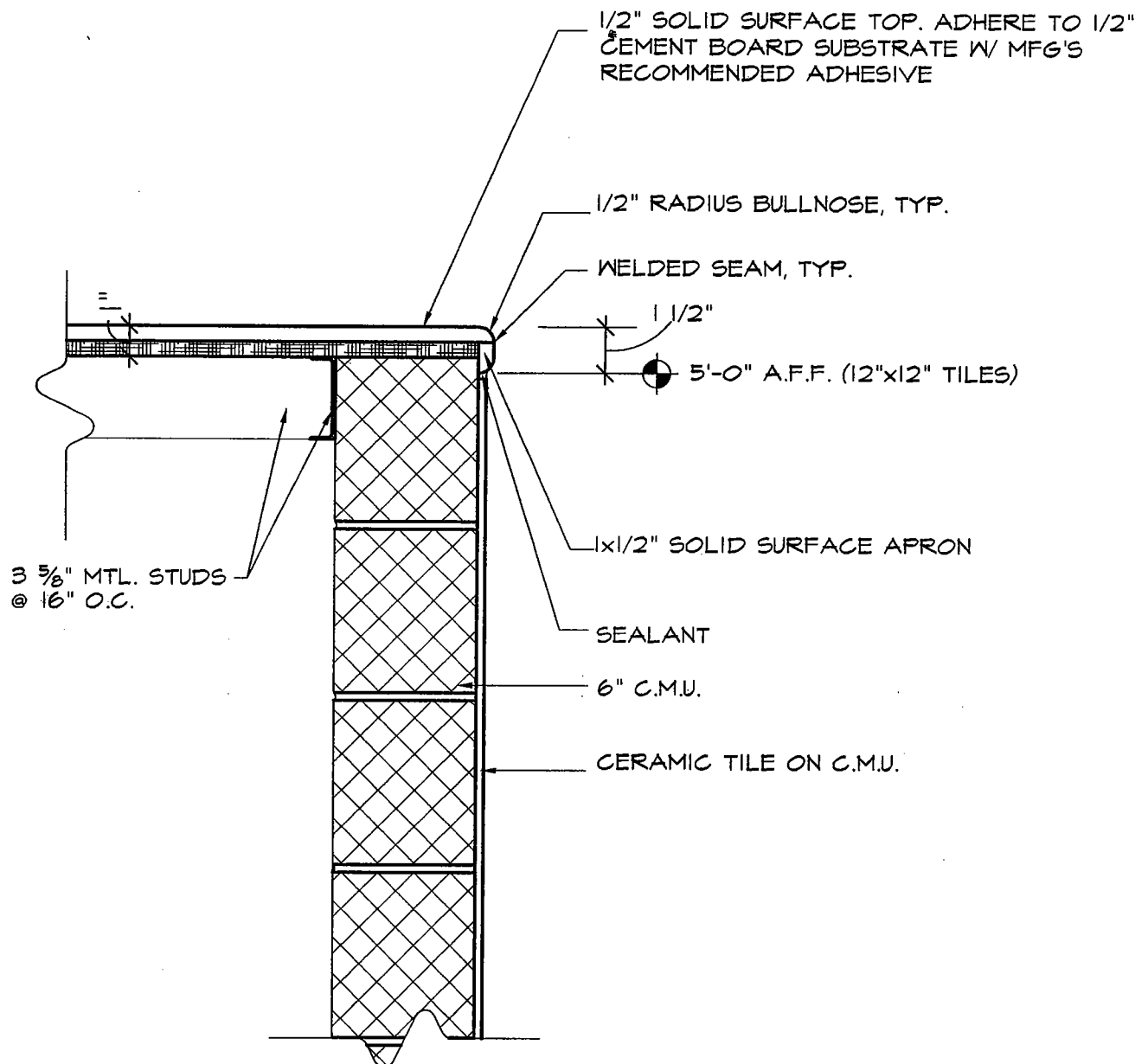
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MAY 2004

PROJECT NO.

TASK 1314.20

EXHIBIT A-8



## URINAL SHELF BULLNOSE DETAIL

NOT TO SCALE



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PROJECT TITLE

RESTROOM DESIGN STANDARDS

SHEET TITLE

URINAL SHELF BULLNOSE DETAIL

SCALE

AS NOTED

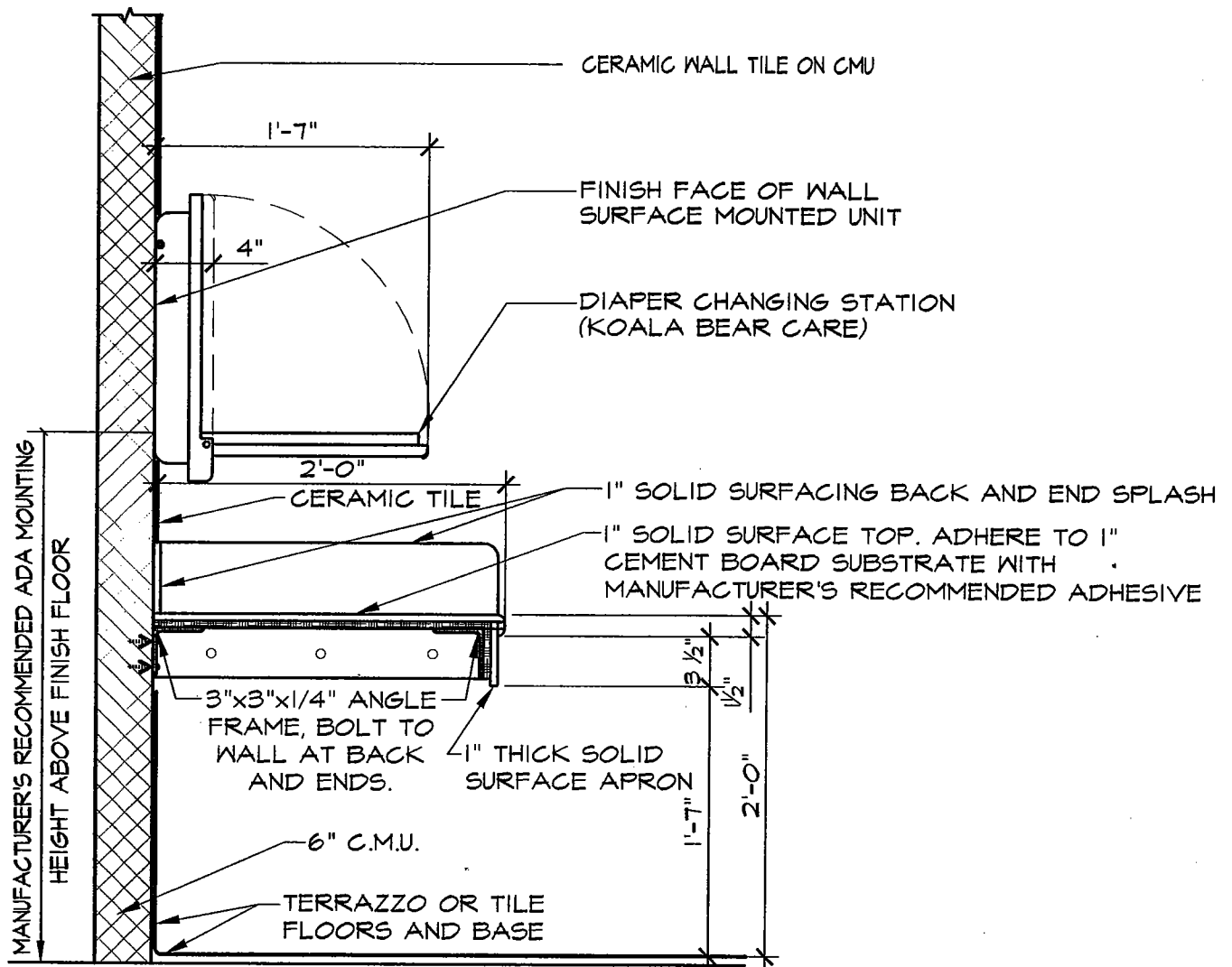
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MAY 2004

PROJECT NO.

TASK 1314.20

EXHIBIT A-9



## TOILET ROOM SHELF-DIAPER CHANGING

NOT TO SCALE

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PROJECT TITLE

RESTROOM DESIGN STANDARDS

SHEET TITLE

TOILET ROOM SHELF-DIAPER CHANGING

SCALE

AS NOTED

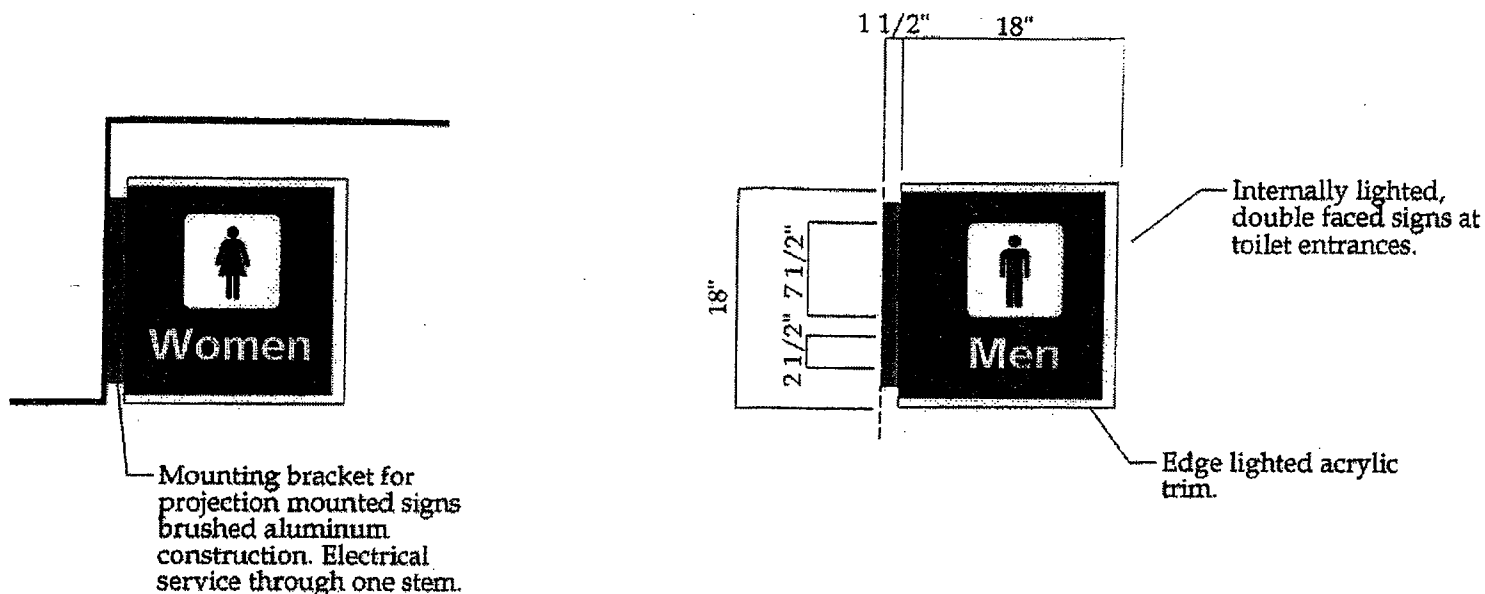
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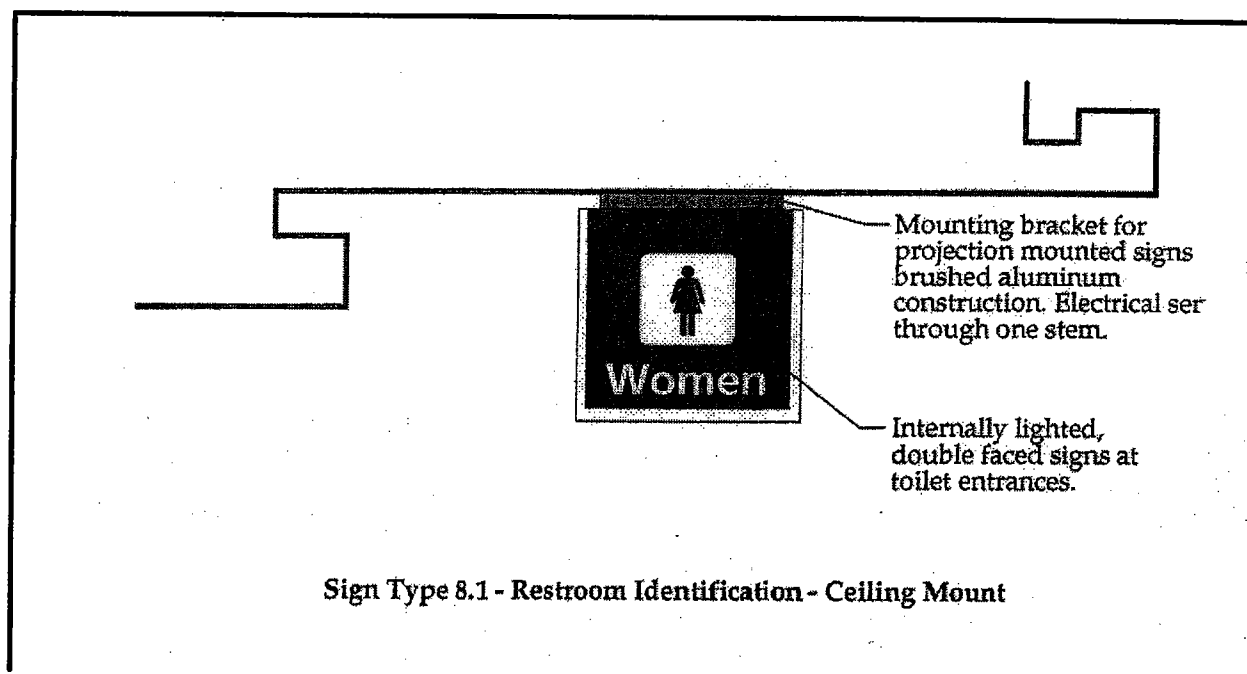
PROJECT NO.

TASK 1314.20

EXHIBIT A-10



**Sign Type 8 - Restroom Identification - Flag Mount**



**Sign Type 8.1 - Restroom Identification - Ceiling Mount**



## SIGNAGE

NOT TO SCALE

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PROJECT TITLE

RESTROOM DESIGN STANDARDS

SHEET TITLE

SIGNAGE-I

SCALE

AS NOTED

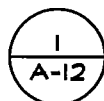
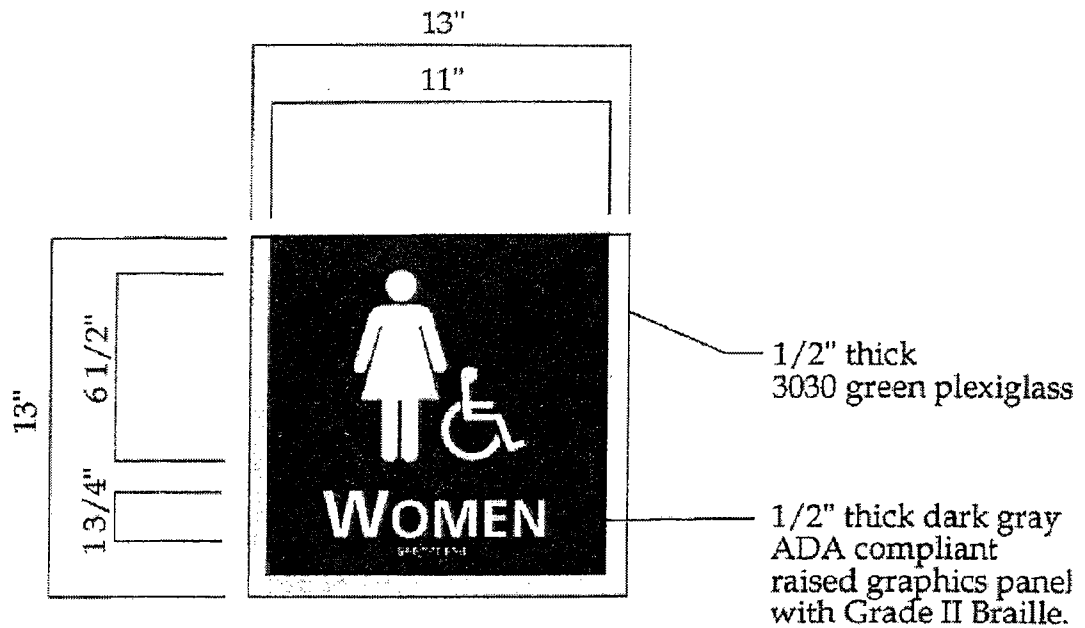
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MAY 2004

PROJECT NO.

TASK 1314.20

EXHIBIT A-II



# SIGNAGE

NOT TO SCALE



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PROJECT TITLE

RESTROOM DESIGN STANDARDS

SHEET TITLE

SIGNAGE-2

SCALE

AS NOTED

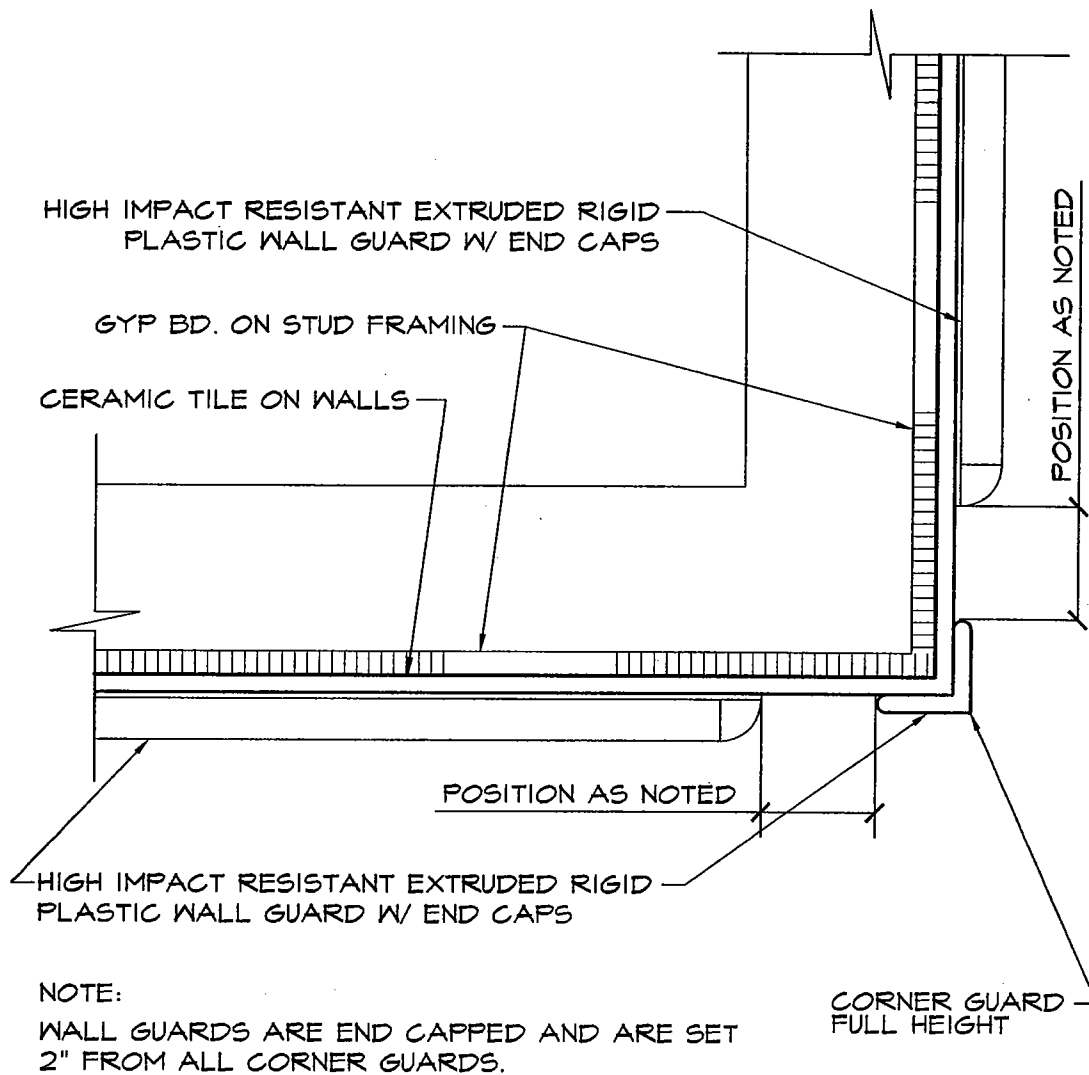
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MAY 2004

PROJECT NO.

TASK 1314.20

EXHIBIT A-12



## CORNER GUARD/WALL GUARD DETAIL

NOT TO SCALE



MICHAEL BAKER JR. INC.  
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PROJECT TITLE

RESTROOM DESIGN STANDARDS

SHEET TITLE

CORNER GUARD/WALL GUARD DETAIL

SCALE

AS NOTED

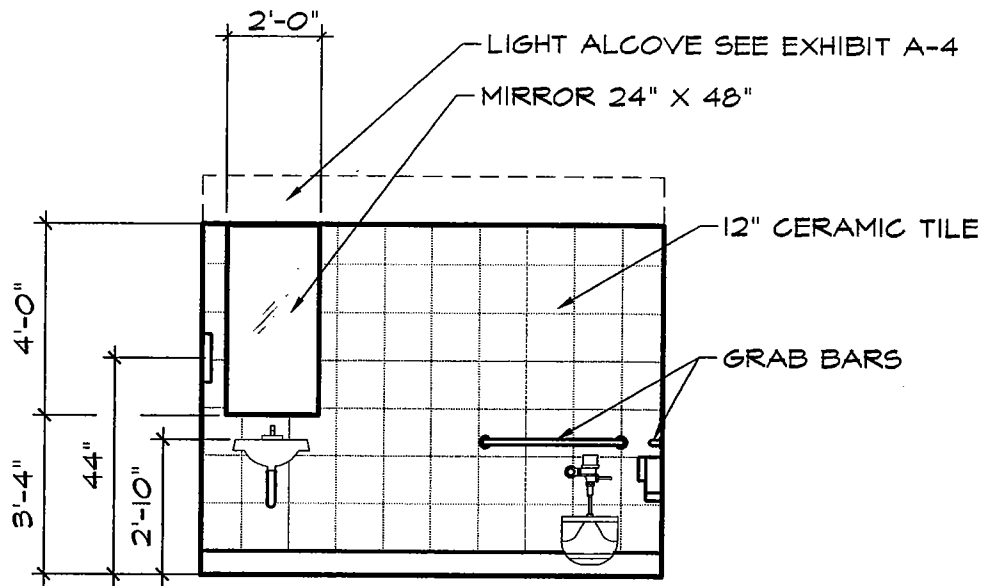
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PROJECT NO.

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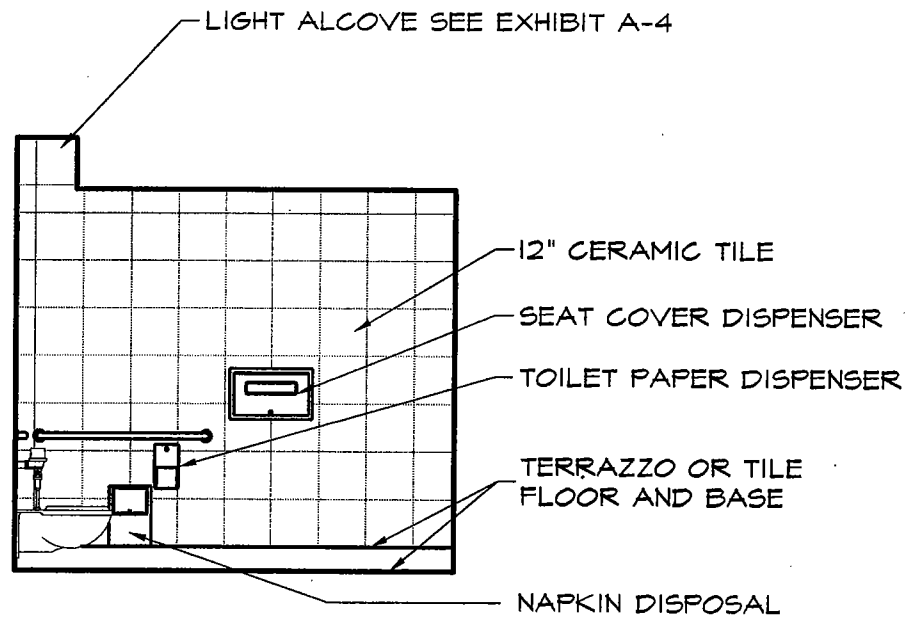
EXHIBIT A-13



2  
A-14

## FAMILY ASSIST RESTROOM

NOT TO SCALE



1  
A-14

## FAMILY ASSIST REST ROOM

NOT TO SCALE

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PROJECT TITLE

REST ROOM DESIGN STANDARDS

SHEET TITLE

TOILET ROOM ELEVATIONS-1

SCALE

AS NOTED

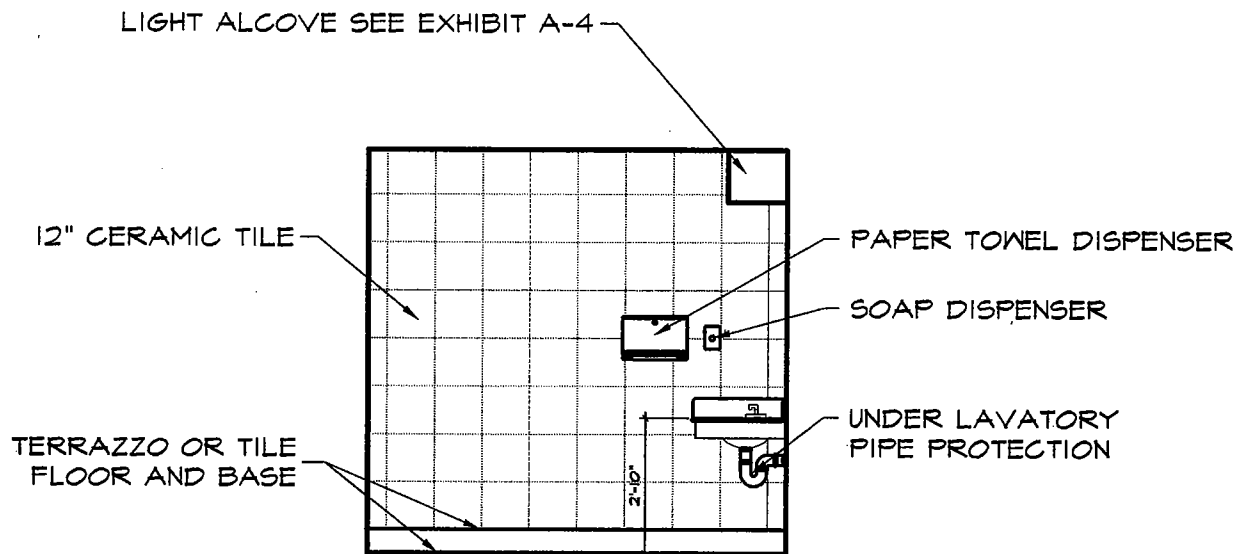
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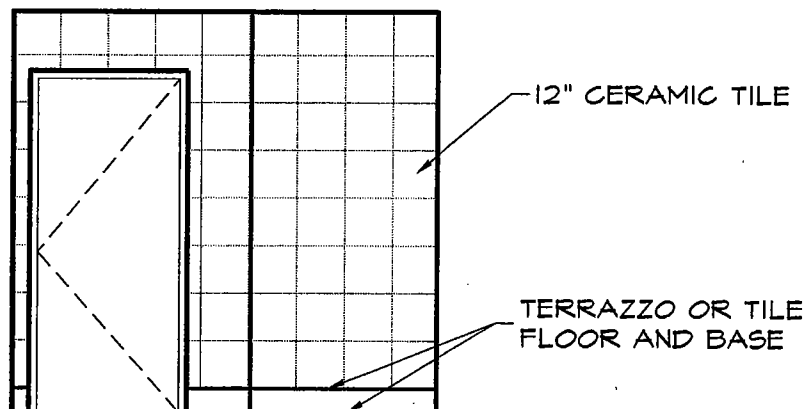
PROJECT NO.

TASK 1314.20

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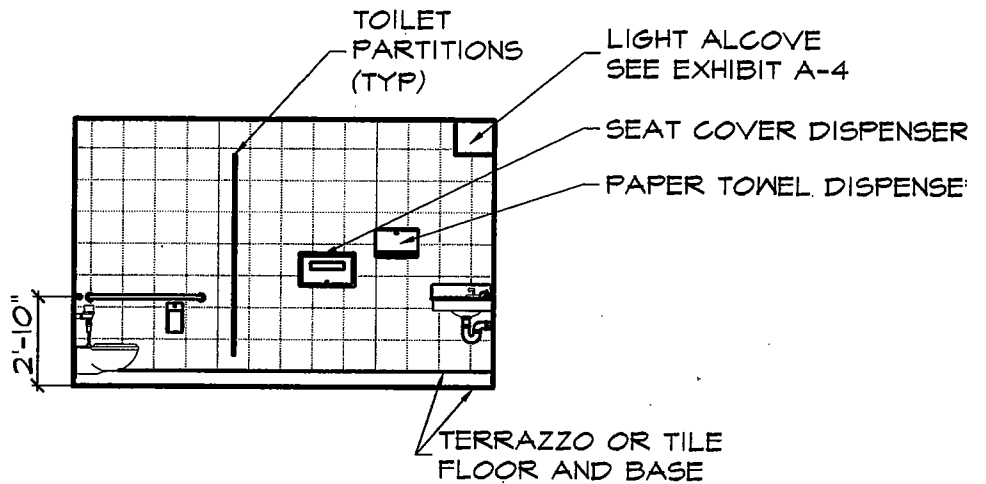


**2**  
A-15  
**FAMILY ASSIST RESTROOM**  
NOT TO SCALE



**1**  
A-15  
**FAMILY ASSIST RESTROOM**  
NOT TO SCALE

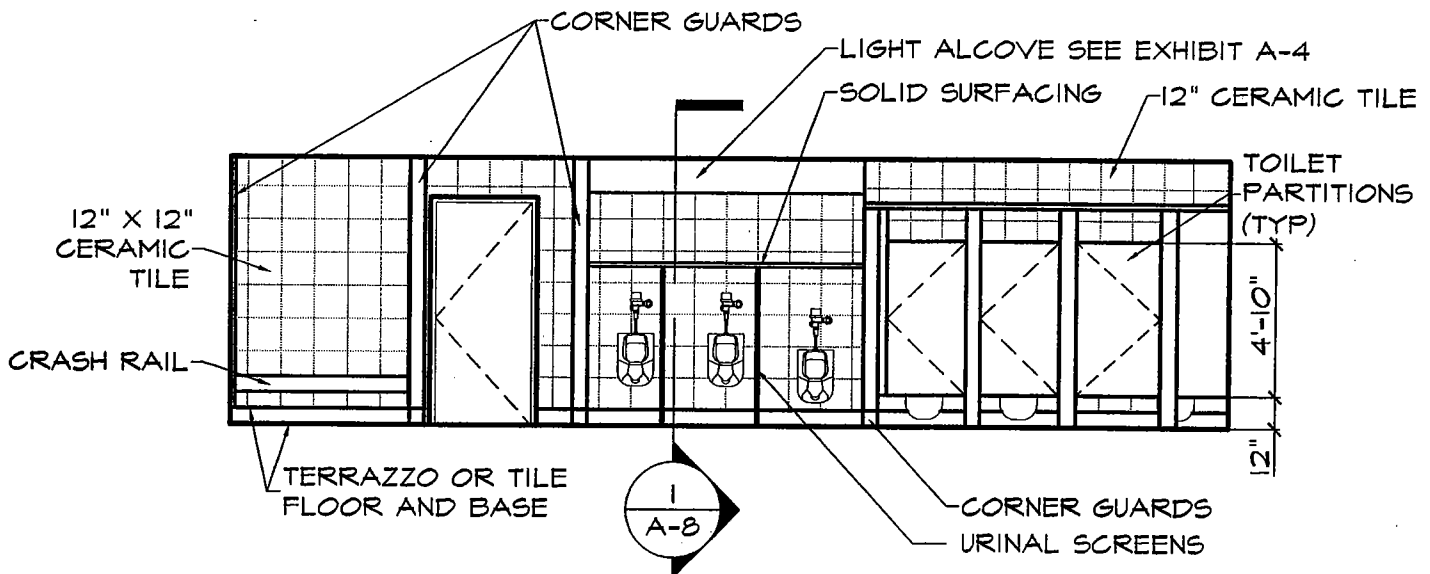




2  
A-16

## MEN'S RESTROOM

NOT TO SCALE



1  
A-16

## MEN'S REST ROOM

NOT TO SCALE

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PROJECT TITLE

RESTROOM DESIGN STANDARDS

SHEET TITLE

TOILET ROOM ELEVATIONS-3

SCALE

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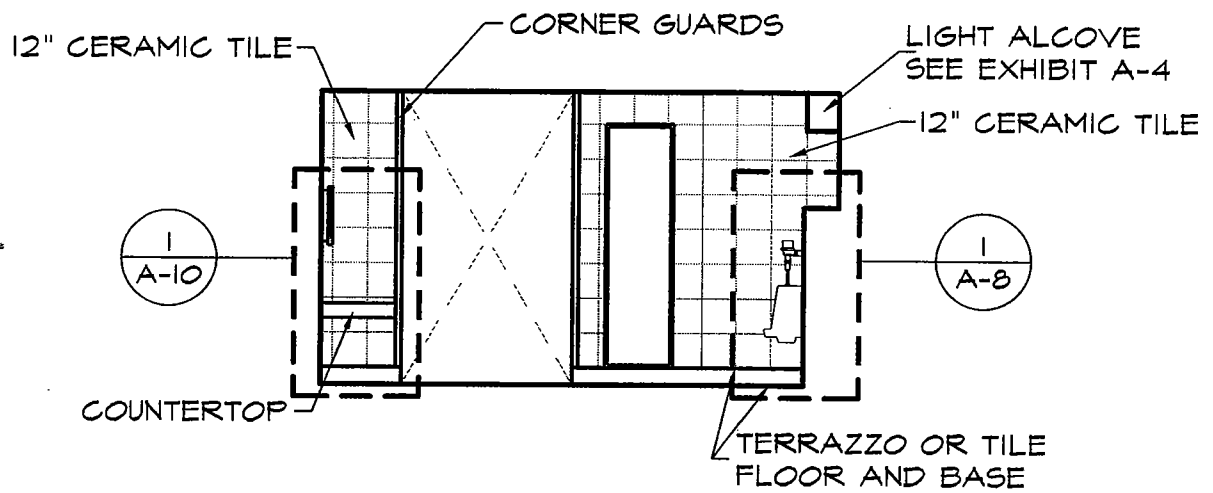
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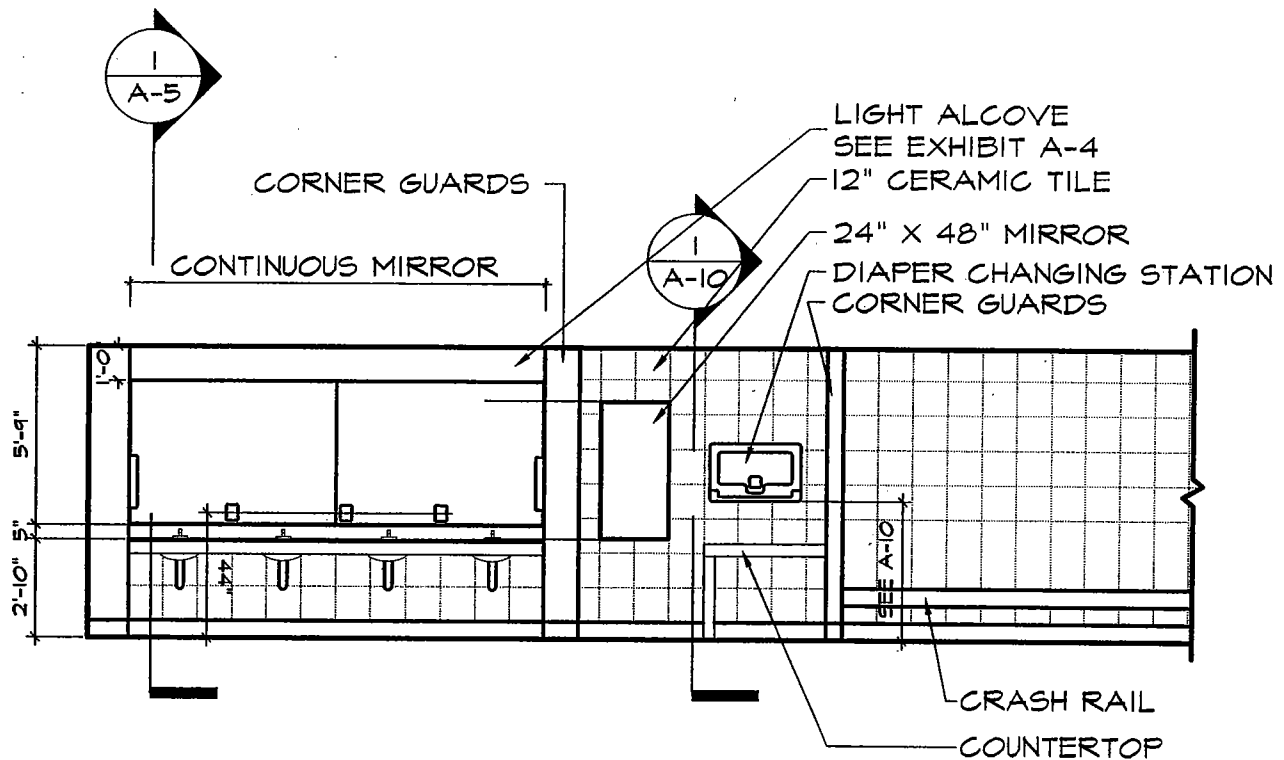
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TASK 1314.20

EXHIBIT A-16



2  
A-17  
**MEN'S RESTROOM**  
NOT TO SCALE



1  
A-17  
**MEN'S RESTROOM**  
NOT TO SCALE

**Baker**

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PROJECT TITLE

**RESTROOM DESIGN STANDARDS**

SHEET TITLE

**TOILET ROOM ELEVATIONS-4**

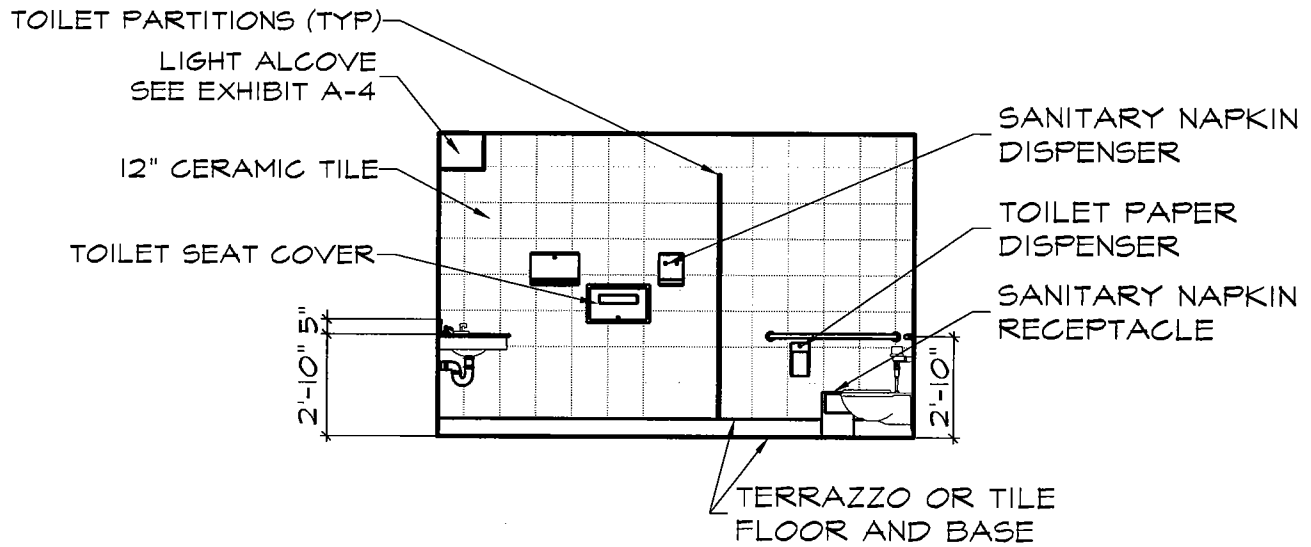
SCALE AS NOTED

DATE MAY 2004

PROJECT NO.

**TASK 1314.20**

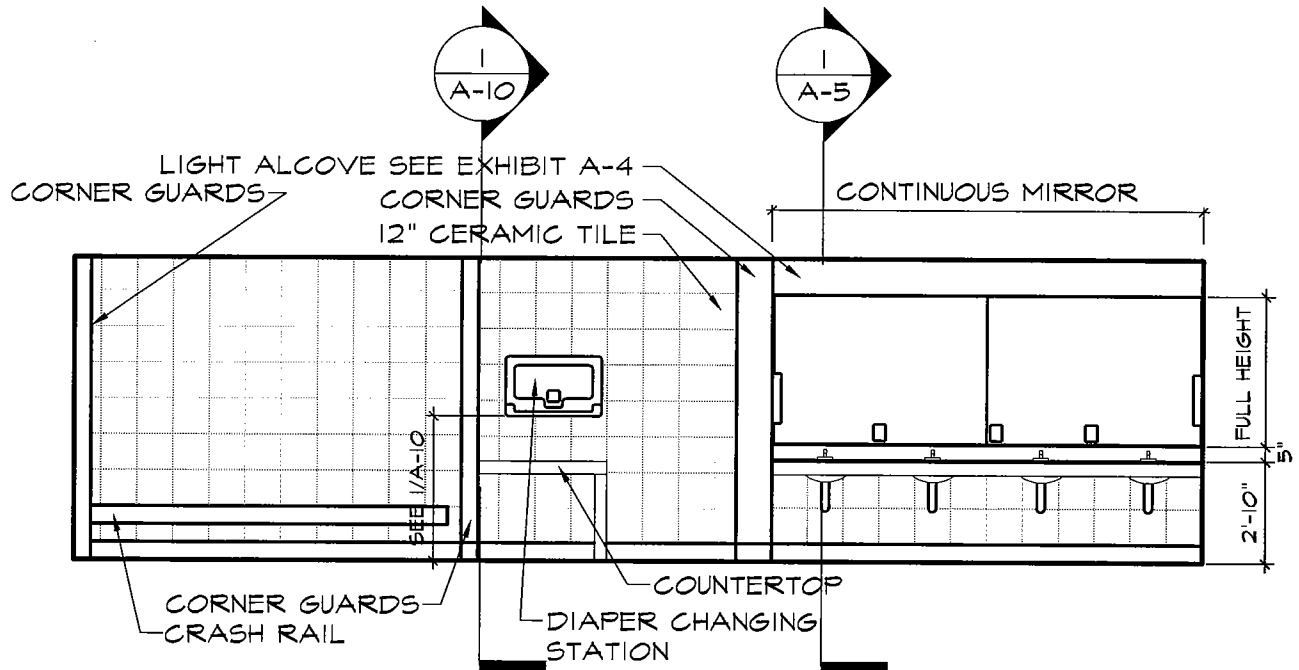
**EXHIBIT A-17**



2  
A-18

## WOMEN'S RESTROOM

NOT TO SCALE



1  
A-18

## WOMEN'S RESTROOM

NOT TO SCALE

**Baker**

Michael Baker Jr., Inc.

MICHAEL BAKER JR., INC.  
Consulting Engineers  
801 Cromwell Park Drive  
Suite 110  
Glen Burnie, Maryland 21061

PROJECT TITLE

RESTROOM DESIGN STANDARDS

SHEET TITLE

TOILET ROOM ELEVATIONS-5

SCALE

AS NOTED

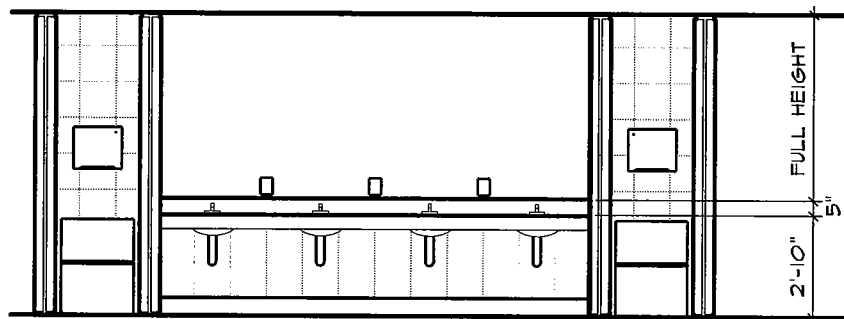
DATE

MAY 2004

PROJECT NO.

TASK 1314.20

EXHIBIT A-18

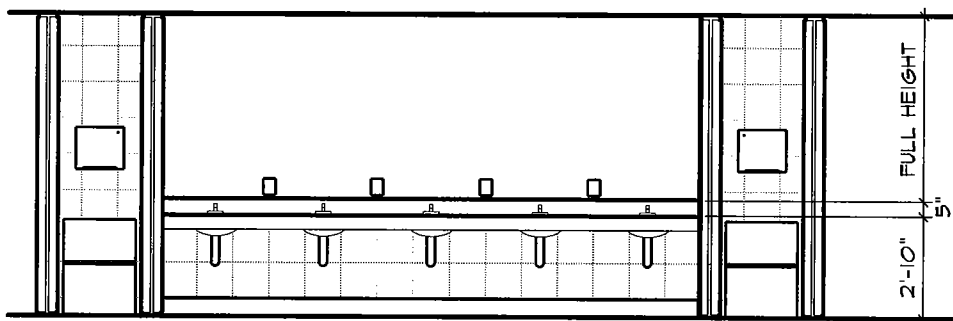


MAXIMUM OF 2 BASINS TO TOWEL DISPENSER



INTERIOR ELEVATION

NONE



MAXIMUM OF 3 BASINS TO TOWEL DISPENSER



INTERIOR ELEVATION

NONE

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Glen Burnie, Maryland 21061

PROJECT TITLE

RESTROOM DESIGN STANDARDS

SHEET TITLE

TOILET ROOM ELEVATIONS-5

SCALE

AS SHOWN

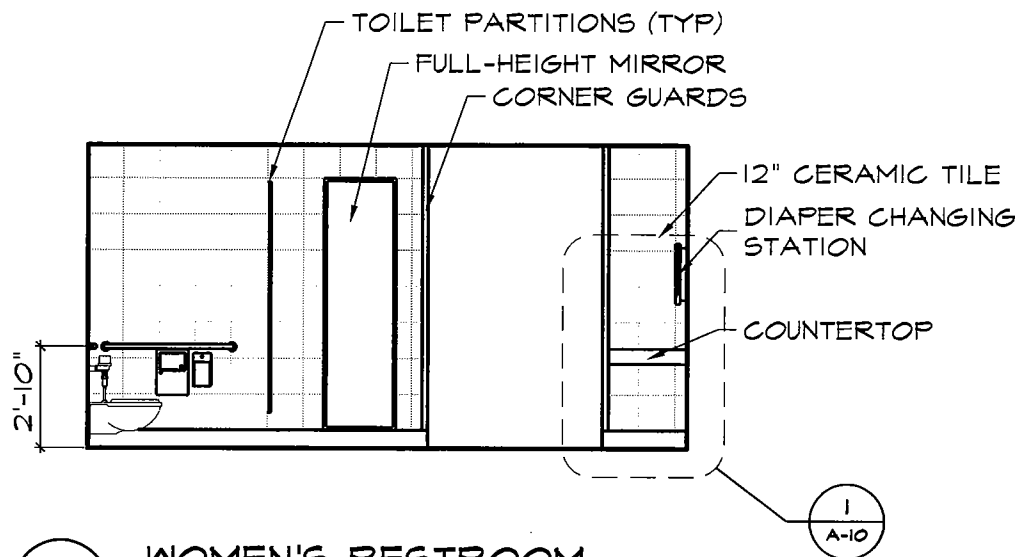
DATE

JANUARY 2003

PROJECT NO.

TASK 1314.20

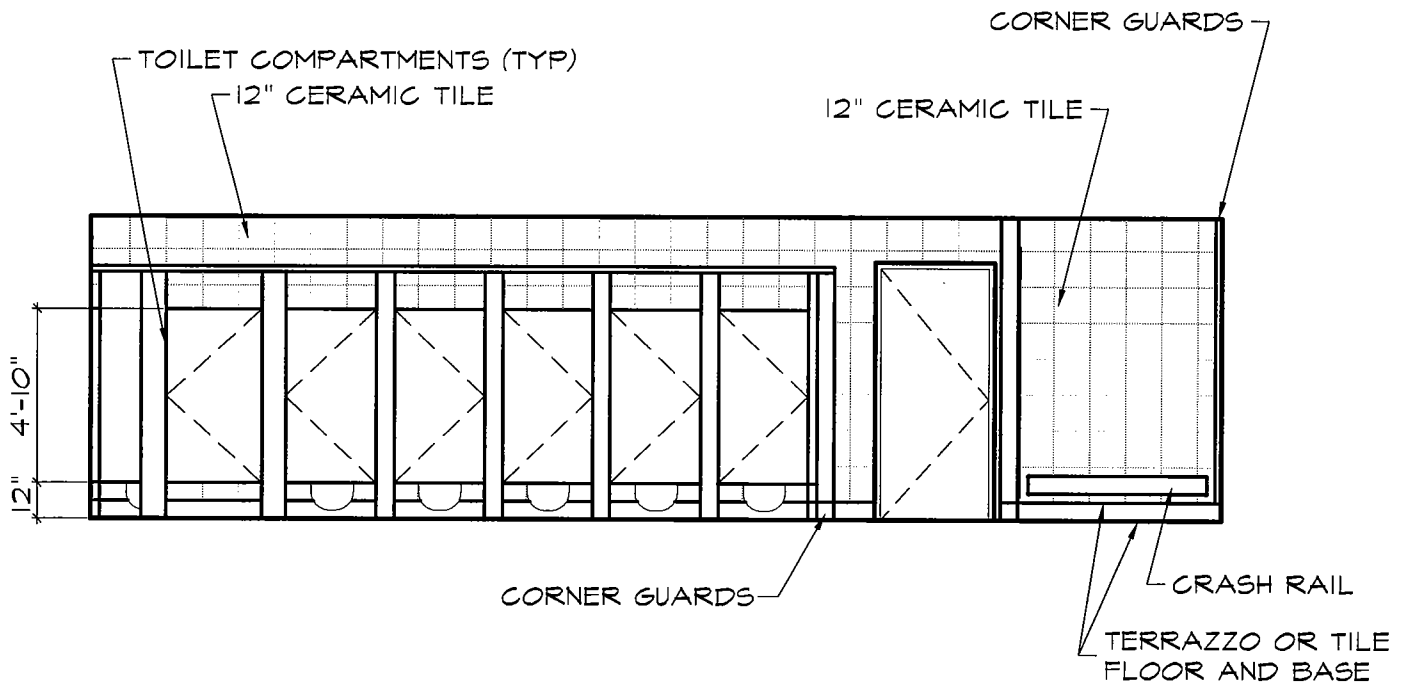
EXHIBIT A-19



2  
A-20

**WOMEN'S RESTROOM**

NOT TO SCALE



1  
A-20

**WOMEN'S RESTROOM**

NOT TO SCALE

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PROJECT TITLE

**RESTROOM DESIGN STANDARDS**

SHEET TITLE

**TOILET ROOM ELEVATIONS-6**

SCALE AS NOTED

DATE MAY 2004

PROJECT NO.

**TASK 1314.20**

**EXHIBIT A-20**

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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.

### **APPENDIX B – PRODUCT CUT SHEETS**

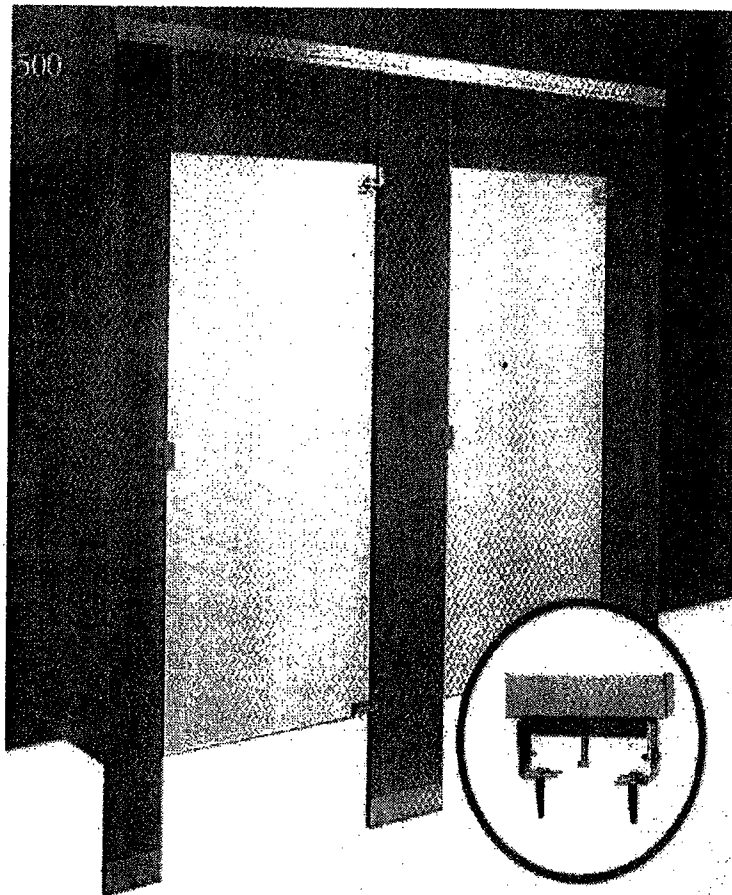
B-1	TOILET PARTITIONS AND DOOR HARDWARE-1
B-2	TOILET PARTITIONS AND DOOR HARDWARE-2
B-3	TOILET PARTITIONS AND DOOR HARDWARE-3
B-4	TOILET PARTITIONS AND DOOR HARDWARE-4
B-5	TOILET PARTITIONS AND DOOR HARDWARE-5
B-6	TOILET PARTITIONS AND DOOR HARDWARE-6
B-7	TOILET PARTITIONS AND DOOR HARDWARE-7
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B-9	TOILET PARTITIONS AND DOOR HARDWARE-9
B-10	TOILET PARTITIONS AND DOOR HARDWARE-10
B-11	TOILET PARTITIONS AND DOOR HARDWARE-11
B-12	TOILET PARTITIONS AND DOOR HARDWARE-12
B-13	TOILET PARTITIONS AND DOOR HARDWARE-13
B-14	TOILET PARTITIONS AND DOOR HARDWARE-14
B-15	TOILET PARTITIONS AND DOOR HARDWARE-15
B-16	TOILET PARTITIONS AND DOOR HARDWARE-16
B-17	TOILET PARTITIONS AND DOOR HARDWARE-17
B-18	TOILET PARTITIONS AND DOOR HARDWARE-18
B-19	TOILET PARTITIONS AND DOOR HARDWARE-19
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**FP500 - Corinthian Overhead Braced**

**Baker**

MICHAEL BAKER JR. INC.  
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PROJECT TITLE

**RESTROOM DESIGN STANDARDS**

SHEET TITLE

**TOILET PARTITIONS AND DOOR HARDWARE-1**

SCALE

**NONE**

DATE

**MARCH 2005**

PROJECT NO.

**TASK 1314.20**

**B-1**



# STAINLESS STEEL TOILET ENCLOSURES

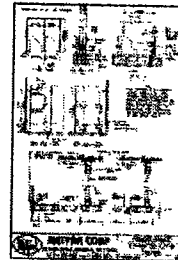
**THE CORINTHIAN METPAR TYPE: FP-500 Overhead Braced**

**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 1/4" (31.75mm)



Click on  
image to  
full size &  
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-gauge 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 pressun 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 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" (7.6) #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 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 a slide latch with external "in-use" indicator.

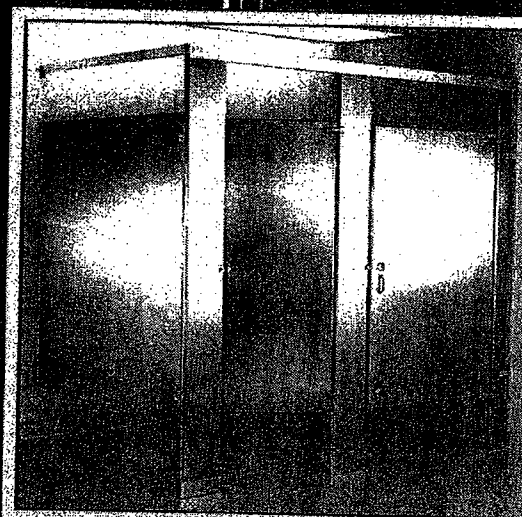
## FINISH:

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

 <b>MICHAEL BAKER JR. INC.</b> 801 Cromwell Park Drive Suite 110 Glen Burnie, MD 21061	PROJECT TITLE		PROJECT NO.  <b>TASK 1314.20</b>
	<b>RESTROOM DESIGN STANDARDS</b>		
	SHEET TITLE		
	<b>TOILET PARTITIONS AND DOOR HARDWARE-2</b>		<b>B-2</b>
	SCALE	DATE	
	<b>NONE</b>	<b>MARCH 2005</b>	

10155/SA  
EasyLine 024

# SANYMETAL



# PARTITIONS

 **Sanymeta**  
A KIRKANE PLUMBING COMPANY

**Baker**

**MICHAEL BAKER JR. INC.**  
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Suite 110  
Glen Burnie, MD 21061

PROJECT TITLE

**RESTROOM DESIGN STANDARDS**

SHEET TITLE

**TOILET PARTITIONS AND DOOR HARDWARE-3**

SCALE

**NONE**

DATE

**MARCH 2005**

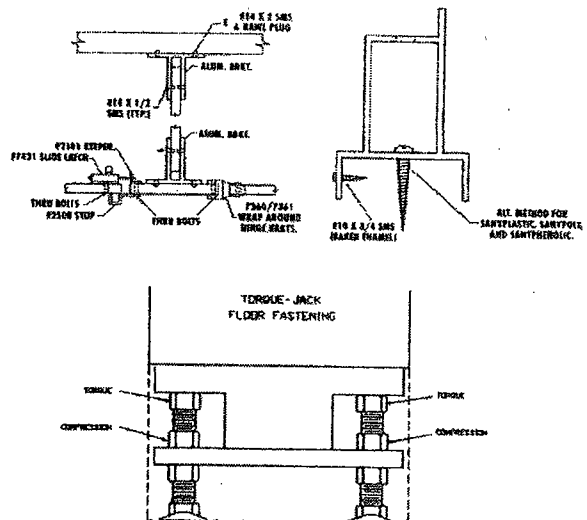
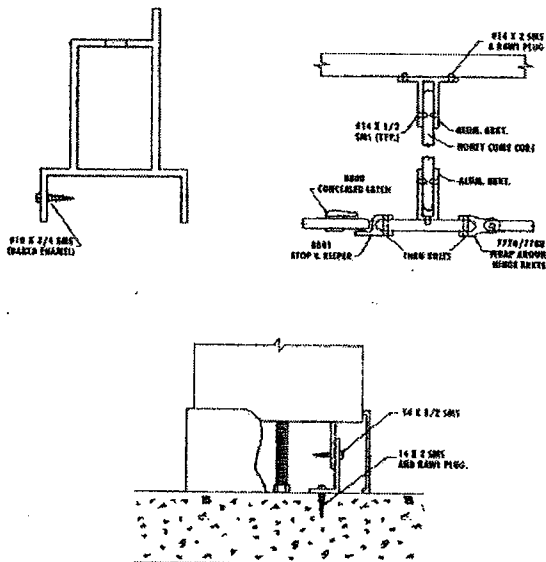
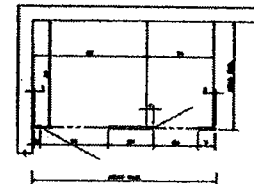
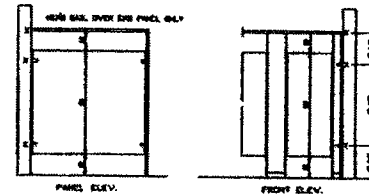
PROJECT NO.

**TASK 1314.20**

**B-3**

Aluminum anti-grip head rail bracing permits installation in otherwise nonfunctional areas.

## ACADEMY



4

**Baker**

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Glen Burnie, MD 21061

PROJECT TITLE

**RESTROOM DESIGN STANDARDS**

SHEET TITLE

**TOILET PARTITIONS AND DOOR HARDWARE-4**

SCALE

**NONE**

DATE

**MARCH 2005**

PROJECT NO.

**TASK 1314.20**

**B-4**

# SHORT FORM SPECIFICATIONS

Sanymetal offers design opportunity... a method to specify and order the type, materials, colors and combinations to meet your criteria for strength, corrosion resistance, in-place costs and design.

Specify the design type (Section 1), select the material for doors, panels and pilasters from Section 2, 3 and 4. For example: Sanymetal panels can be installed with steel pilasters.

## BAKED ENAMEL

## STAINLESS STEEL

<b>1</b> TYPE	<p>1: Academy toilet compartments shall be Acrylic Coated Academy type as manufactured by Sanymetal.</p> <p>Century toilet compartments shall be Acrylic Coated Century type as manufactured by Sanymetal.</p> <p>Normandie toilet compartments shall be Acrylic Coated Normandie type as manufactured by Sanymetal.</p>	<p>1: Academy toilet compartments shall be stainless steel Academy type as manufactured by Sanymetal.</p> <p>Century toilet compartments shall be stainless steel Century type as manufactured by Sanymetal.</p> <p>Normandie toilet compartments shall be stainless steel Normandie type as manufactured by Sanymetal.</p>
<b>2</b> DOORS	<p>2: Shall be 1" thick with two sheets of #22 Galvanized-Bonded steel enclosing sound-deadening Bridgecore. All formed edges shall be welded every 18" and sealed with a surrounding oval-crown locking strip, mitered, welded and finished at the corners.</p> <p>Standard door size, other than "handicapped" is 24".</p>	<p>2: Shall be 1" thick with two sheets of #22 gauge, 304 16-8 stainless steel enclosing sound-deadening Bridgecore. All formed edges shall be welded every 18" and sealed with a surrounding oval-crown locking strip, mitered, welded and finished at the corners.</p> <p>Standard door size, other than "handicapped" is 24".</p>
<b>3</b> PANELS	<p>3: Academy, Century and Normandie shall be 1" thick with two sheets of #22 Galvanized-Bonded steel enclosing sound-deadening Bridgecore. All formed edges shall be welded every 18" and sealed with a surrounding oval-crown locking strip, mitered, welded and finished at the corners.</p>	<p>3: Academy, Century and Normandie shall be 1" thick with two sheets of #22 gauge, 304 16-8 stainless steel enclosing sound-deadening Bridgecore. All formed edges shall be welded every 18" and sealed with a surrounding oval-crown locking strip, mitered, welded and finished at the corners.</p>
<b>4</b> PILASTERS	<p>4: Academy pilasters shall be 1 1/4" thick with two sheets of acrylic coated #20 gauge Galvanized-Bonded steel welded and finished as specified for Baked Enamel doors. Pilaster bases shall be attached with floor straps and leveling bolts to secure for anchorage. Pilaster tops shall be overhead braced the full perimeter of the installation with 1" x 1 1/2" anodized aluminum anti-grip headrail bracing.</p> <p>Century pilasters shall be 1 1/4" thick with two sheets of #18 gauge, Galvanized-Bonded steel welded and finished as specified for baked enamel doors. Pilasters to be secured with 3/8" bolts to overhead member (by others) in accordance with details shown on page 6. Not recommended for ceiling heights exceeding 9'0".</p> <p>Normandie pilaster shall be 1 1/4" thick with two sheets of #18 gauge, Galvanized-Bonded steel welded and finished as specified for baked enamel doors. Pilasters to be secured with 3/8" bolts and expansion shield in accordance with details shown on page 5.</p>	<p>4: Academy pilasters shall be 1 1/4" thick with two sheets of #20 gauge, #304 16-8 stainless steel welded and finished as specified for Stainless doors. Pilaster bases shall be attached with floor straps and leveling bolts to secure for anchorage. Pilaster tops shall be overhead braced the full perimeter of the installation with 1" x 1 1/2" anodized aluminum anti-grip headrail bracing.</p> <p>Century pilasters shall be 1 1/4" thick with two sheets of #18 gauge, stainless steel welded and finished as specified for Stainless doors. Pilasters to be secured with 3/8" bolts to overhead member (by others) in accordance with details shown on page 6.</p> <p>Normandie pilaster shall be 1 1/4" thick with two sheets of #18 gauge, stainless steel welded and finished as specified for baked enamel doors. Pilasters to be secured with 3/8" bolts and expansion shield in accordance with details shown on page 5.</p>
<b>5</b> HARDWARE	<p>5: a. Top hinge pin shall be secured at three points with all door hinge liners fully flush with face plates of the door.</p> <p>b. Each door shall be equipped with chrome plated cast alloy door hook and bumper. Sanymetal concealed latch #8800 with bolt of stainless steel permitting exterior access. a one piece chrome plated stop and keeper and #7961 concealed controlled power bearing gravity hinge.</p> <p>c. The door shall be adjustable to permit rest position at any angle within a 270° arc and the weight at all times shall be carried by a power bearing with all moving parts concealed within the door thickness.</p> <p>d. Pilaster hinge brackets shall be chrome-plated zamak alloy and free-bolted to the pilaster.</p> <p>e. Floor and ceiling connections shall be concealed with a one piece 304 stainless steel theftproof pin.</p> <p>f. Chrome-plated zamak strap brackets shall be used to attach panels and pilasters.</p>	<p>5: a. Top hinge pin shall be secured at three points with all chrome-plated door hinge liners fully flush with face plates of the door.</p> <p>b. Each door shall be equipped with chrome plated cast alloy door hook and bumper. Sanymetal concealed latch number 8800 with bolt of stainless steel permitting exterior access. a one-piece chrome plated stop and keeper and number 7961 concealed controlled power bearing gravity hinge.</p> <p>c. The door shall be adjustable to normal rest position at any angle within a 270° arc and the weight at all times be carried by a power bearing with all moving parts concealed within the door thickness.</p> <p>d. Pilaster hinge brackets shall be chrome-plated zamak alloy and free-bolted to the pilaster.</p> <p>e. Floor and ceiling connections shall be concealed with one piece 304 stainless steel theftproof pin.</p> <p>f. Chrome-plated zamak strap brackets shall be used to attach panels and pilasters.</p>
<b>6</b> FINISH  COLOR	<p>6: Finish shall consist of base metal coating and a finish color coat of thermo-setting acrylic enamel applied electrostatically in a preswaged, dust free atmosphere, baked on to produce a uniform, smooth lustrous protective finish.</p> <p>7: Colors shall be.....(Sanymetal number and color name) (Any two colors for coordinating pilaster/panels and doors may be specified.)</p>	<p>6: All stainless steel units shall be #4 finish and shall be paper covered for protection during shipment and installation.</p> <p>7: Colors shall be 304 stainless steel, #4 finish</p>
<b>8</b> CERTIFICATION	<p>8: A certificate of compliance shall be affording that all materials are in accordance with Sanymetal's preceding specifications.</p>	<p>8: A certificate of compliance shall be affording that all materials are in accordance with Sanymetal's preceding specifications.</p>

10

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PROJECT TITLE

**RESTROOM DESIGN STANDARDS**

SHEET TITLE

**TOILET PARTITIONS AND DOOR HARDWARE-5**

SCALE

**NONE**

DATE

**MARCH 2005**

PROJECT NO.

**TASK 1314.20**

**B-5**

stainless steel panels with baked enamel pilasters or, normal homogeneous materials can be used depending upon preference.

Possible combinations are virtually unlimited for top performance, durability, lowest maintenance and proven Sanymetal value. Complete specifications available on request.

10155 SAP  
BuyLine 0247

## SANYPLASTIC

## SANYPHENOLIC

## SANYPOLY

1: Academy toilet compartments shall be Plastic Laminated Academy type as manufactured by Sanymetal.  
Century toilet compartments shall be Plastic Laminated Century type as manufactured by Sanymetal.  
Normandie toilet compartments shall be Plastic Laminated Normandie type as manufactured by Sanymetal.

Academy toilet compartments shall be Solid Phenolic Core (SPC) Academy type as manufactured by Sanymetal.  
Century not recommended.  
Normandie not recommended.

1: Academy toilet compartments shall be Solid Polymer Academy type as manufactured by Sanymetal.  
Century not recommended.  
Normandie not recommended.

2: Shall be constructed of industry standard plastic laminate (HEMA approved, laminated under heat and pressure to a solid 43 lb. density) baseboard core. Finished Doors shall be 1" thick.  
Standard door size, other than "handicapped" is 24".

2: Shall be 3/4" thick solid phenolic core with high pressure melamine color surface on faces. Edges shall be burnished and slightly rounded.  
Standard door size, other than "handicapped" is 24".

2: Doors shall be 58" high, 1" thick, single component construction, Solid Polymer.  
Standard door size, other than "handicapped" is 24".

3: Shall be 3/4" thick and of the same construction, finish and performance standards as for Sanyplastic doors (section 2 above).

3: Academy shall be 1/2" thick solid phenolic core with high pressure color surface on faces. Edges shall be burnished and slightly rounded.

3: Panels shall be 58" high, 1" thick, single component construction, Solid Polymer.

4: Academy pilasters shall be 1 1/4" thick of same construction, finish and performance as for Sanyplastic doors. Pilasters shall be secured to floor by means of a 1/4" thick anchor bar mechanism and shall be secured and leveled by using 3/8" bolts and nut-tension/compression mounted. Pilasters shall be braced with edgewise, anodized aluminum anti-grip headroll and wall rail.

Century pilasters shall be 1 1/4" thick of the same construction, finish and performance as for Sanyplastic doors. Pilaster shall be secured to overhead support member (furnished by others), by means of 1/4" thick anchor bar mechanism, and shall be secured and leveled by using 3/8" bolts and nut-tension/compression mounted. Steel core pilasters recommended for ceiling heights exceeding 8'6".

Normandie pilasters shall be 1 1/4" thick of same construction, finish and performance as for Sanyplastic doors. Pilasters shall be secured to floor by means of 1/4" thick anchor bar mechanism and shall be secured and leveled by using 3/8" bolts and nut-tension/compression mounted.

4: Academy shall be 1" thick solid phenolic core with high pressure color surface on faces. Edges shall be burnished and slightly rounded.

Headroll shall be heavy duty aluminum extrusions, anodized with anti-grip configuration, and shall be fastened to the pilaster tops.

4: Pilasters shall be 82" high, 1" thick, single component construction, fitted with an 11 gauge stainless steel footer for attachment to min. 3/8" floor studs and expansion shields.

Headroll shall be heavy duty aluminum extrusions, anodized with anti-grip configuration, and shall be fastened to the pilaster tops.

5: Doors shall be equipped with Sanymetal #6101 top hinge recessed into door 2" from top with pin supported in door above and below top hinge bracket. Lower hinge shall be Sanymetal #6100 controlled power bearing consisting of Tyrol cams under spring tension. Door weight shall be carried by power bearing only, not on the cams. Door cycling shall be on a level plane and shall be operable and adjustable to any angle within a 90° arc.

Brackets: For panels and pilasters shall be chrome-plated tamarc.

Operation: A power bearing shall carry the door weight. All moving parts shall be concealed within the 1" door thickness.

Accessories: Attachment and Construction. Hinge brackets shall be non-ferrous chrome plated slip type attached to the pilaster by means of through bolts. Top hinge bracket shall be Sanymetal #7361, bottom hinge bracket to be Sanymetal #7360.

Door keeper and stop shall be Sanymetal, chrome plated No. 2501 keeper and No. 2900 stop with rubber bumper locked into place. Door latch shall be Sanymetal No. 7431 non-ferrous, chrome plated slide latch. Pilaster base shall be 3" high, No. 364 stainless steel, polished finish to conceal floor for ceiling connections.

6: All units shall be made of Sanyplastic plastic laminate. All wood grain panels larger than 57 1/4" will have horizontal grain, unless vertical splicing is required.

7: Color shall be from current Sanyplastic color section. Any two colors may be combined.

8: A certificate of compliance shall be attesting that all materials are in accordance with Sanymetal's preceding specifications.

Use of this product in showers or areas subject to hose-down maintenance is not recommended. Sanymetal recommends rust-proof Phenolic or Stainless Steel for these environments.

5: Hinges shall be fabricated from 11 gauge stainless steel, one piece leaf, for surface mounting. Hinge shall be equipped with one piece 3/8" stainless steel pin extending the full height of the hinge. Upper and lower hinge are to both be cam operated, with the one piece pin: Sanymetal #7980/81.

Coat hook and bumper to be stainless steel 14 gauge #7267.

Door strike and keeper shall be 14 gauge stainless steel, Sanymetal #7369/7370.

Door latch to be slide type, 14 gauge stainless steel, Sanymetal #7231.

Bracket for wall and partition attachment shall be 14 gauge stainless steel.

Pilasters shall be attached to the floor by means of an 11 gauge stainless steel footer, with provisions for leveling, attached to two 3/8" diameter stainless steel studs set into expansion shields. The floor connection can be covered by a 4" high stainless steel shoe, #4 finish. Aluminum bracket not available for phenolic material.

6: Melamine color surface on material face, edges burnished.

All wood grain panels larger than 57 1/4" will have horizontal grain.

7: Color shall be selected from the manufacturer's high pressure Sanyplastic color chart, the colors available shall be the same as offered for Sanyplastic partitions.

8: A certificate of compliance shall be attesting that all materials are in accordance with Sanymetal's preceding specifications.

5: Hinges shall be fabricated from 11 gauge stainless steel, one piece leaf, for surface mounting. Hinge shall be equipped with one piece 3/8" stainless steel pin extending the full height of the hinge. Upper and lower hinge are to both be cam operated, with the one piece pin: Sanymetal #7980/81.

Coat hook and bumper to be stainless steel 14 gauge #7267.

Door strike and keeper shall be 14 gauge stainless steel, Sanymetal #7369/7370.

Door latch to be slide type, 14 gauge stainless steel, Sanymetal #7231.

Panel brackets to wall pilasters to be heavy duty aluminum, anodized and painted with 3 brackets per connection. (Optional) Full height aluminum brackets with rail finish can be specified if required.

Pilaster shoe 4" high stainless steel shoe #4 finish.

(Optional) Headstrips to be applied to the bottom edges of panels and doors are available in both aluminum or stainless steel to prevent burning.

6: Panels, doors and pilasters shall be fabricated from Polymer resin, which forms a single component section, waterproof and non-absorbent, with a self-lubricating surface.

7: Color shall extend throughout the entire thickness of all the components. Color shall be selected from the manufacturer's standard polymer color.

8: A certificate of compliance shall be attesting that all materials are in accordance with Sanymetal's preceding specifications.

Sanymetal provides a one-year warranty against workmanship and defects not against inherent physical characteristics of the solid polymer material such as sagging/warping due to lack of rigidity.

Note: Sanymetal reserves the right to improve, modify, or change its material and specifications at any time in such a manner as it may consider necessary or advisable, and to discontinue the manufacture and sales of any product without notice.

17

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PROJECT TITLE

**RESTROOM DESIGN STANDARDS**

SHEET TITLE

**TOILET PARTITIONS AND DOOR HARDWARE-6**

SCALE

**NONE**

DATE

**MARCH 2005**

PROJECT NO.

**TASK 1314.20**

**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.



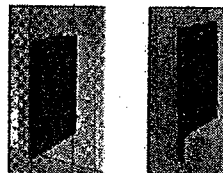
#### **Ceiling Hung**

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.



**Baker**

MICHAEL BAKER JR. INC.  
801 Cromwell Park Drive  
Suite 110  
Glen Burnie, MD 21061

PROJECT TITLE

**RESTROOM DESIGN STANDARDS**

SHEET TITLE

**TOILET PARTITIONS AND DOOR HARDWARE-7**

SCALE

**NONE**

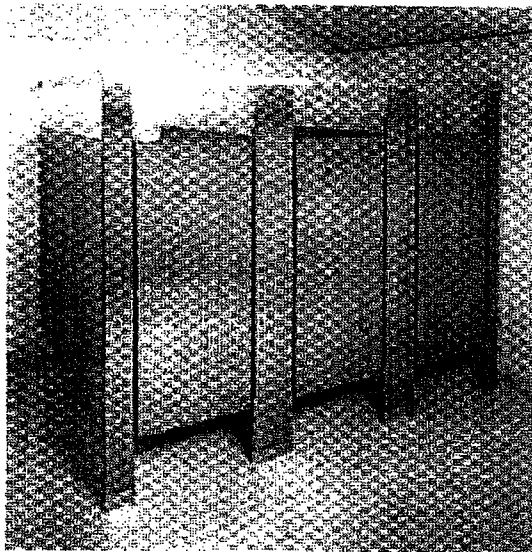
DATE

**MARCH 2005**

PROJECT NO.

**TASK 1314.20**

**B-7**



## Global Stainless Steel

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

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

**View Specifications/Drawings**  
**Care and Maintenance Instructions**

### Construction Features



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

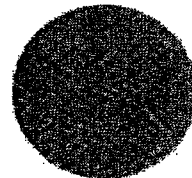
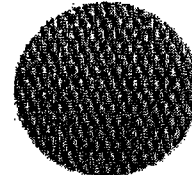


**Welded Corners**  
Corners of panels, pilasters and doors are welded to each other and to the adjacent face sheets.



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

### Optional Textured Finishes



### Options:

**Plywood Core**

**No Sight Line**

**Eastern Style Height**

**Full Height Aluminum Brackets**

**Full Height Stainless Steel Brackets**



**Concealed Latch**  
With emergency access and ADA lever handle.



**Bottom Door Hinge**  
Gravity-positioning hinge provides safe, durable and maintenance-free support.



**Upper Door Bracket**  
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 attached to the pilaster.



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



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



**Shoe Construction**  
One-piece stainless steel, type 304, with #4 satin finish trim shoes are hemmed top and bottom for rigidity and sleek appearance.

[Home](#) | [Materials & Colors](#) | [Specifications](#) | [Care & Maintenance](#) | [Contact Us](#)

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PROJECT TITLE

**RESTROOM DESIGN STANDARDS**

SHEET TITLE

**TOILET PARTITIONS AND DOOR HARDWARE-8**

SCALE NONE

DATE MARCH 2005

PROJECT NO.

**TASK 1314.20**

**B-8**

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



**PART-1 GENERAL**

**1.01 DESCRIPTION**

- A. Textured leather grain stainless steel compartment work includes the following:
  - 1. Floor anchored/overhead braced partitions.
- B. 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:
  - 1. Toilet compartments
  - 2. Hardware for toilet compartments
  - 3. Shop drawings and working drawings
  - 4. Manufacturer's guarantee
- D. Related work specified elsewhere shall include accessories and anchorage/blocking for attachment of compartments.

**1.02 PRODUCTS**

- A. Submittal of shop drawings and details, for architect's approval.
- B. A sample of textured leather grain finish stainless steel and hardware samples shall be submitted for approval to the architect upon request.

**PART-2 PRODUCTS**

**2.01 MANUFACTURER**

- A. 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, stretcher-leveled quality stainless steel formed and bonded under pressure with a non-toxic adhesive to a full-face honeycomb core.
- B. Pilasters shall be 1-1/4", constructed of two sheets of 22-gauge, textured leather grain finish stainless steel, formed and bonded under pressure with a non-toxic adhesive to a full-face honeycomb core.

**2.03 CONSTRUCTION**

- A. Doors and panels shall be 1" thick. Panels over 48" shall be manufactured with four (4) face sheets (2) sheets each side, seamed and spot welded together. The edges shall be sealed with a 22-gauge, 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.
- B. Pilasters shall be 1-1/4" thick. Edges shall be sealed with 22-gauge stainless steel interlocking molding. An inverted stirrup with a jack bolt 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 adjustment. A shoe shall conceal each mounting, having an internal cross section conforming to the pilaster.
- C. Headrail shall be provided to bridge all compartments and brace the end freestanding pilasters to the wall; the headrail to comprise anodized aluminum 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 order.)**

- A. All exposed door hardware shall be of chromium-plated diecast Zamac and shall be as noted:
  - 1. Upper door hinge is recessed and interlocked in door and includes a nylon pin within the plane of the door. Lower door hinge is recessed in door and includes mating box 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.
  - 2. Door hardware shall include a coat hook, bumper, a stop, keeper, and a concealed latch with emergency access.
  - 3. Fasteners shall be of chrome-plated steel; door hinges will be mounted with theft-proof barrel nuts and machine screws; hooks and handles will be mounted with theft-proof, full-thread screws.
- B. Wall brackets shall be secured to walls with anchoring and/or expansion shields.
- C. Pilaster shoes shall be of type 304 stainless steel having a #4 finish.

**PART-3 EXECUTION**

**3.01 PREPARATION**

- A. Examine areas to receive toilet compartments for correct height and spacing of anchorage/blocking and plumbing fixtures that may affect installation of compartments. Report any discrepancies to the architect.
- B. Take complete and accurate measurements of complete toilet compartment locations.
- C. Start of work constitutes acceptance of job.

**3.02 INSTALLATION**

- A. Install compartments in a rigid, straight, plumb and level manner as shown on the shop drawings and manufacturer's installation instructions.
- B. All doors and panels to be mounted at 12" above the finished floor unless otherwise specified.
- D. Clearance at vertical edges of door shall be uniform top to bottom.
- E. 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.

**3.03 WARRANTY**

- A. Global Steel Products Corp. guarantees its textured leather grain stainless steel units, properly 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 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

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PROJECT TITLE

**RESTROOM DESIGN STANDARDS**

SHEET TITLE

**TOILET PARTITIONS AND DOOR HARDWARE-9**

SCALE

**NONE**

DATE

**MARCH 2005**

PROJECT NO.

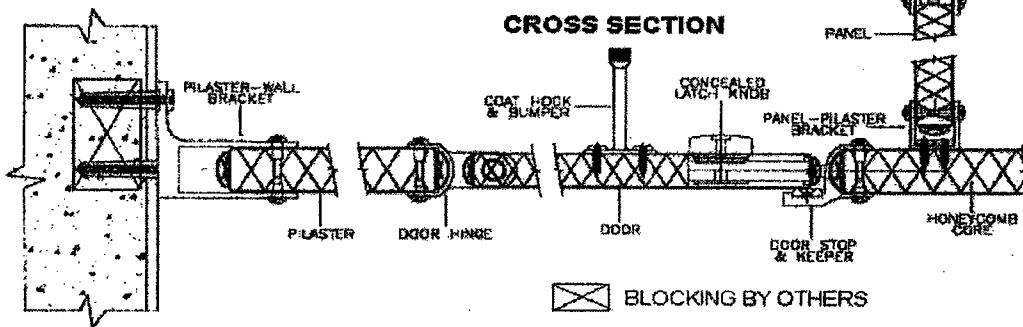
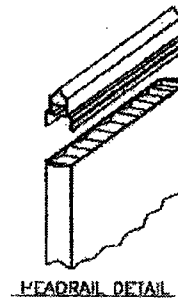
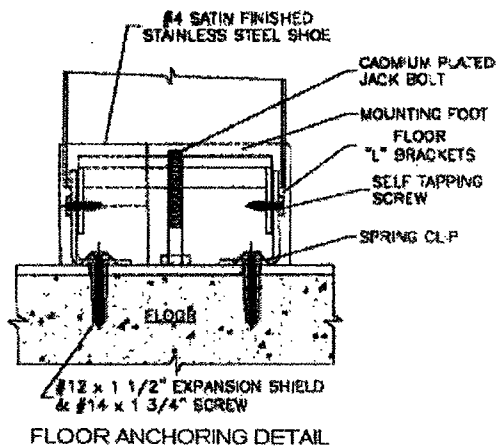
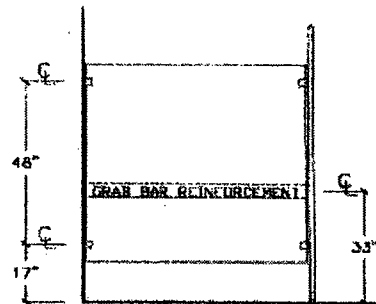
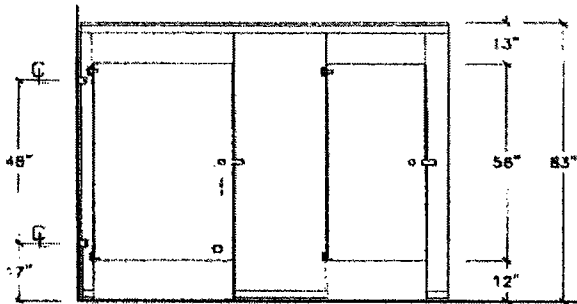
**TASK 1314.20**

**B-9**





**FLOOR ANCHORED/OVERHEAD BRACED  
STAINLESS STEEL  
TEXTURED LEATHER GRAIN**



2.18

95 Marcus Blvd., Deer Park, New York 11729 Phone: 631-586-3330 Fax: 631-586-3455  
Website: [www.globalpartitions.com](http://www.globalpartitions.com) email: [sales@globalpartitions.com](mailto:sales@globalpartitions.com)

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PROJECT TITLE

**RESTROOM DESIGN STANDARDS**

SHEET TITLE

**TOILET PARTITIONS AND DOOR HARDWARE-10**

SCALE

NONE

DATE

MARCH 2005

PROJECT NO.

**TASK 1314.20**

**B-10**



### Our Commitment to Your Satisfaction

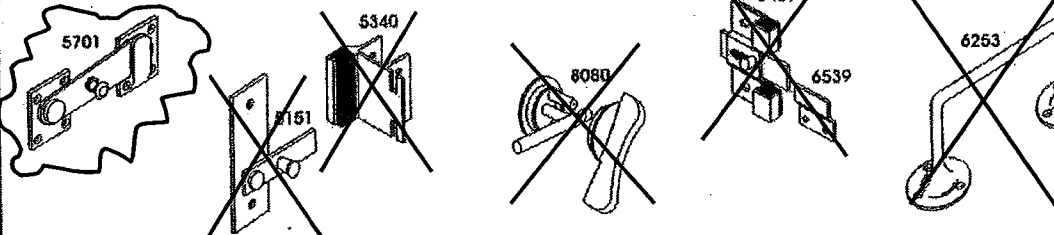
For over 50 years, Jacknob has been supplying the highest quality partition hardware and washroom accessories. Manufacturing over 2,400 standard items, as well as a wide range of specialty and private label components, has given us experience and production capabilities unmatched in the industry.

Complete tooling and up-to-date production facilities integrated with our computerized ordering & inventory systems provide efficient service and fast delivery.

We're proud our growing list of clients and welcome every opportunity to justify our reputation for customer satisfaction. If you have any questions concerning a hardware application or suitability of a particular component, please feel free to call.

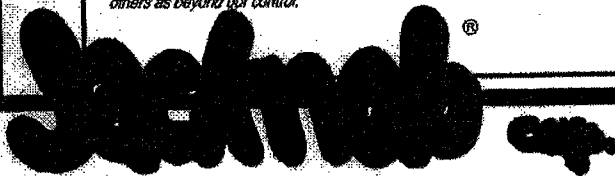
STALL LAYOUT.....  
 INSWING HARDWARE AND REPLACEMENT PAKS.....  
 OUTSWING HARDWARE AND REPLACEMENT PAKS.....  
 INSWING HARDWARE SURFACE MOUNTED HINGES.....  
 OUTSWING HARDWARE SURFACE MOUNTED HINGES.....  
 PREPACKAGED PANEL AND PILASTER POST PAKS.....  
 PREPACKAGED ALCOVE, URINAL, ANGLE, AND HEADRAIL PAKS.....  
 CAST WALL BRACKETS.....  
 STAMPED AND EXTRUDED WALL BRACKETS.....  
 DOUBLE HIGH AND CONTINUOUS WALL BRACKETS.....  
 SURFACE MOUNTED HINGES.....  
 STRIKE AND KEEPERS FOR SQUARE PILASTER POSTS.....  
 STRIKE AND KEEPERS FOR ROUND PILASTER POSTS AND STAMPED STAINLESS STEEL STRIKE AND KEEPERS.....  
 TOP PIVOT HINGES.....  
 BOTTOM PIVOT HINGES.....  
 DOOR HOOKS, PULLS AND STOPS, SLIDE AND THROW LATCHES, CONVERSION KITS FOR CONCEALED LATCHES.....  
 CONCEALED LATCHES AND KNOBS.....  
 PILASTER SHOES AND ANCHORING DEVICES.....  
 PILASTER ANCHOR PAKS.....  
 TOP AND BOTTOM DOOR INSERTS.....  
 ALCOVE CLIPS, HEADRAIL BRACKETS, END PLUGS, AND PAKS.....  
 PINTLES, CAMS PINS, AND CANDLE CAMS.....  
 PAPER ROLL HOLDERS AND CURTAIN ROD HOLDERS.....  
 SCREW PAKS AND ASSORTED FASTENERS.....  
 SHEET METAL SCREWS AND ASSORTED FASTENERS.....

### ADA Compliance Hardware & Accessories



#### About ADA Compliance -

The American Disabilities Act (ADA) of 1992 was enacted to make accessible all areas of public, municipal and commercial buildings to the physically challenged. Public lavatories and restrooms require special consideration to comply with these new and vigorously enforced regulations. The Jacknob Corp. has placed specific emphasis on thoroughly understanding and providing the correct hardware and washroom accessories to satisfy these new laws, and is ready to supply what you need to come up to code. While our hardware and accessories meet or exceed the new ADA guidelines, we do indemnify ourselves as corporate and individual entities against situations of installation and actions of others as beyond our control.



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PROJECT TITLE

**RESTROOM DESIGN STANDARDS**

SHEET TITLE

**TOILET PARTITIONS AND DOOR HARDWARE-11**

SCALE

**NONE**

DATE

**MARCH 2005**

PROJECT NO.

**TASK 1314.20**

**B-11**

# TP HINGES

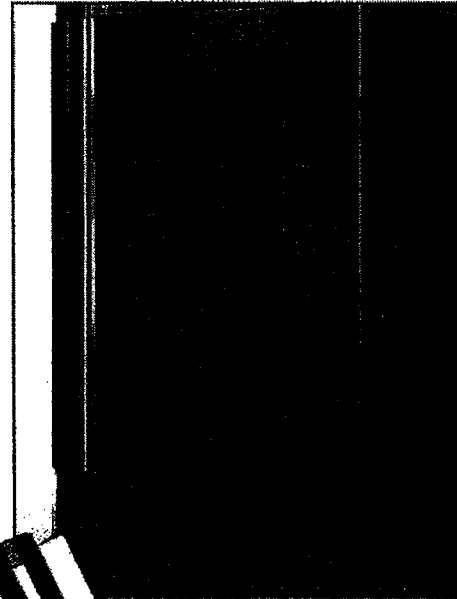
- ☐ **Continuous Partition Hinges are Durable** - Add years of maintenance-free operation to any partition system.
- ☐ **Support Partition Doors Along Their Entire Length** - Markar TP Hinges run the complete length of the door to distribute weight evenly.
- ☐ **Add Rigidity to Ceiling Hung Partitions** - 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 aluminum.
- ☐ **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.

**TP** 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.

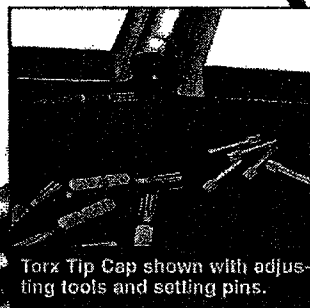
In addition to their strength and durability, TP Hinges provide important benefits. When less expensive multi-part hinge systems are used on partitions, they leave a gap along the door "sight-line", thus exposing the occupant. Markar's Continuous Hinge alternatives have twenty-eight bearing surfaces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



Photographed at Comtec Industries, Scranton, PA



Torx Tip Cap shown with adjusting tools and setting pins.

**MARKAR**

**Baker**

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PROJECT TITLE

**RESTROOM DESIGN STANDARDS**

SHEET TITLE

**TOILET PARTITIONS AND DOOR HARDWARE-12**

SCALE

**NONE**

DATE

**MARCH 2005**

PROJECT NO.

**TASK 1314.20**

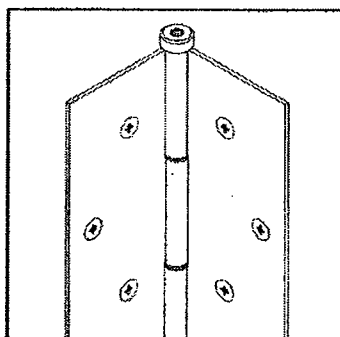
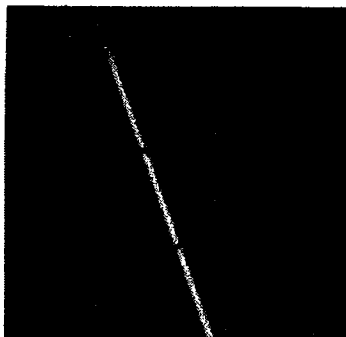
**B-12**

# TP HINGES

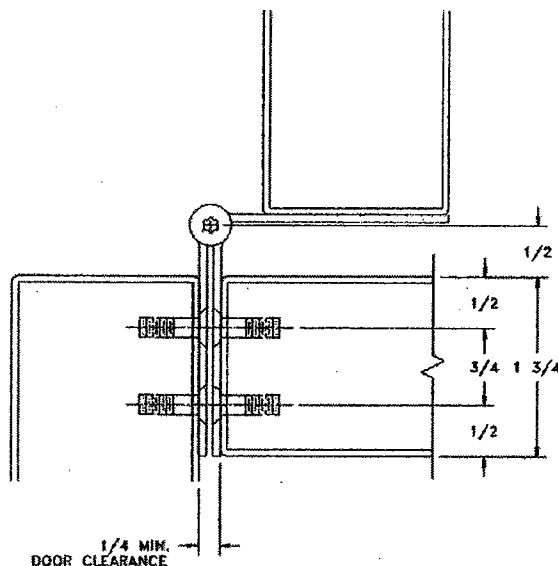
toilet

Edge Mount

**FM-900-TP Spring-Loaded**  
**FM-500-TP 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.



## 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

- 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 stainless steel (629).
- 84 powder coated paint colors.
- Custom lengths (in inches).
- Custom hole pattern.
- Tamper-proof security screws.



**Markar Products, Inc.**

68 Ward Road • Lancaster, NY 14086 • 716-685-4104 • Toll Free: 1-800-866-1688 • Fax: 716-685-3919

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PROJECT TITLE

**RESTROOM DESIGN STANDARDS**

SHEET TITLE

**TOILET PARTITIONS AND DOOR HARDWARE-13**

SCALE

**NONE**

DATE

**MARCH 2005**

PROJECT NO.

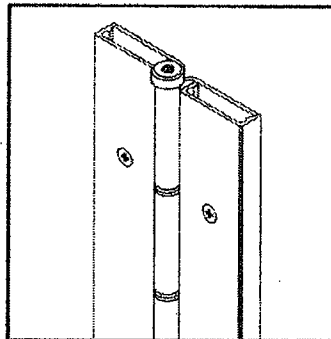
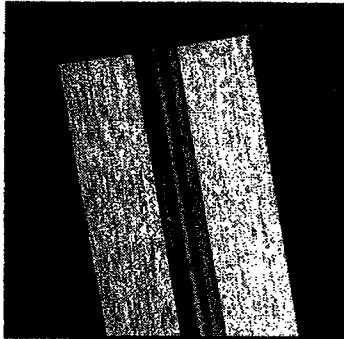
**TASK 1314.20**

**B-13**

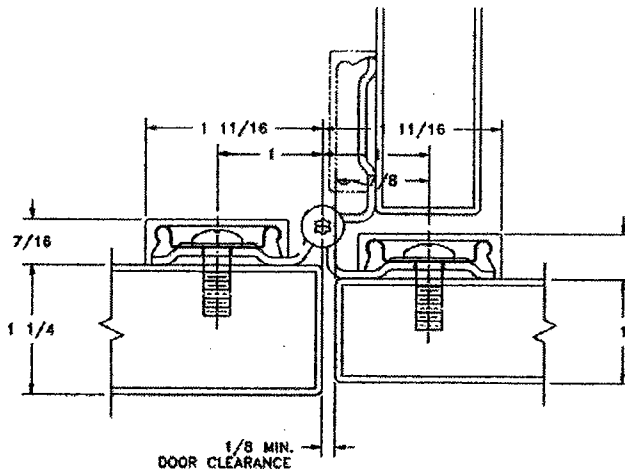
# TP HINGES

Full Surface

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



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 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

- 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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 801 Cromwell Park Drive  
 Suite 110  
 Glen Burnie, MD 21061

PROJECT TITLE

**RESTROOM DESIGN STANDARDS**

SHEET TITLE

**TOILET PARTITIONS AND DOOR HARDWARE-14**

SCALE

**NONE**

DATE

**MARCH 2005**

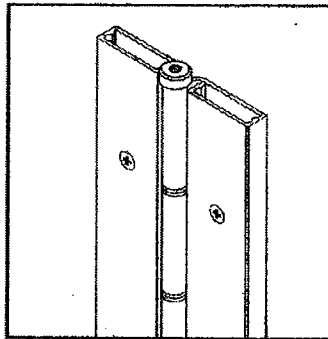
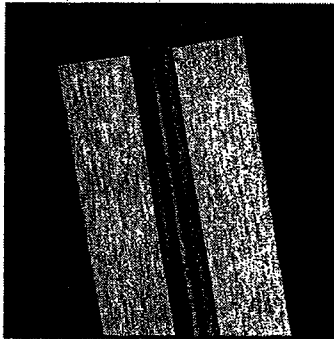
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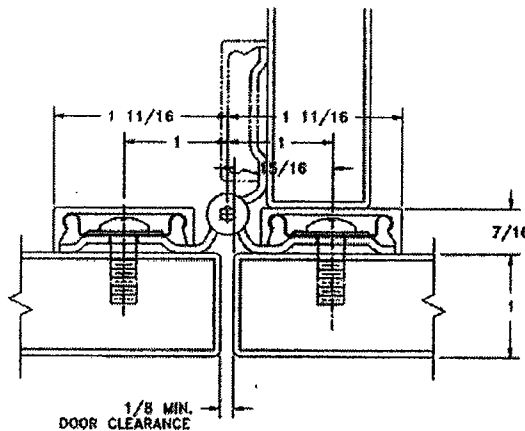
**B-14**

# TP HINGES

Full Surface



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



## FS-902-TP Flush Spring-Loaded FS-502-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

- 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.



Markar Products, Inc.

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Glen Burnie, MD 21061

PROJECT TITLE

RESTROOM DESIGN STANDARDS

SHEET TITLE

TOILET PARTITIONS AND DOOR HARDWARE-15

SCALE

NONE

DATE

MARCH 2005

PROJECT NO.

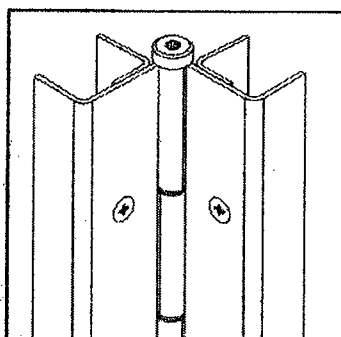
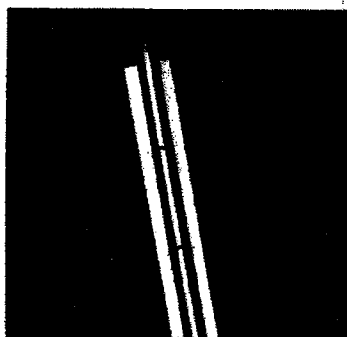
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**B-15**

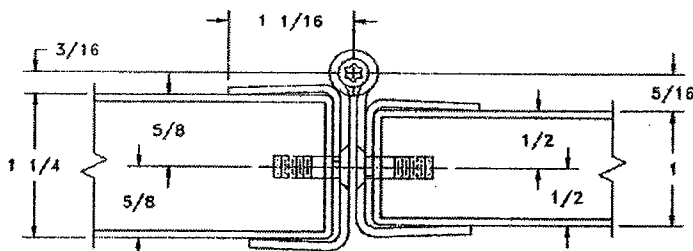
# TP HINGES

toilet

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.



## HG-906-TP 1/8" Offset Spring-Loaded

## HG-506-TP 1/8" Offset

### 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".



Markar Products, Inc.

68 Ward Road • Lancaster, NY 14086 • 716-685-4104 • Toll Free: 1-800-868-1688 • Fax: 716-685-3919

**Baker**

MICHAEL BAKER JR. INC.  
801 Cromwell Park Drive  
Suite 110  
Glen Burnie, MD 21061

PROJECT TITLE

RESTROOM DESIGN STANDARDS

SHEET TITLE

TOILET PARTITIONS AND DOOR HARDWARE-16

SCALE

NONE

DATE

MARCH 2005

PROJECT NO.

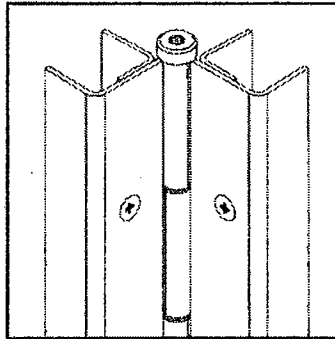
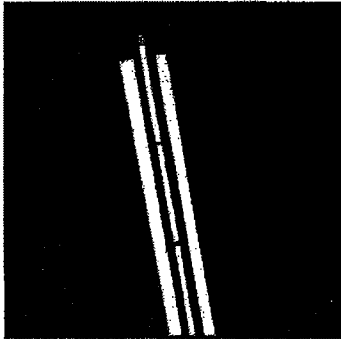
TASK 1314.20

**B-16**

# TP HINGES

Hinge Guard

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



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.

## 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

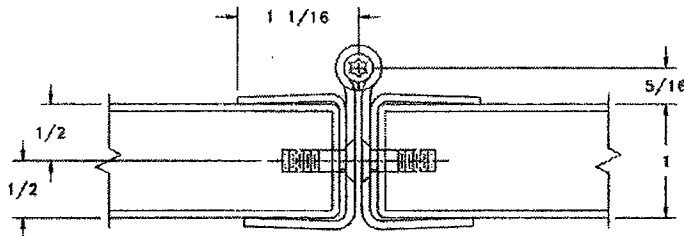
Supports weights up to 80 lbs.

### 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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 801 Cromwell Park Drive  
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PROJECT TITLE

**RESTROOM DESIGN STANDARDS**

SHEET TITLE

**TOILET PARTITIONS AND DOOR HARDWARE-17**

SCALE

**NONE**

DATE

**MARCH 2005**

PROJECT NO.

**TASK 1314.20**

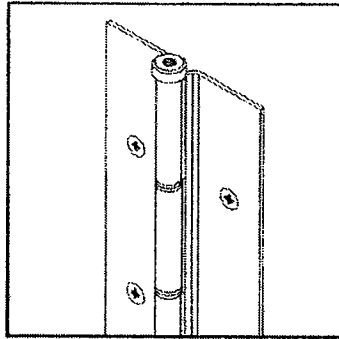
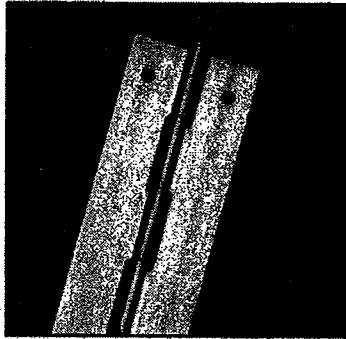
**B-17**



# TP HINGES

Full Surface

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



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.

## 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

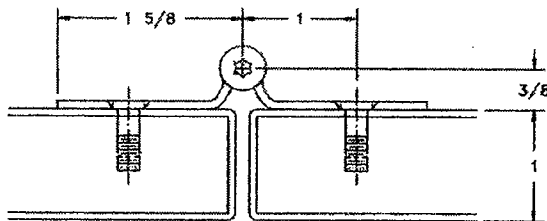
Supports weights up to 80 lbs.

### Sizes

54" and 57"

### Non-Handed

Use the same hinge for right or left handed doors.



## Optional Features

- US 32 bright polished stainless steel (629).
- B4 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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PROJECT TITLE

**RESTROOM DESIGN STANDARDS**

SHEET TITLE

**TOILET PARTITIONS AND DOOR HARDWARE-18**

SCALE

**NONE**

DATE

**MARCH 2005**

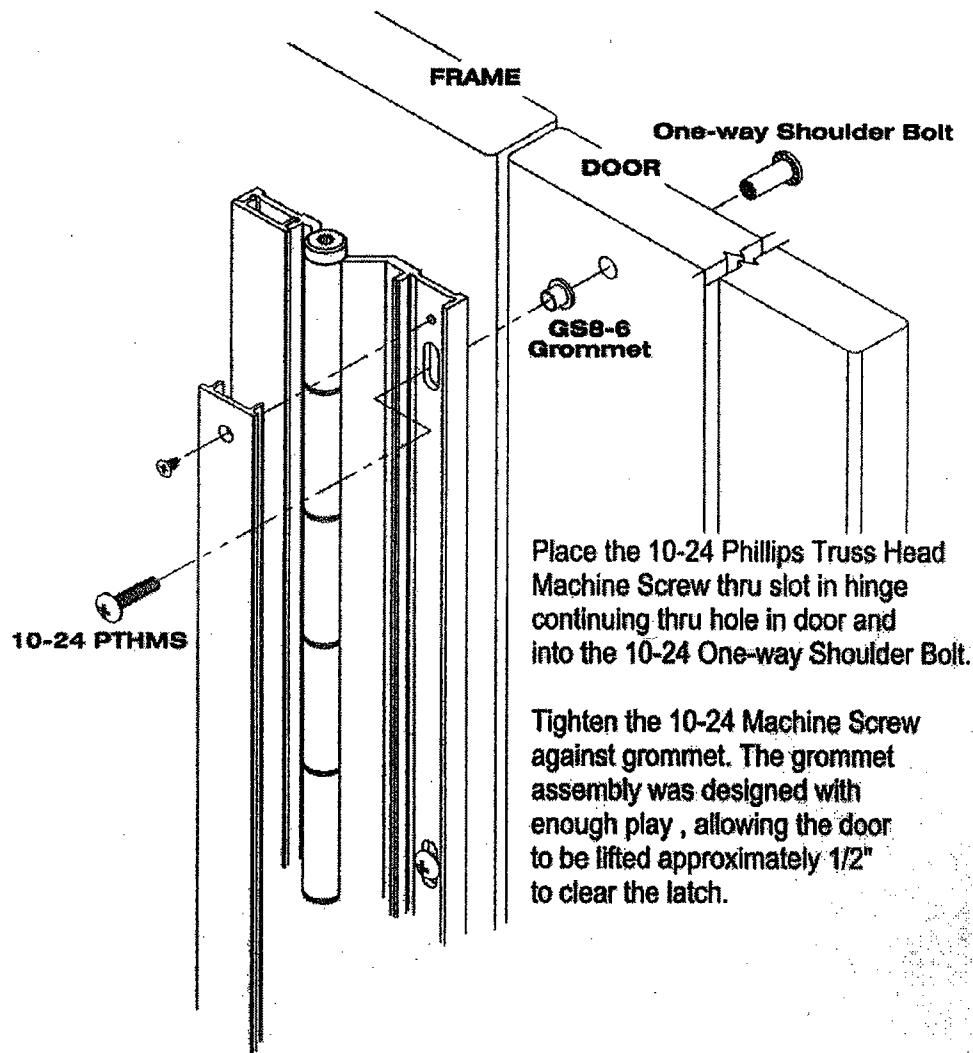
PROJECT NO.

**TASK 1314.20**

**B-18**

## 400 SERIES TOILET PARTITION SAFETY LIFT FEATURE

**TECHNICAL MEMO**



4/99



For more information contact:

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PROJECT TITLE

**RESTROOM DESIGN STANDARDS**

SHEET TITLE

**TOILET PARTITIONS AND DOOR HARDWARE-19**

SCALE

**NONE**

DATE

**MARCH 2005**

PROJECT NO.

**TASK 1314.20**

**B-19**

# 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 in<sup>2</sup> for a 7-foot hinge and 6.5 in<sup>2</sup> for a 10-foot hinge.

### Tensile Limits

7' door 4.5 in<sup>2</sup>  
x 85,000 P.S.I. = 385,075 lbs  
+ 12 (safety factor) = 32,100 lbs

8' door 5.0 in<sup>2</sup>  
x 85,000 P.S.I. = 440,675 lbs  
+ 12 (safety factor) = 36,725 lbs

10' door 6.5 in<sup>2</sup>  
x 85,000 P.S.I. = 551,850 lbs  
+ 12 (safety factor) = 46,000 lbs

### Shear Limits

7' door 9.0 in<sup>2</sup>  
x 35,000 P.S.I. = 317,125 lbs  
+ 12 (safety factor) = 26,425 lbs

8' door 10.25 in<sup>2</sup>  
x 35,000 P.S.I. = 358,625 lbs  
+ 12 (safety factor) = 29,885 lbs

10' door 13.0 in<sup>2</sup>  
x 35,000 P.S.I. = 455,450 lbs  
+ 12 (safety factor) = 37,875 lbs

### Fasteners

Type: 10-24 machine screw  
Material: 1035 cold rolled steel  
Tension: 83,000 P.S.I.  
Area: 0.0145 in<sup>2</sup>

7' hinge 16 fasteners  
x 0.0145 in<sup>2</sup> = 0.232 in<sup>2</sup>  
x 83,000 P.S.I. = 19,256 lbs  
+ 12 (safety factor) = 1,604 lbs

8' hinge 18 fasteners  
x 0.0145 in<sup>2</sup> = 0.261 in<sup>2</sup>  
x 83,000 P.S.I. = 21,663 lbs  
+ 12 (safety factor) = 1,805 lbs

10' hinge 20 fasteners  
x 0.0145 in<sup>2</sup> = 0.290 in<sup>2</sup>  
x 83,000 P.S.I. = 24,070 lbs  
+ 12 (safety factor) = 2,005 lbs

Type: 1/4-20 machine screw  
Material: 1035 cold rolled steel  
Tension: 83,000 P.S.I.  
Area: 0.0269 in<sup>2</sup>

7' hinge 16 fasteners  
x 0.0269 in<sup>2</sup> = 0.430 in<sup>2</sup>  
x 83,000 P.S.I. = 35,723 lbs  
+ 12 (safety factor) = 2,977 lbs

8' hinge 18 fasteners  
x 0.0269 in<sup>2</sup> = 0.484 in<sup>2</sup>  
x 83,000 P.S.I. = 40,189 lbs  
+ 12 (safety factor) = 3,349 lbs

10' hinge 20 fasteners  
x 0.0269 in<sup>2</sup> = 0.538 in<sup>2</sup>  
x 83,000 P.S.I. = 44,654 lbs  
+ 12 (safety factor) = 3,721 lbs

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PROJECT TITLE

**RESTROOM DESIGN STANDARDS**

SHEET TITLE

**TOILET PARTITIONS AND DOOR HARDWARE-20**

SCALE

**NONE**

DATE

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PROJECT NO.

**TASK 1314.20**
**B-20**

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**PRODUCT DETAIL**



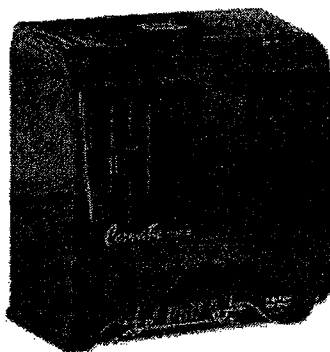
Refill Info



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, smoke-capacity Cormatic® VuAll® roll towel you control costs with style. Our com free roll towel dispensers feature no t or cranks that can serve as germ res 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

**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 p limiting the amount of product dis time

Item #	Product Family	Pack	Inner Pack Count
HV200K	Hygiene		6 Count
Color Dispenser Dimensions Paper Grade Ply Core Size	SCC	UPC # Ret Scanner Co	
Smoke		36500049706	



Shipping Info

Gross Case Shipping Layer Floor HI Floor Pallet HI Pallet Shipping C

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PROJECT TITLE

**RESTROOM DESIGN STANDARDS**

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**PAPER TOWEL DISPENSER**

SCALE

NONE

DATE

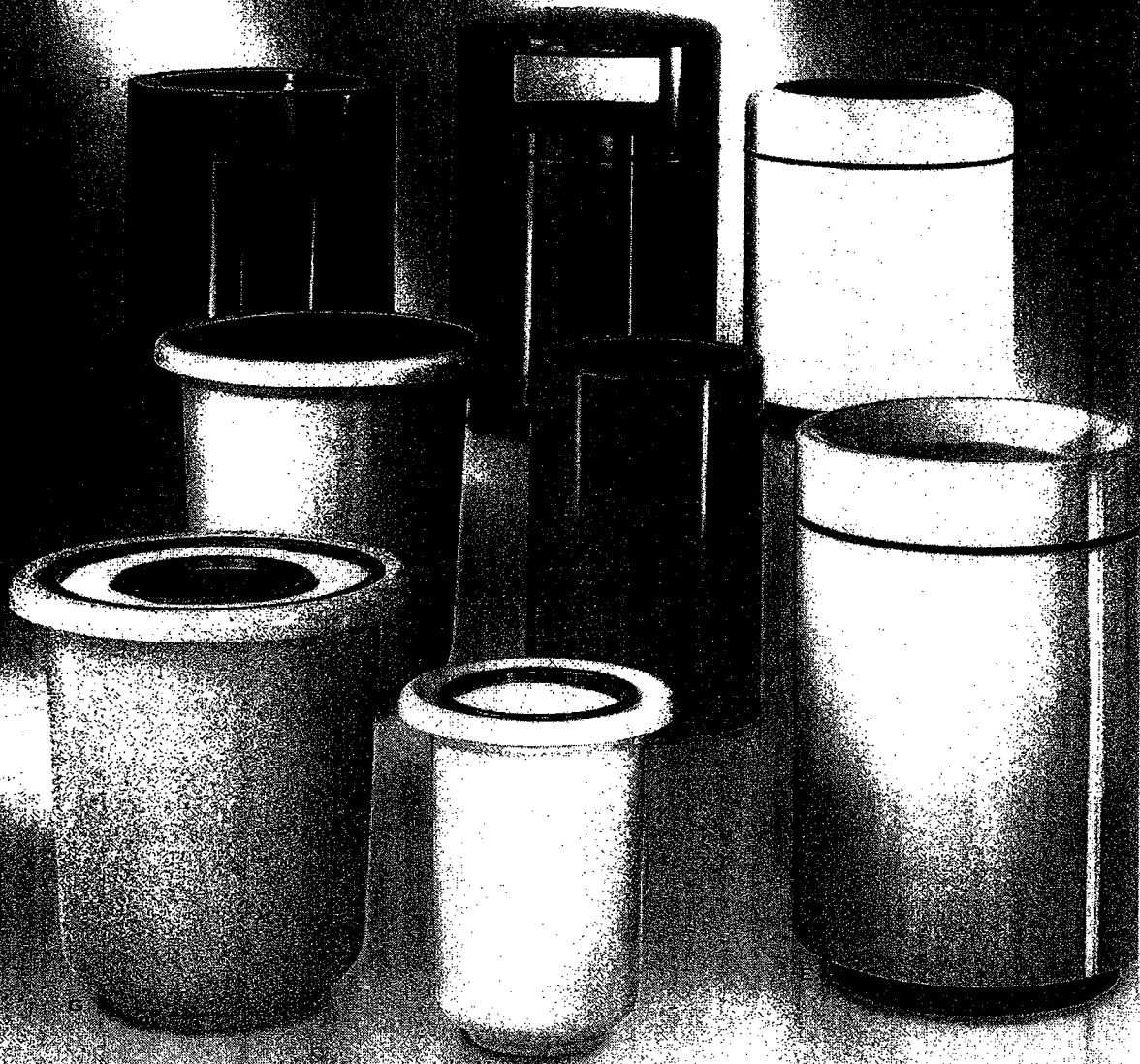
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PROJECT NO.

TASK 1314.20

**B-21**

The Barolani Series



FIBERGLASS RECEPTACLES, URNS AND PLANTERS

**Baker**

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301 Cromwell Park Drive  
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Glen Burnie, MD 21061

PROJECT TITLE

**RESTROOM DESIGN STANDARDS**

SHEET TITLE

**RECEPTACLES-1**

SCALE **NONE**

DATE **MARCH 2005**


PROJECT NO.

**TASK 1314.20**

**B-22**

# THE BARCLAY SERIES

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

- Over 30 different colors in solid, matte, and Sand-x™ finishes are offered. Rose Gran-x™ and Gray Gran-x™ 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, to retard 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. 

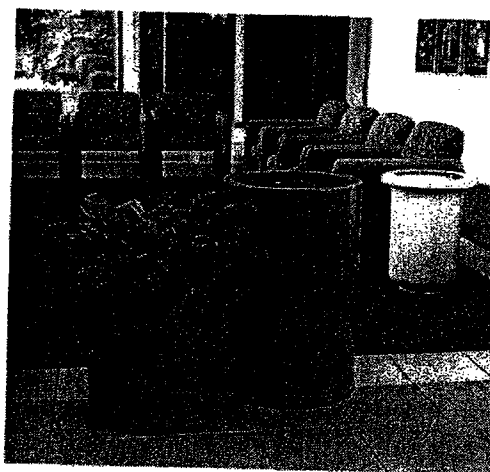


Folding retainer bands hold poly bags securely inside the receptacle.

## FIRE SAFE / SELF-EXTINGUISHING FIBERGLASS RECEPTACLES



See page 20.



Description	Model Number	Liner	Gallon Capacity			Dimensions	Disposal Opening Dimensions	Color Shown
			RB	PL	GL			
A Waste Receptacle	FG1838ARLD	PL / GL	—	21	21	18" Dia. x 30" H	9" Dia.	Blackberry
B Waste Receptacle	FG2432 <sup>1</sup>	RB / PL / GL	57	40	31	24" Dia. x 32" H	18" Dia.	Black
C Waste Receptacle	FG2439 <sup>1</sup>	RB / PL / GL	57	40	31	24" Dia. x 39" H	Two 13" W x 6.5" H	Plum
D Waste Receptacle	FG2432AR <sup>1</sup>	RB / PL / GL	57	40	31	24" Dia. x 32" H	8" Dia.	Almond
E Waste Receptacle	FG2438 <sup>1</sup>	RB / PL	62	50	—	24" Dia. x 39" H	13" Dia.	Warm Gray
F Waste Receptacle	FG12730GT <sup>1</sup>	PL	—	22	—	27" Dia. x 30" H	12" Dia.	Tan
G Ash / Trash	FG12730GSUT <sup>1</sup>	PL	—	22	—	27" Dia. x 30" H	12" Dia.	Rose Gran-x
H Urn	FG11824GSU	—	—	—	—	18" Dia. x 24" H	—	Marble

Liner codes: RB - Poly Bag Retainer Bands, PL - Germ-Fighter® Rigid Plastic Liner, GL - Galvanized Steel Liner.

<sup>1</sup> FG2432, FG2438, FG2432AR, FG2438, FG12730GT, FG12730GSUT cannot ship UPS

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PROJECT TITLE

**RESTROOM DESIGN STANDARDS**

SHEET TITLE

**RECEPTACLES-2**

SCALE **NONE**

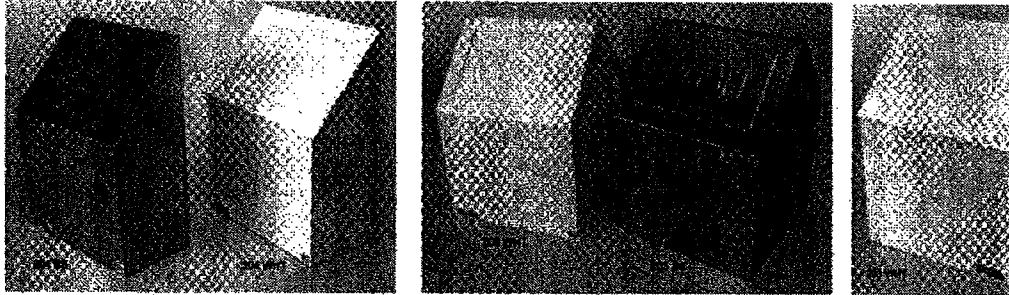
DATE **MARCH 2005**

PROJECT NO.

**TASK 1314.20**

**B-23**

## 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	Finish	Product Name
●	203 WHT	White Gloss	Sanitary Napkin Receptacle - Wall
●	204 S/S	Satin Stainless Steel	Sanitary Napkin Receptacle - Wall
●	204 WHT	White Gloss	Sanitary Napkin Receptacle - Wall
●	205 S/S	Satin Stainless Steel	Sanitary Napkin Receptacle - Floor
●	205 WHT	White Gloss	Sanitary Napkin Receptacle - Floor
●	206 WHT	White Gloss	Individual Sanitary Napkin Bag Dispenser
●	225	Liner	Individual Sanitary Napkin Bag

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**RESTROOM DESIGN STANDARDS**

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**RECEPTACLES-3**

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**B-24**



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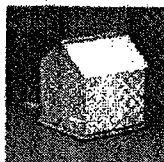
[Trash Receptacles](#)



#### Convertible Sanitary Napkin Receptacle

Price \$41.56 Save up to 23%

Hinged lid. 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 4d x 11h.



#### Deluxe Sanitary Napkin Receptacle

Price \$74.10 Save up to 7%

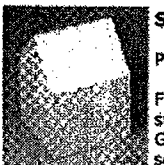
OSHA compliant. Floor model services two stalls. Sanitary—foot pedal opens lid. Antimicrobial Germ-Fighter® leakproof rigid plastic liner controls germs and odors. Easy-empty side opening design. Heavy-duty steel, contains 30% recycled steel content. Powder coated finish. Uses plastic liner bags (EXCLB1718)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



#### 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 piano hinges. Galvanized inner liners. Plastic Liner Bags (EXCLB1718) sold separately. 9w x 9d x 11-1/2h.

4 pages

Contact us by phone 1-877-677-7015 or email [questions@cleansweepsupply.com](mailto:questions@cleansweepsupply.com)

5 items

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PROJECT TITLE

RESTROOM DESIGN STANDARDS

SHEET TITLE

RECEPTACLES-4

SCALE

NONE

DATE

MARCH 2005

PROJECT NO.

TASK 1314.20

**B-25**



## Channel Frame



B-165 SERIES

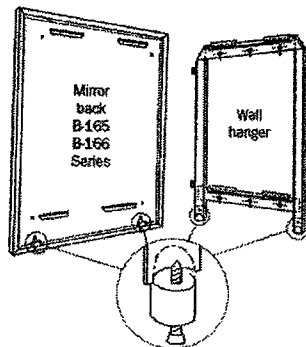
**B-165 SERIES FRAMED MIRRORS** One-piece channel frame is  $\frac{1}{2}$ " x  $\frac{1}{2}$ " x  $\frac{1}{2}$ " (13 x 13 x 13mm) with bright polished finish and mitered corners. Phillips-head frame screw permits easy replacement of mirror. No. 1 quality,  $\frac{1}{4}$ " (6mm) glass mirror electrolytically copper-plated; guaranteed against silver spoiling for 10 years. Mirror corners and back protected by shock absorbing material. Back is galvanized steel. Secured to concealed wall hanger with two theft-resistant locking screws.

### STANDARD STOCK SIZES B-165 SERIES MIRROR

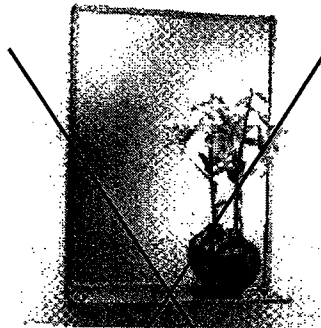
Model No.	Width	Height	
B-165 1624	16"	24"	(41 x 61cm)
B-165 1824	18"	24"	(46 x 61cm)
B-165 1830	18"	30"	(46 x 76cm)
B-165 1836	18"	36"	(46 x 91cm)
B-165 2430	24"	30"	(61 x 76cm)
B-165 2436	24"	36"	(61 x 91cm)
B-165 2448	24"	48"	(61 x 122cm)
B-165 2460	24"	60"	(61 x 152cm)
B-165 3636	36"	36"	(91 x 91cm)
B-165 4836	48"	36"	(122 x 91cm)
B-165 6036	60"	36"	(152 x 91cm)

### SPECIAL-ORDER CUSTOM SIZE MIRRORS

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



## Channel Frame/Shelf



B-166 SERIES

**B-166 SERIES MIRROR/SHELF COMBINATION** Theft-resistant channel-frame mirror with one-piece type-304, satin finish stainless steel shelf; projects 5" (127mm) and has  $\frac{3}{8}$ " (10mm) return edges on front and sides. Front return edge hemmed for maximum rigidity. Concealed 16-gauge (1.6mm) stainless steel brackets attach shelf to mirror frame.

### STANDARD STOCK SIZES B-166 SERIES MIRROR/SHELF

Model No.	Width	Height	
B-166 1824	18"	24"	(46 x 61cm)
B-166 1830	18"	30"	(46 x 76cm)
B-166 1836	18"	36"	(46 x 91cm)
B-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 special sizes, use Series Number followed by width and height.

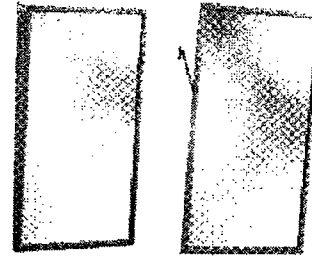
## Frameless, stainless steel

**B-1556 SERIES FRAMELESS MIRRORS** Bright polished stainless steel. Mirror has  $\frac{1}{4}$ " (6mm) return concealing  $\frac{1}{4}$ " (6mm) tempered masonite backing. Furnished with four mounting screws.

### STANDARD STOCK SIZES B-1556 SERIES MIRROR

Model No.	Width	Height	
B-1556 1620	15 $\frac{1}{2}$ "	19 $\frac{1}{2}$ "	(39 x 50cm)
B-1556 1824	17 $\frac{1}{2}$ "	23 $\frac{1}{2}$ "	(44 x 60cm)
B-1556 1830	17 $\frac{1}{2}$ "	29 $\frac{1}{2}$ "	(44 x 75cm)
B-1556 2436	23 $\frac{1}{2}$ "	35 $\frac{1}{2}$ "	(60 x 90cm)

## Tilt Mirrors



B-293

B-294

**B-293 SERIES TILT MIRRORS** Provide visibility for wheelchair patients. Frame is type-304 stainless steel, satin finish. Special bevel design hugs mirror. No. 1 quality,  $\frac{1}{4}$ " (6mm) glass mirror electrolytically copper plated. Mirror extends 4" (10cm) from wall at top and tapers to 1" (25mm) at bottom.

### STANDARD STOCK SIZES B-293 SERIES MIRROR

Model No.	Width	Height	
B-293 1630	16"	30"	(41 x 76cm)
B-293 1830	18"	30"	(46 x 76cm)
B-293 1836	18"	36"	(46 x 91cm)
B-293 2436	24"	36"	(61 x 91cm)

### SPECIAL-ORDER CUSTOM SIZE MIRRORS

Maximum size mirror: 36" x 48" (91 x 1219mm).

### B-294 SERIES TILTING MIRRORS

Tilt forward to provide full visibility for wheelchair patients or return to upright position. Frame is  $\frac{3}{4}$ " x  $\frac{1}{4}$ " (19 x 19mm), type-304 stainless steel angle, satin finish. Special bevel design hugs mirror. No. 1 quality,  $\frac{1}{4}$ " (6mm) glass mirror electrolytically copper-plated. Top of mirror tilts 7" (18cm) from wall with self-locking mechanisms; bottom of mirror mounts to wall with full-length stainless steel hinge.

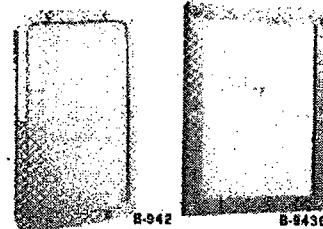
### STANDARD STOCK SIZES B-294 SERIES MIRROR

Model No.	Width	Height	
B-294 1624	16"	24"	(41 x 61cm)
B-294 1630	16"	30"	(41 x 76cm)

### SPECIAL-ORDER CUSTOM SIZE MIRRORS

Maximum size mirror: 30" x 36" (762 x 914mm).

## Vandal-Resistant



B-942

B-9436

**B-942 FRAMELESS MIRROR (Secured From Front)** Mirror is 11  $\frac{1}{4}$ " x 17  $\frac{1}{4}$ " (285 x 440mm) overall,  $\frac{1}{4}$ " (6mm) deep. 18-gauge (1.2mm), type-430 stainless steel with bright polished finish.

**B-9436 FRAMED MIRROR (Secured From Front)** Reflective surface: type-304 bright polished stainless steel. Frame: 14-gauge (2mm), type-304 stainless steel with satin finish;  $\frac{3}{8}$ " (16mm) deep; corners heliarc welded, ground and polished smooth; mirror protected by  $\frac{1}{2}$ " (13mm) thick fiberboard backing. Overall mirror size: 12" x 16" (305 x 405mm).

MIRRORS

**Baker**

MICHAEL BAKER JR. INC.  
801 Cromwell Park Drive  
Suite 110  
Glen Burnie, MD 21061

PROJECT TITLE

**RESTROOM DESIGN STANDARDS**

SHEET TITLE

**MIRRORS-1**

SCALE

**NONE**

DATE

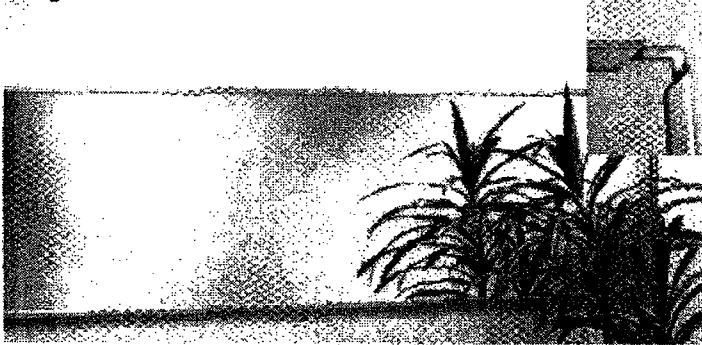
**MARCH 2005**

PROJECT NO.

**TASK 1314.20**

**B-26**

## Angle Frame



B-290 SERIES

**B-290 SERIES FRAMED MIRRORS** One-piece roll formed frame is  $\frac{3}{4}$ " x  $\frac{3}{4}$ " (19 x 19mm), type-304 stainless steel angle with satin finish. Special bevel design hugs mirror. Corners are heliarc welded, ground and polished smooth. No. 1 quality,  $\frac{1}{4}$ " (6mm) glass mirror electrolytically copper-plated; guaranteed against silver spoilage for 15 years. Mirror edges protected with plastic filler strips to prevent chipping; back is protected by  $\frac{3}{16}$ " (5mm) thick, water-resistant, polyethylene padding. Galvanized steel back attached to frame with concealed screws. Secured to concealed wall hanger (shown below) with two theft-resistant locking screws.

**SPECIAL-ORDER CUSTOM SIZE B-290 AND B-292 SERIES MIRRORS** Maximum size of one-piece mirror: 144" x 72" (366 x 183cm). Maximum frame size available: 186" x 72" (472 x 183cm) with two pieces of glass in one-piece frame furnished with I-section molding with polished stainless steel exposed finish covering seam where two pieces of glass butt together. Shelves longer than 120" (305cm) will be furnished as two pieces butted together. To specify special sizes, use Series Number followed by width and height in inches. For example: B-290 70 x 30 (178 x 76cm) or B-292 132 x 48 (335 x 122cm).

### DESIGNER'S NOTES

To specify mirrors, use Series Number desired followed by width and height in inches. Width dimension must always be stated first following Series Number.

B-165, B-166, B-290, B-292, B-293, and B-294 Series mirrors must be installed with width and height dimensions as ordered. Mirror back and wall hanger cannot be installed side ways to reverse width and height dimensions.

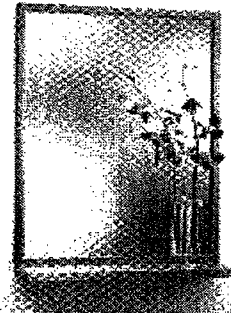
### SPECIAL-ORDER REFLECTIVE SURFACES

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.

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

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

## Angle Frame/Shelf

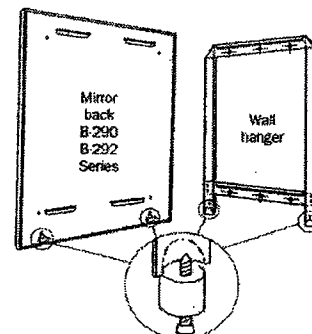


B-292 SERIES

**B-292 SERIES MIRROR/SHELF COMBINATION** Theft-resistant angle-frame mirror furnished with one-piece, type-304 satin-finish stainless steel shelf; projects 5" (127mm) and has  $\frac{3}{4}$ " (19mm) return edges on front and sides. Front return edge hemmed for maximum rigidity and safety. Corners are heliarc welded, ground and polished smooth. Concealed 16-gauge (1.6mm) stainless steel brackets attach shelf to mirror frame.

### STANDARD STOCK SIZES B-292 SERIES MIRROR/SHELF

Model No.	Width	Height
B-292 1824	18"	24"
B-292 1830	18"	30"
B-292 1836	18"	36"
B-292 2436	24"	36"



### BARRIER-FREE WASHROOM GUIDELINES

**MIRRORS.** Bottom edge of reflective surface should be mounted no higher than 40" (1015mm) above the finish floor. A single full-length mirror is recommended in each washroom because it is universally usable.

### IMPORTANT NOTE

All Bobrick framed mirrors are manufactured to overall dimensions, as shown in all mirror tables on pages 18 and 19. Overall height of mirror/shelf models includes shelf.

### 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 theft-resistant screws on bottom of mirror back. Back is constructed of galvanized steel. Note: Provide minimum  $\frac{3}{4}$ " (19mm) clearance at top of mirror for mounting on wall hanger, minimum 1" (25mm) clearance at bottom for engaging locking screws, and 1" (25mm) clearance on each side.

**Baker**

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PROJECT TITLE

RESTROOM DESIGN STANDARDS

SHEET TITLE

MIRRORS-2

SCALE NONE

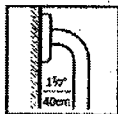
DATE MARCH 2005

PROJECT NO.

TASK 1314.20

**B-27**

## Grab Bars Comply With Barrier-Free Design Codes



Clearance between wall and grab bar

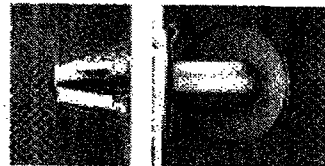
- Constructed of satin-finish stainless steel tubing in 1 1/4" and 1 1/2" (30 and 40mm) diameters; concealed or exposed mounting.
- Peened nonslip gripping surface available on all Series. Add suffix .99 to model number.
- Bar 18 gauge (1.2mm), type-304 stainless steel.
- Bar passes through flange and is heliarc welded to form single structural unit.

- Comply with structural strength requirements: grab bars that provide 1 1/2" (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.

### INSTALL GRAB BARS WITHOUT BACKING. NO NEED TO OPEN AND RECONSTRUCT WALLS.



WingIt™ Grab Bar Fastening System secures all Bobrick Grab Bar Series. For walls with a minimum of 3/8" (16mm) thick painted or tiled drywall. Can also be used on 1/2" (13mm) thick drywall with added finished wall material. The fastener will support 300 lb. load exceeding all building code and governmental agency guidelines including ADAAG in the United States.

**#251-4 WINGIT™ GRAB BAR FASTENER** For 2 1/2" and 3 1/2" (65 and 90mm) or deeper hollow walls with finished wall surfaces 3/4" to 1 1/2" (8 to 38mm) thick. One fastener required for each flange. Corrosion-resistant stainless steel. Patented.

WingIt™ is a trademark of WingIt Innovations, LLC.

### EXPOSED MOUNTING

- Flange 1/8" (3mm) thick, type-304 stainless steel plate, 3" (75mm) diameter.
- Exposed mounting screw holes; vandal-resistant screws available as an optional accessory.



### CONCEALED MOUNTING WITH SNAP FLANGE

- Cover snaps over mounting flange to conceal screws.
- Concealed mounting flange 1/8" (3mm) thick, type-304 stainless steel plate, 2" W x 3 1/4" H (50 x 80mm), with screw holes for concealed anchors.
- Cover is 22 gauge (0.8mm), type-304 stainless steel with satin finish, 3 1/4" (85mm) diameter.



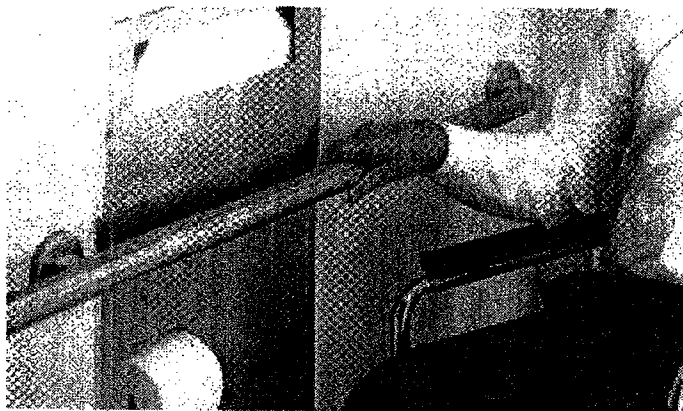
## GRAB BARS

Series	Diameter	*Finish
*B-6106	1 1/2" (40mm)	Satin Finish
*B-490	1 1/4" (30mm)	Satin Finish

\*Peened nonslip gripping surface available. Add suffix .99 to model number.

Series	Diameter	*Finish
*B-6808	1 1/2" (40mm)	Satin Finish
*B-6806	1 1/4" (30mm)	Satin Finish

\*Peened nonslip gripping surface available. Add suffix .99 to model number.



### BARRIER-FREE RESTROOM GUIDELINES

**GRAB BARS:** Diameter of grab bars should be 1 1/4" to 1 1/2" (30-40mm) with 1 1/2" (40mm) clearance from the wall. Grab bars should not rotate in their fittings. The required mounting height is universally 33" to 36" (840-915mm) from the centerline of the grab bar to the finish floor. The structural strength of all grab bars and their mounting devices should withstand more than 250 pounds of force (1112 N). For all barrier-free toilet compartments, individual toilet rooms and guest bathrooms, it is recommended that a 36" (915mm) high horizontal grab bar be installed on the back wall over the toilet and a 42" (1065mm) min. horizontal grab bar be installed on the side wall or partition nearest the toilet. This can also be accomplished with a single horizontal two-wall grab bar.

36 USA & Canada QuickShip model, 37 USA QuickShip model.

**Baker**

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Glen Burnie, MD 21061

### PROJECT TITLE

**RESTROOM DESIGN STANDARDS**

### SHEET TITLE

**GRAB BARS-1**

SCALE **NONE**







DATE **MARCH 2005**

### PROJECT NO.

**TASK 1314.20**

**B-28**

## Grab Bar Configurations

	CONCEALED MOUNTING	CONCEALED MOUNTING	EXPOSED MOUNTING	EXPOSED MOUNTING
GRAB BAR CONFIGURATIONS	B-6806 SERIES 1 1/2" (40mm) dia. satin finish or peened grip snap-flange	B-5806 SERIES 1 1/4" (30mm) dia. satin finish or peened grip snap-flange	B-6106 SERIES 1 1/2" (40mm) dia. satin finish or peened grip	B-490 SERIES 1 1/4" (30mm) dia. satin finish or peened grip
 Straight	B-6806 x 12", 18", 24", 30", 36", 42", 48" (305, 455, 610, 760, 915, 1065, 1220mm)  B-6806.99 x 18", 24", 30", 36", 42", 48" (455, 610, 760, 915, 1065, 1220mm)	B-5806 x 12", 18", 24", 30", 36", 42", 48" (305, 455, 610, 760, 915, 1065, 1220mm)  B-5806.99 x 24", 36", 42" (610, 915, 1065mm)	B-6106 x 18", 24", 36", 42", 48" (455, 610, 915, 1065, 1220mm)  B-6106.99 x 24", 36", 42" (610, 915, 1065mm)	
 36" W x 24" D (91 x 61cm) Grab Bar for Toilet/Shower/ Toilet Compartment	B-68616 B-68616.99	B-58616 B-58616.99		
 30 3/8" W x 15 7/8" D (78 x 40cm) Grab Bar for 36" x 36" (91 x 91cm) Shower Stall	B-6861 B-6861.99			
 54" W x 36" D (137 x 91cm) Grab Bar for Toilet Compartment/ Tub/Shower	B-68137 B-68137.99	B-58137 B-58137.99		
 29" (74cm) Swing Up (Wall Mounted) Patented				B-4988 B-4988.99
 33 3/8" H x 27 7/8" D (84 x 71cm) Swing Away (Floor Mounted)				B-4993 B-4993.99
OPTIONAL MOUNTING DEVICES Order for each Series using part numbers listed. See descriptions below.	#252-30 #2521-30 #2522-30 2562 2573 2583	#252-30 #2521-30 #2522-30 2562 2573 2583	#252-30 #2521-30 #2522-30 2571 2581	#252-30 #2521-30 #2522-30 2571 2581

OPTIONAL MOUNTING KITS. Order one per flange. Part No. 252-30 (3) sheetmetal screws; 2521-30 (3) machine screws with toggle nuts; 2522-30 (3) machine screws with expansion shields. OPTIONAL ANCHOR DEVICES. Part No. 2562 concealed anchor plates for stud walls (order one per pair of flanges); 2571 and 2573 concealed anchors for solid walls (order one per flange); 2581 and 2583 anchors for 3/4" to 1" (19-25mm) panels (order one per flange).

GRAB BARS

37

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PROJECT TITLE

**RESTROOM DESIGN STANDARDS**

SHEET TITLE

**MIRRORS-2**

SCALE **NONE**

DATE **MARCH 2005**

PROJECT NO.

**TASK 1314.20**

**B-29**

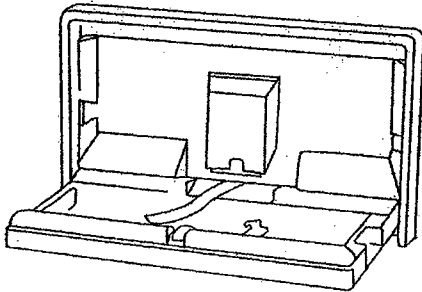


**PRODUCT INFORMATION**  
**TO ORDER, PLEASE CALL: 888.733.3456**  
**OR FAX: 303.574.9000**  
**7881 South Wheeling Court, Englewood, CO 80112**

## Baby Changing Station

Provides a practical place for parents to attend to their children's dirty diapers without leaving your business

### Horizontal



### Horizontal

#### Unit dimensions:

**Height:** 20 in (508 mm) **width:** 35 in (889 mm)

**Depth:** 4 in (102 mm) closed; 20 in (508 mm) opened

**Changing surface:** 442 sq in (2873 sq mm)

**Weight:** 30 lbs (13.64 kilos)

### Vertical

#### Unit dimensions:

**Height:** 36 in (914 mm) **width:** 22 in (559 mm)

**Depth:** 5.25 in (127 mm) closed; 35 in (889 mm) opened

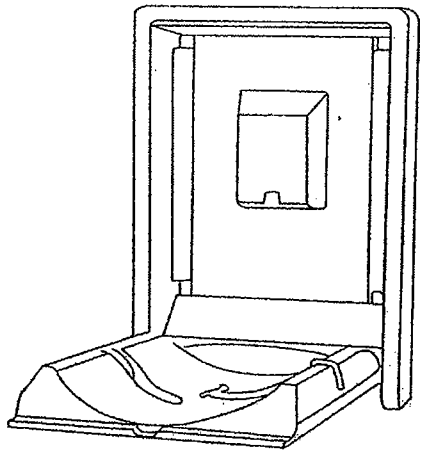
**Changing surface:** 420 sq in (2730 sq mm)

**Weight:** 30 lbs (13.64 kilos)

### Product features:

- Rugged design withstands static loads up to 400 pounds (182 kilos)
- Steel-on-steel hinges with 10 gauge (3.42 mm squared) steel mounting supports for durability
- Hidden pneumatic gas spring to ensure smooth, safe open and close motions; closes fully after each use
- Child protection strap features snap-lock fastener to hold child secure
- Sanitary bed liner dispenser holds 25 liners to promote good hygiene
- High-impact polyethylene resists odors, has no sharp corners, and cleans easily
- Chemical-free sanitary liners are made from 3-ply biodegradable paper for protection and easy disposal
- Molded-in safety and usage instructions in 6 languages
- Door plaque clearly identifies family friendly restrooms
- Includes step-by-step instructions and all mounting hardware for easy installation
- Optional factory-installed lock secures station from vandalism
- Available in off-white and light gray

### Vertical



### Additional Features:

- 5-year manufacturers limited warranty
- Made in the USA

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 801 Cromwell Park Drive  
 Suite 110  
 Glen Burnie, MD 21061

PROJECT TITLE

**RESTROOM DESIGN STANDARDS**

SHEET TITLE

**DIAPER CHANGING STATIONS-1**

SCALE **NONE**

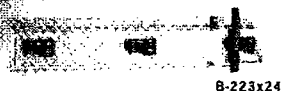
DATE **MARCH 2005**

PROJECT NO.

**TASK 1314.20**

**B-30**

## Recessed and Surface Mounted



B-223x24

**B-223 MOP AND BROOM HOLDER Type-304** stainless steel, satin finish. Anti-slip mop holders have spring-loaded rubber cam that grips handles  $\frac{7}{8}$ " to  $1\frac{1}{4}$ " (20-30mm) diameter. Holds mops  $3\frac{1}{4}$ " (85mm) from wall. Height 5" (125mm).

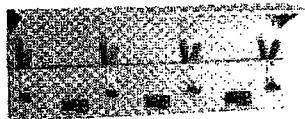
Model No.	No. Holders	Length
B-223x24	3	24" (610mm)
B-223x36	4	36" (915mm)



B-224x36

**B-224 SHELF WITH MOP AND BROOM HOLDERS AND RAG HOOKS** Shelf is 18-gauge (1.2mm), type-304 stainless steel, satin finish; 8" H, 8" D (150 x 205mm). Anti-slip mop holders have spring-loaded rubber cam that grips handles  $\frac{7}{8}$ " to  $1\frac{1}{4}$ " (20-30mm) diameter. Holds mops 8" (205mm) from wall. Stainless steel rag hooks. Rod for wet rags below shelf.

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

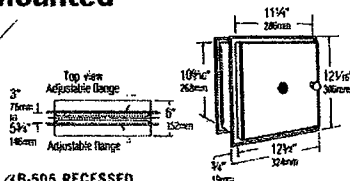
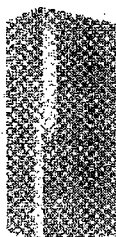


B-239x34

**B-239 CLASSIC SERIES SHELF WITH MOP AND BROOM HOLDERS AND HOOKS** Shelf is 18-gauge (1.2mm), type-304 stainless steel, satin finish; 13" H, 8" D (330 x 205mm). Anti-slip mop holders have spring-loaded rubber cam that grips handles  $\frac{7}{8}$ " to  $1\frac{1}{4}$ " (20-30mm) dia. Stainless steel hooks.

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

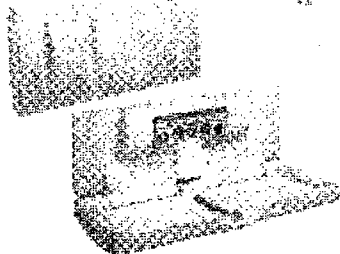
**B-633 STAINLESS STEEL CORNER GUARDS** Eliminate expensive maintenance work. 18-gauge (1.2mm), type-304 stainless steel, satin finish. No sharp edges. Furnished with adhesive mounting for easy permanent installation:  $3\frac{1}{2}$ " x  $3\frac{1}{2}$ " (90 x 90mm); 48" (1220mm) long.



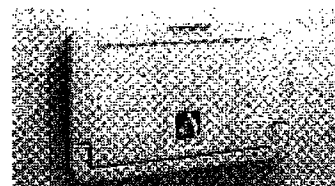
**B-505 RECESSED SPECIMEN PASS-THRU CABINET** Provides convenient passage for specimen from patient area to laboratory. Mounts in walls 3" to 5 3/4" (75-145mm) thick. Type-304 stainless steel, satin finish.

Self-closing doors: Interlocking mechanism prevents both doors from being open at the same time; provides sight barrier. Removable stainless steel tray. Rough Wall Opening:  $11\frac{1}{2}$ " W,  $10\frac{3}{8}$ " H (290 x 275mm); 3" to 5 3/4" (75-145mm) thick.

**B-235 SURFACE-MOUNTED PAPER CUP DISPENSER** Satin-finish stainless steel. Dispenses 150-3-oz (0.1-1.1) cups. Also adjusts to dispense up to 6-oz (0.21) cups. Tumbler lock on top and stainless steel piano-hinge on bottom. Cabinet swings down for easy filling. Slot on front indicates refill time:  $3\frac{1}{4}$ " W,  $14\frac{1}{2}$ " H,  $3\frac{1}{4}$ " D (85 x 370 x 85mm).



**B-2230 CLASSIC SERIES SURFACE-MOUNTED DIAPER CHANGING STATION** Provides safe, convenient location for parent and child in public washrooms at a budget price. Unit features a smooth concave changing area with nylon 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 exposed on interior or exterior surfaces. Bed secured to backplate with concealed full-length stainless steel hinge rod with steel bushings embedded in the plastic. Unit supports loads up to 250 lb. (113kg) when properly installed. Equipped with liner dispenser that accommodates many commercially available folded liners. Unit measures  $34\frac{1}{4}$ " W,  $16\frac{3}{8}$ " H (870mm x 430mm). When closed, surface-mounted unit projects 4" (102mm) from wall; when open, bed projects 18" (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 polyethylene resists odors and bacterial growth; matches Bobrick color #889 Grey. Unit has foam core for added durability. No hinge structure exposed on interior or exterior surfaces. Bed secured to back plate with concealed full-length stainless steel hinge rod with steel bushings imbedded 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 C-fold or multifold paper towels measuring  $6\frac{1}{2}$ " to  $10\frac{3}{8}$ " long by  $2\frac{3}{8}$ " to  $4\frac{3}{8}$ " wide (165-270mm x 65-125mm). 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); semi-recessed unit projects 1 5/8" (40mm). When open, surface mounted bed projects 19" (485mm) from wall; semi-recessed bed projects 16 3/8" (420mm). For semi-recessing, provide Rough Wall Opening  $30\frac{1}{2}$ " W,  $18\frac{1}{2}$ " H, 4" D (775 x 470 x 102mm). Patented.

**B-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 PARTITION-MOUNTED CHILDEAT** Provides safe location off of floor for child with parent inside toilet compartment or fitting room. Features safety strap and hooks for bag or purse. Polyethylene matches Bobrick color #889 Grey. Supports up to 80 lb (36kg) when properly installed. Closed unit measures 13" W, 18" H,  $4\frac{1}{2}$ " D (330 x 455 x 115mm). Seat projects  $13\frac{1}{4}$ " (335mm) from partition when open.



HEALTHCARE ACCESSORIES/CHILDCARE PRODUCTS

**Baker**

MICHAEL BAKER JR. INC.  
801 Cromwell Park Drive  
Suite 110  
Glen Burnie, MD 21061

PROJECT TITLE

**RESTROOM DESIGN STANDARDS**

SHEET TITLE

**DIAPER CHANGING STATIONS-2**

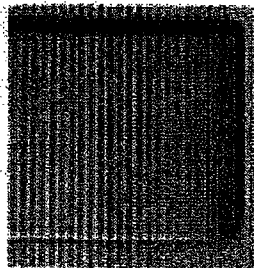
SCALE NONE

DATE MARCH 2005

PROJECT NO.

**TASK 1314.20**

**B-31**



## 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**

**Baker**

**MICHAEL BAKER JR. INC.**  
 801 Cromwell Park Drive  
 Suite 110  
 Glen Burnie, MD 21061

PROJECT TITLE

**RESTROOM DESIGN STANDARDS**

SHEET TITLE

**CRASH RAILS-1**

SCALE

**NONE**

DATE

**MARCH 2005**

PROJECT NO.

**TASK 1314.20**

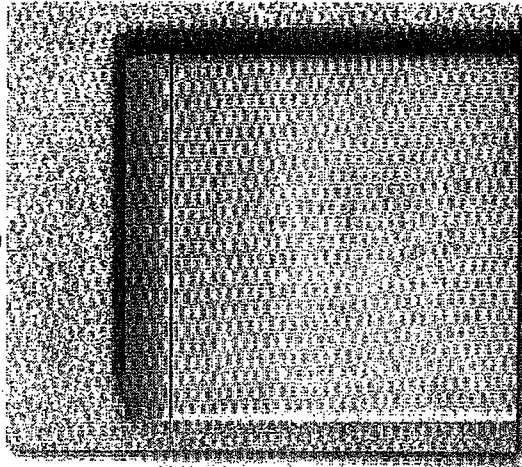
**B-32**

## KOROSEAL WALL PROTECTION SYSTEMS

### KOROGARD<sup>(r)</sup> 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<sup>(r)</sup> 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° Corner Cap
C804	135° Corner Cap
C805	Splice Kit
C841	Extended End Cap

**Baker**

MICHAEL BAKER JR. INC.  
801 Cromwell Park Drive  
Suite 110  
Glen Burnie, MD 21061

PROJECT TITLE

**RESTROOM DESIGN STANDARDS**

SHEET TITLE

**CRASH RAILS-2**

SCALE NONE

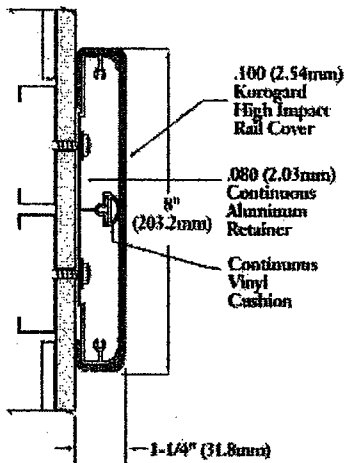
DATE MARCH 2005

PROJECT NO.

**TASK 1314.20**

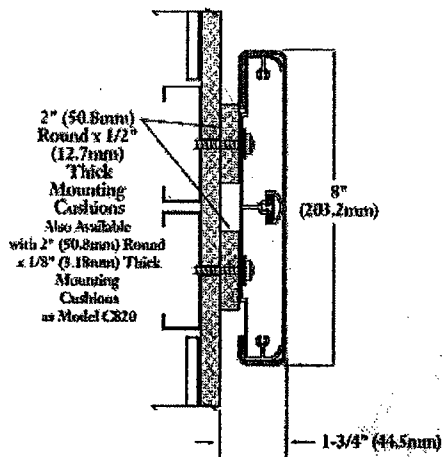
**B-33**





**CB00**

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**CB30**

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PROJECT TITLE

**RESTROOM DESIGN STANDARDS**

SHEET TITLE

**CRASH RAILS-3**

SCALE

**NONE**

DATE

**MARCH 2005**

PROJECT NO.

**TASK 1314.20**

**B-34**

# KOROSEAL WALL PROTECTION SYSTEMS

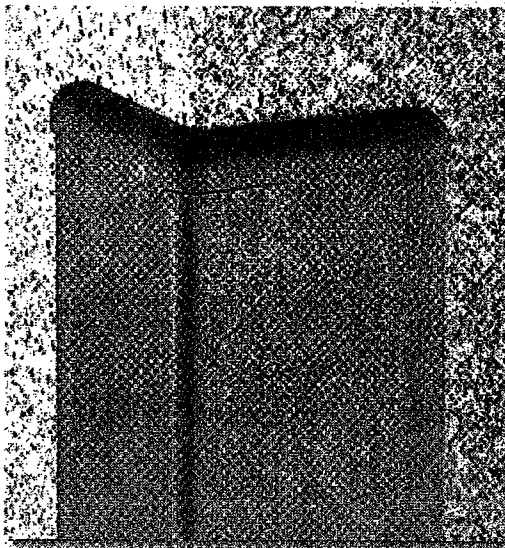
## KOROGARD<sup>(r)</sup> G200-Series

### 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.

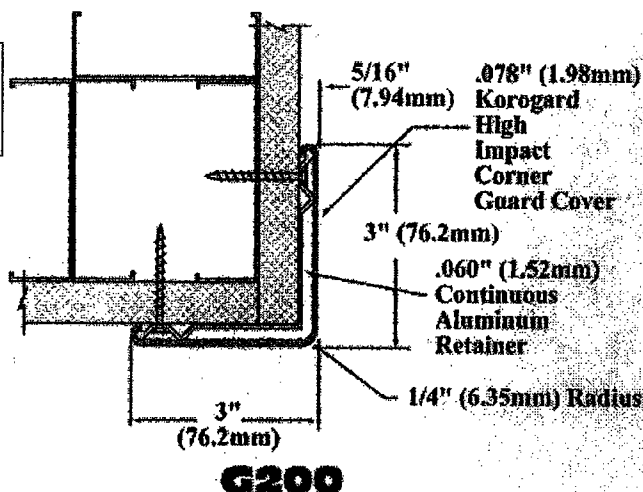
KOROGARD G200-Series Corner Guards are backed by a limited five-year warranty. All corner guards are Class I/A fire rated and meet national building code standards. All KOROGARD linear profiles color coordinate with a multitude of KOROSEAL<sup>(r)</sup> Wallcoverings for a systems approach to wall protection.

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](#)

G200 SERIES ACCESSORY ITEMS	
G201	Standard End Cap
G211	135° End Cap



**G200**

**Baker**

MICHAEL BAKER JR. INC.  
801 Cromwell Park Drive  
Suite 110  
Glen Burnie, MD 21061

PROJECT TITLE

**RESTROOM DESIGN STANDARDS**

SHEET TITLE

**CORNER GUARDS-1**

SCALE

**NONE**

DATE

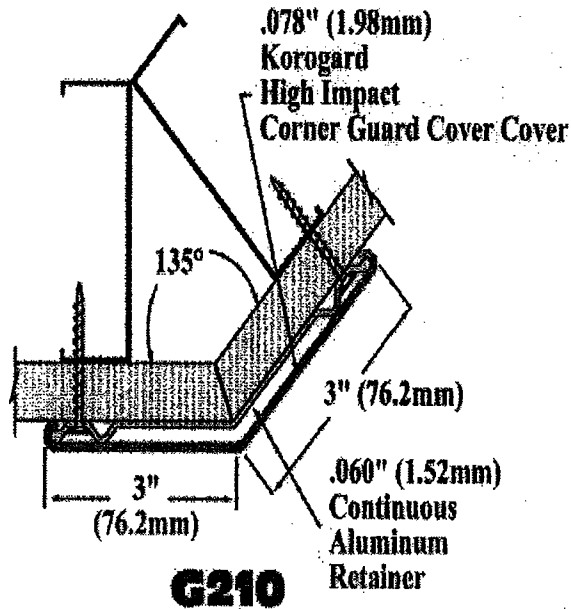
**MARCH 2005**

PROJECT NO.

**TASK 1314.20**

**B-35**

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**KOROSEAL**  
**WALL PROTECTION SYSTEMS**

A Division of RJF International Corporation  
3875 Embassy Parkway, Fairlawn, OH 44333  
Phone 800-628-0449 or 330-668-7600  
Fax 330-668-7703

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Glen Burnie, MD 21061

PROJECT TITLE

**RESTROOM DESIGN STANDARDS**

SHEET TITLE

**CORNER GUARDS-2**

SCALE

**NONE**

DATE

**MARCH 2005**

PROJECT NO.

**TASK 1314.20**

**B-36**

# REPUBLIC STORAGE SYSTEMS



## THE LOCKER BOOK

**Baker**

MICHAEL BAKER JR. INC.  
801 Cromwell Park Drive  
Suite 110  
Glen Burnie, MD 21061

PROJECT TITLE

**RESTROOM DESIGN STANDARDS**

SHEET TITLE

**LOCKERS-1**

SCALE **NONE**

DATE **MARCH 2005**

PROJECT NO.

**TASK 1314.20**

**B-37**

STANDARD LOCKERS								
W x D Inches	Single Tier Heights	Double Tier Heights	Triple Tier Heights	Four tier Heights	3-High Box Heights	4-High Box Heights	5-High Box Heights	6-High Box Heights
9 x 12	48, 54, 60, 72	30, 36			20, 24	15, 18		
9 x 15	48, 54, 60, 72	30, 36			20, 24			
9 x 18	60, 72	30, 36			20, 24			
9 x 21	60, 72	30, 36						
9 x 24	60, 72	30, 36						
12 x 12	36, 48, 54, 60, 72	24, 30, 36, 42	20, 24	18	20, 24	15, 18	12, 14, 4	12
12 x 15	36, 48, 54, 60, 72	24, 30, 36, 42	20, 24		20, 24	15, 18	12, 14, 4	12
12 x 18	36, 48, 60, 72	24, 30, 36, 42	20, 24		20, 24	15, 18	12, 14, 4	12
12 x 21	60, 72	30, 36						
12 x 24	60, 72	30, 36						
15 x 12	60, 72	30, 36			20, 24		12, 14, 4	12
15 x 15	60, 72	30, 36			20, 24	15, 18	12, 14, 4	12
15 x 18	60, 72	30, 36			20, 24	15, 18	12, 14, 4	12
15 x 21	60, 72	30, 36						
15 x 24	60, 72	30, 36						
18 x 12	60, 72	30, 36						
18 x 15	60, 72	30, 36						
18 x 18	60, 72	30, 36						
18 x 21	60, 72	30, 36						
18 x 24	60, 72	30, 36						
24 x 18	60, 72	30, 36						
24 x 21	60, 72	30, 36						
24 x 24	60, 72	30, 36						

ADDITIONAL SIZES FOR STANDARD LOCKERS			
W x D Inches	Two Person Heights	Duplex Heights	Double Door Heights
15 x 12	60, 72		
15 x 15	60, 72	60, 72	
15 x 18	60, 72	60, 72	
15 x 21	60, 72		
18 x 15	60, 72		
18 x 18	60, 72	60, 72	
18 x 21		60, 72	
24 x 18			60, 72
24 x 21			60, 72
24 x 24			60, 72



Actual height of the 36" single tier locker is 36 1/2"

Above: Standard Lockers  
 Jeanette McKee Elementary/Middle School  
 Jeanette, Pennsylvania  
 Architect: Kachik and Graves, Pittsburgh, Pennsylvania  
 Distributor: Tri-State Lockers & Shelving, Pittsburgh, Pennsylvania

**Baker**

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PROJECT TITLE

**RESTROOM DESIGN STANDARDS**

SHEET TITLE

**LOCKERS-2**

SCALE

**NONE**

DATE

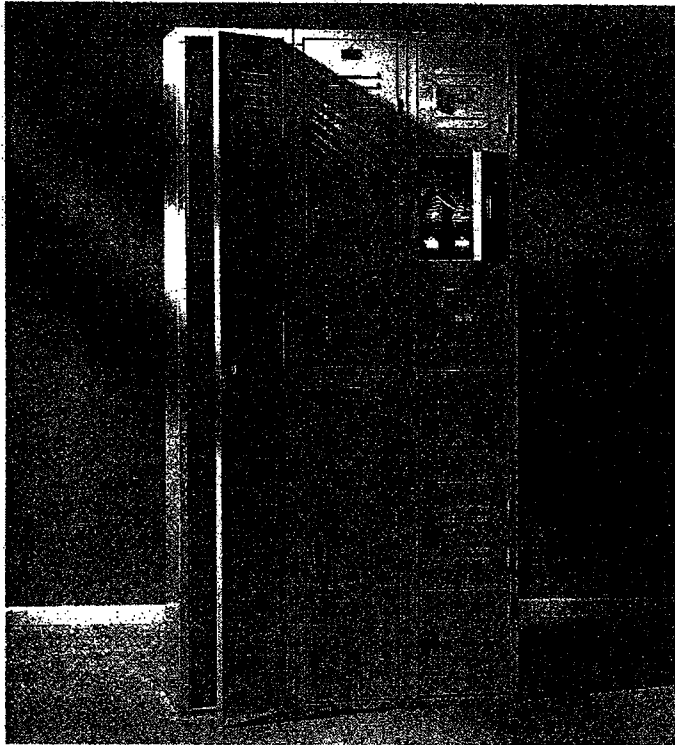
**MARCH 2005**

PROJECT NO.

**TASK 1314.20**

**B-38**

# STANDARD LOCKERS

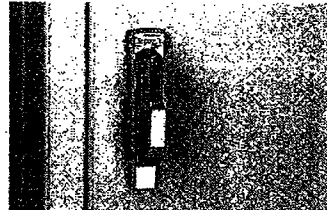


Republic's Standard Locker is recognized as the industry standard for durability, reliability and value. Year after year, generation after generation, this sturdy locker has been meeting the most demanding expectations for quality, design and performance.

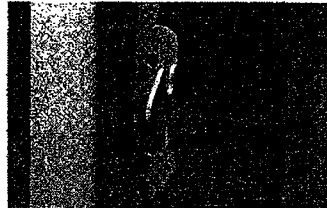
Republic® offers you a broad range of options, features and accessories to customize your lockers to meet any specific need or application.

- 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

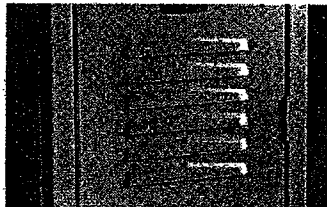
For fast delivery, many Standard Lockers are also available from Republic's Qwik Ship stock. Check with your local Republic distributor.



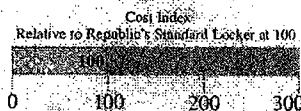
Lift handle is made of attractive, durable chrome plated die cast zinc. The rugged handle case protects the lift trigger from kicking and other abuse, and also serves as a padlock strike. Handle equipped with two rubber silencers to reduce mechanism noise.



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 near the top and bottom of each door.



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PROJECT TITLE

**RESTROOM DESIGN STANDARDS**

SHEET TITLE

**LOCKERS-3**

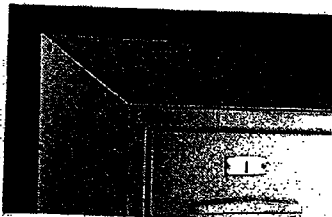
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DATE **MARCH 2005**

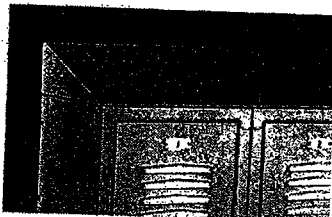
PROJECT NO.

**TASK 1314.20**

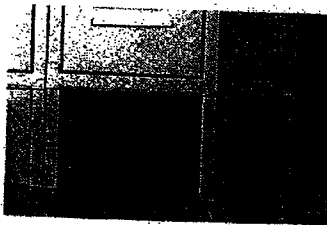
**B-39**



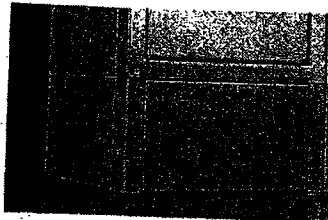
*Individual Sloping Tops provide a finished appearance, prevent trash accumulation on locker tops and discourage using locker tops as storage areas. The rise of the slope is  $\frac{1}{4}$  the locker depth. Standard flat tops are omitted.*



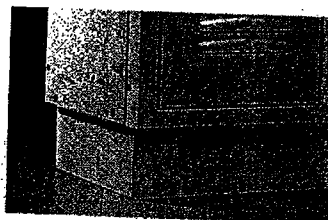
*Continuous Sloping Tops provide a smooth, finished appearance for lockers mounted along walls or in island groups. The rise of the slope is  $\frac{1}{4}$  the locker depth. Customize your installation with sloping top splices, valley corners and hip ends - all without exposed fasteners.*



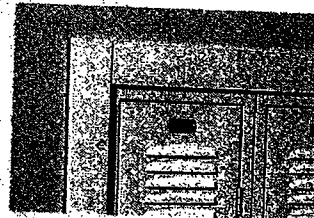
*6" Legs may be furnished with all lockers. Front legs are an extension of vertical frames. Adjustable rear angle legs are provided for every third upright.*



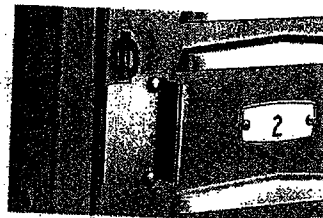
*20 gauge Closed Front and End Bases give a finished appearance to lockers with legs. Closed Bases also cover the hard to clean area under the lockers.*



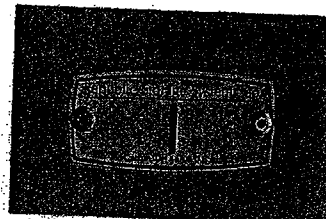
*16 gauge Zee Bases offer an attractive and economical way to raise lockers above the floor and create an overhang or "toe space". Available in 3", 4" and 6" heights.*



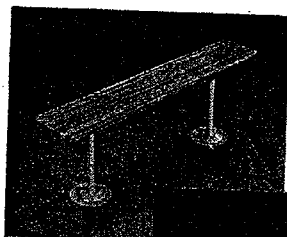
*Recess Trim really sets off your recessed locker installations. The trim has a 3" face and a  $\frac{1}{4}$ " top return. Integral corner caps and hairline joints reinforced with welded-on splice fingers leave a clean appearance. When used with Mondrian® or Designer lockers the trim can be set in a sculptured design (locker projects 1" beyond wall) or a flush design (locker projects  $\frac{1}{4}$ " beyond wall).*



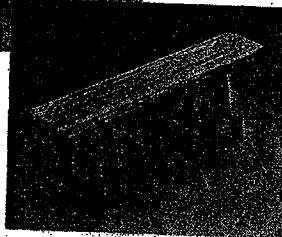
*Standard Box Locker Pull provides a convenient finger pull and serves as a padlock strike and lock hole cover. Made from 20 gauge stainless steel.*



*Number plates feature  $\frac{1}{2}$ " high black numerals on brushed aluminum to permit easy locker identification.*



*Benches and Pedestals have an overall height of 17 $\frac{1}{2}$ ". Benches are 9 $\frac{1}{2}$ " wide x 1 $\frac{1}{4}$ " full finished thickness laminated maple. Pedestals consist of sturdy 1 $\frac{1}{2}$ " O.D. tubing with 10 gauge steel flanges welded to each end.*



*Moveable Benches consist of maple bench tops mounted to free-standing trapezoidal-shaped pedestals. Pedestals made from  $\frac{1}{4}$ " x 3" aluminum bar stock, with black anodized finish.*

**Baker**

MICHAEL BAKER JR. INC.  
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Glen Burnie, MD 21061

PROJECT TITLE

**RESTROOM DESIGN STANDARDS**

SHEET TITLE

**LOCKERS-4**

SCALE

**NONE**

DATE

**MARCH 2005**

PROJECT NO.

**TASK 1314.20**

**B-40**



L-96A

# Steel Lockers

## For Secure Personal Storage



**Baker**

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Suite 110  
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PROJECT TITLE

**RESTROOM DESIGN STANDARDS**

SHEET TITLE

**LOCKERS-5**

SCALE **NONE**

DATE **MARCH 2005**

PROJECT NO.

**TASK 1314.20**

**B-41**





# Vanguard Lockers



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.

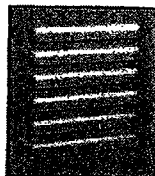
What you see first is the baked enamel finish, which is applied over a phosphatized smooth steel surface. There are 17 standard colors from which to choose, and the body parts are the same color as the doors.



Vanguard Handle

Single and double tier 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 spring-loaded 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.

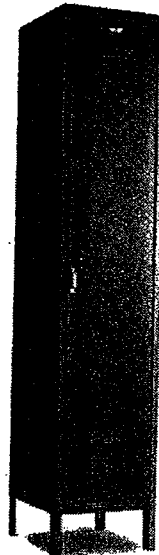


Vanguard Louvers

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, 5-knuckle 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 ordered by the opening. 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.



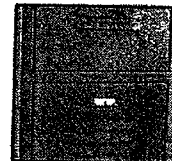
Single Tier



Double Tier

**Single Tier** — The most popular and widely used locker offers maximum space for full hanging of clothing and other belongings. Each locker has a convenient shelf for storage of books, hats or other small articles. Lockers 18" deep or more come with a coat rod in addition to coat hooks.

**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 belongings.



Size (Inches)		Single Tier		Double Tier		
W	D	60" Opening Ht.	72" Opening Ht.	30" Opening Ht. (60" overall ht.)	36" Opening Ht. (72" overall ht.)	42" Opening Ht. (84" overall ht.)
		Cat. No.	Cat. No.	Cat. No.	Cat. No.	Cat. No.
9	12	6101V	6151V	6201V	6221V	-
9	15	6103V	6153V	6203V	6223V	-
9	18	6105V	6155V	6205V	6225V	-
12	12	6111V	6161V	6211V	6231V	6251V
12	15	6113V	6163V	6213V	6233V	6253V
12	18	6115V	6165V	6215V	6235V	6255V
12	21	6117V	6167V	6217V	6237V	-
15	12	6119V	6169V	-	6239V	-
15	15	6121V	6171V	-	6241V	6261V
15	18	6123V	6173V	-	6243V	6263V
15	21	6125V	6175V	-	6245V	-
18	18	6131V	6181V	-	6247V	-
18	21	6133V	6183V	-	6249V	-
18	24	6135V	6185V	-	-	-
*24	18	6149V	6199V	-	-	-
*24	21	6153V	6193V	-	-	-
*24	24	6160V	6199V	-	-	-

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

Baker

MICHAEL BAKER JR. INC.  
801 Cromwell Park Drive  
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Glen Burnie, MD 21061

PROJECT TITLE

RESTROOM DESIGN STANDARDS

SHEET TITLE

LOCKERS-6

SCALE NONE

DATE MARCH 2005

PROJECT NO.

TASK 1314.20

B-42

**PENCO**

# Vanguard Lockers



3 Tier



4 Tier



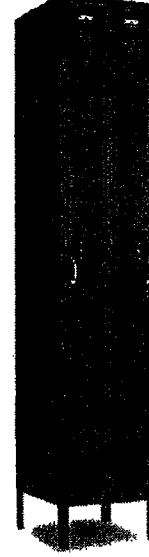
5 Tier



6 Tier



2 Person



Duplex

**Multiple Tier Box Lockers** — Also known as "box lockers" for their compact dimensions, Penco multiple tier lockers allow numerous users in the smallest amount of floor space. They are available in 3, 4, 5 and 6 tier configurations, and are ideal for storage of athletic gear or employee personal storage. Can be locked with padlocks or built-in locks. (Vanguard cast handle with multi-point latching is available at extra cost on 3 Tier box lockers).

**2 Person Lockers** — A space saving model that has ample room for two people while occupying about the same space as a single tier locker. Full width book compartment doors. Coat rods are included in lockers 18" deep or more.

*Hidden door release for book compartment doors of 2 Person lockers.*



**Duplex Lockers** — An economical way to provide full length locker convenience in a small amount of floor space. Two private lockers are combined in one 15" wide frame. Door openings are 6" wide and each locker contains a 7-1/2" wide shelf located 18" from the top.

Size (Inches)		3 Tier		4 Tier		5 Tier		6 Tier	2 Person		Duplex
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.	14-25" Opening Ht. (72" overall ht.) Cat. No.	12" Opening Ht. (72" overall ht.) Cat. No.	40" Opening Ht. (60" overall ht.) Cat. No.	52" Opening Ht. (72" overall ht.) Cat. No.	72" Opening Ht. Cat. No.
12	12	6307V	6319V	6325V	6331V	6343V	6353V	6365V	-	-	-
12	15	6309V	6321V	6327V	6337V	6345V	6355V	6367V	-	-	-
12	18	6311V	6323V	6329V	6339V	6347V	6357V	6369V	-	-	-
12	21	6349V	6399V	6393V	6395V	-	6435V	6371V	-	-	-
15	12	-	-	-	-	-	-	-	6510V	6500V	-
15	15	-	-	-	6431V	6351V	6359V	6373V	6506V	6501V	6591V
15	18	-	-	-	6433V	6397V	6361V	6375V	6437V	6503V	6593V
15	21	-	-	-	-	-	-	6377V	-	6505V	6595V
18	18	-	-	-	-	-	-	6379V	-	-	-
18	21	-	-	-	-	-	-	6378V	-	-	-

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**

MICHAEL BAKER JR. INC.  
801 Cromwell Park Drive  
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Glen Burnie, MD 21061

PROJECT TITLE

RESTROOM DESIGN STANDARDS

SHEET TITLE

LOCKERS-7

SCALE NONE

DATE MARCH 2005

PROJECT NO.

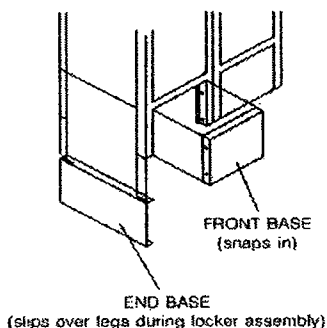
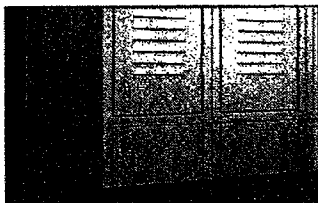
TASK 1314.20

**B-43**

## Individual Closed Bases

Front and end bases are designed to fit between 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.)

Closed Bases				
Size (Inches)			Cat. No.	
W	D	H		
Front Bases				
9	-	6	60216C	
12	-	6	60217	
15	-	6	60218	
18	-	6	60219	
24	-	6	60220C	
End Bases Single Row				
-	12	6	60204	
-	15	6	60205	
-	18	6	60206	
-	21	6	60207	
-	24	6	60208C	
End Bases Double Row				
-	24	6	60209C	
-	30	6	60210C	
-	36	6	60211C	

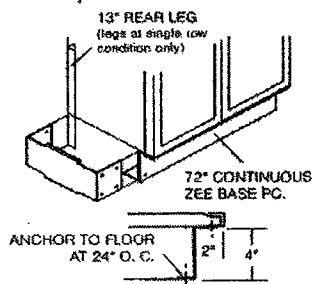


## Zee Bases

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 Base			
Size (Inches)			Cat. No.
W	D	H	
Front Zee Base			
72	-	4	66700H
Splice/End Base Single Row			
-	12	4	66701H
-	15	4	66702H
-	18	4	66703H
-	21	4	66704H
-	24	4	66705H
Splice/End Base Double Row			
-	30	4	66707H
-	24	4	66706H
-	36	4	66708H
Zee Base Filler			
-	-	4	66709H
Rear Leg for Zee			
-	-	4	60092C

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.)



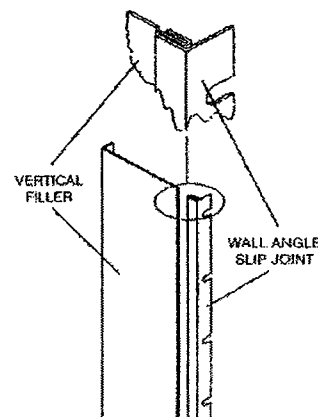
## Fillers

Penco provides standard fillers to adapt lockers to a wide range of field conditions and provide a professional, 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 finish. The slip joint conceals any raw edges caused by field cutting.

A. Vertical Fillers			
Size (Inches)			Cat. No.
W	D	H	
Fillers, Vertical Angle			
5	-	60	66112C
5	-	72	66115C
9	-	60	66114C
9	-	72	66117C
9	-	78	66127C
12	-	60	66113C
12	-	72	661141C
12	-	78	66116C
Wall Angle Slip Joints			
-	-	60	66118C
-	-	72	66119C
-	-	78	66121C

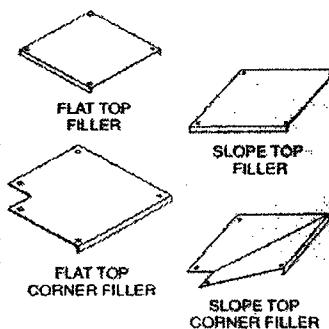


### B. Top Fillers

Size (Inches)			Cat. No.
W	D	H	
Flat Top Fillers			
15	12	-	661321C
15	15	-	661322C
15	18	-	661323C
Slope Top Fillers			
15	12	-	661371C
15	15	-	661372C
15	18	-	661373C
Flat Top Corner Fillers			
12	12	-	66138C
15	15	-	66139C
18	18	-	66140C
Slope Top Corner Fillers			
12	12	-	66100C
15	15	-	66101C
18	18	-	66102C

### 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.

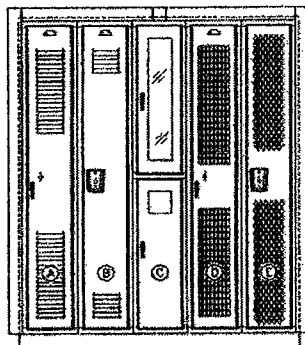
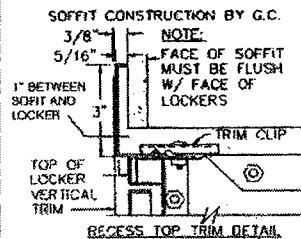


FOR SAFETY PURPOSES WE STRONGLY RECOMMEND THAT ALL LOCKERS BE EITHER FLOOR OR WALL ANCHORED.

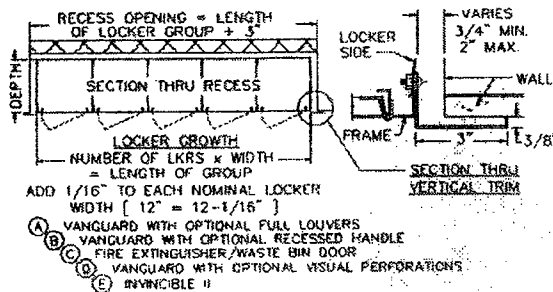
## Recess Trim

Recess Trim - 3" Recess trim bridges the gap between lockers and wall and/or soffits when the lockers are recessed into a wall.

Recess Trim			
Size (Inches)			Cat. No.
W	D	H	
Side Trim, LH			
3	-	63	60465C
3	-	75	60469C
Side Trim, RH			
3	-	63	60466C
3	-	75	60470C
Top Trim			
74	-	3	60456H
Splice			
2	-	3	60105C
Outside Corner Splice			
2	2	3	66108C

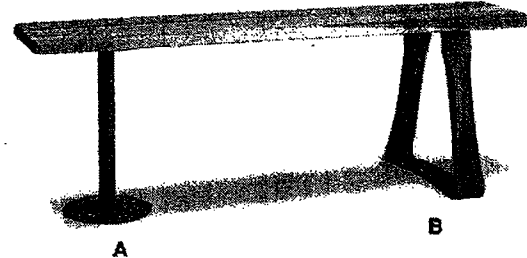


ELEVATION OF RECESSED LOCKERS



## 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" deep x 1-1/4" thick. (Order Pedestals separately.)

Bench Tops	
Size (Inches)	Cat. No.
W	
36	09611
48	09600
60	09601
72	09602
84	09603
96	09604
108	09605
120	09606
132	09607
144	09608

## 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.

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

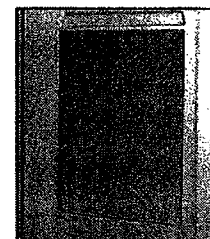
Pedestal consists of a heavy duty steel tube welded to top and bottom flanges. Hardware for fastening to the bench only is included. Pedestal must be anchored to the floor. Order two or more per bench (see above). Available for quick shipment in 028 Gray; available in all 17 colors. Cat. No. 60822H

### 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

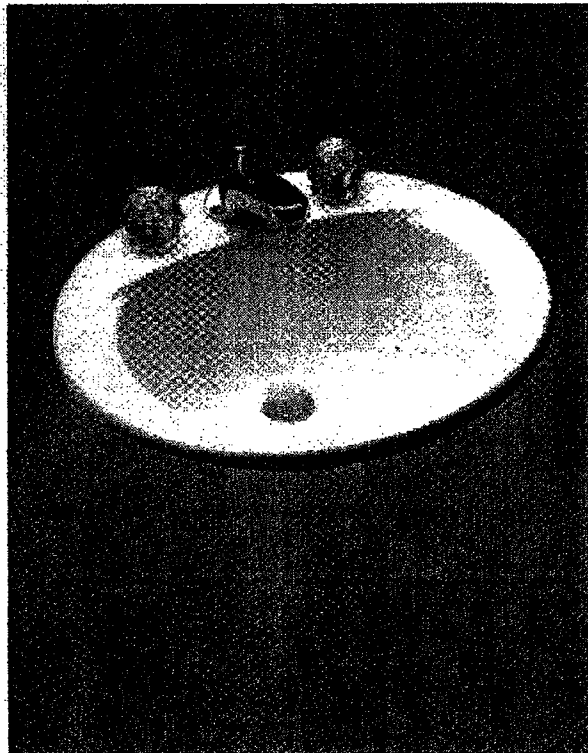
## Mirror

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.



**TOTO®**  
Perfection by Design

# LT501 Self-Rimming Lavatory



LT501.8

- ☑ 20" x 17"
- ☑ Attractive design in vitreous china
- ☑ Spacious oval basin
- ☑ Concealed front overflow

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

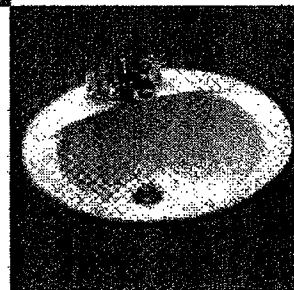
☑ **LT501**  
Lavatory only with single hole faucet center

☑ **LT501.4**  
Lavatory only with 4" faucet centers

☑ **LT501.8**  
Lavatory only with 8" faucet centers

Colors:  
Standard 801 Cotton  
Optional See price book for additional colors

Faucet Not Included



LT501.4

**Reliance Commercial Line**

**Baker**

MICHAEL BAKER JR. INC.  
801 Cromwell Park Drive  
Suite 110  
Glen Burnie, MD 21061

PROJECT TITLE

**RESTROOM DESIGN STANDARDS**

SHEET TITLE

**LAVATORIES-1**

SCALE **NONE**

DATE **MARCH 2005**

PROJECT NO.

**TASK 1314.20**

**B-46**

## LT501 Self-Rimming Lavatory

### DESIGN

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

### FUNCTION

Durable vitreous china offers years of quality use.

### SPECIFICATIONS

Waste: 1 1/4" O.D.  
Size: 20"W x 17"D  
Basin: 15 1/4"W x 11 1/4"D  
Material: Vitreous china  
Warranty: One Year Limited Warranty  
Shipping Weight: LT501 / LT501.4 / LT501.8  
20.5 lbs.

Shipping Dimensions: LT501 / LT501.4 / LT501.8  
21 1/4"L x 19 1/4"W x 10 1/4"H

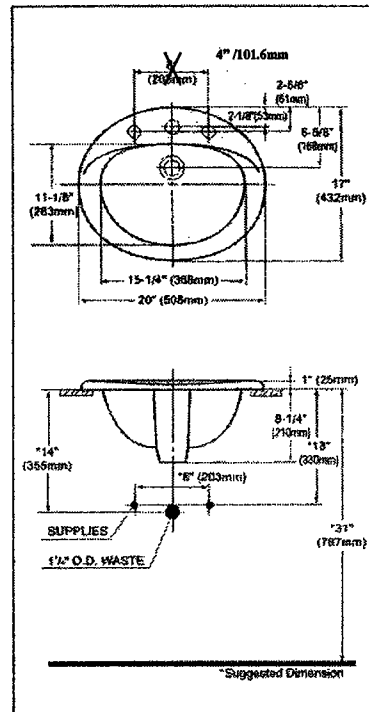
Fixture dimensions meet ANSI/ASME standard  
A112.19.2M and CAN/CSA B 45 requirements.

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



Meets the American Disabilities Act Guidelines 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.



LT501.8

**TOTO**  
Perfection by Design

TOTO U.S.A., INC. • 1155 Southern Road, Morrow, GA 30260  
Tel. (770) 282-8686 • Fax. (770) 282-8701 • www.totousa.com  
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Printed on recycled paper ♻️

REV 4/00

**Baker**

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Glen Burnie, MD 21061

PROJECT TITLE

**RESTROOM DESIGN STANDARDS**

SHEET TITLE

**LAVATORIES-2**

SCALE **NONE**

DATE **MARCH 2005**

PROJECT NO.

**TASK 1314.20**

**B-47**

# SONNET™

# 1-345-V or S

## SELF-RIMMING COUNTERTOP LAVATORY VITREOUS CHINA

### FEATURES

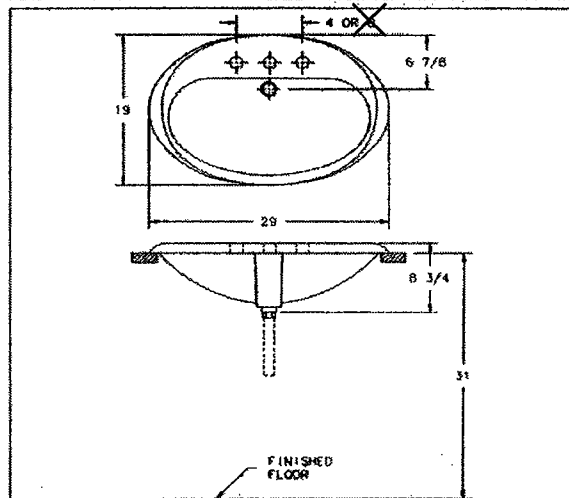
- **Lavatory:** Sonnet™ 1-345-V or S vitreous china self-rimming countertop lavatory with oval basin and front overflow. (Countertop is not included.)
- **Trim:** Specify C-1003-G (4") or C-1113-G (8") Dial-ese supply and indirect lift waste fitting with aerator and indexed acrylic handles or select 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 B-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.



### ROUGH-IN SPECIFICATIONS



Continuous product improvement is a Crane Plumbing policy. Therefore prices and specifications are subject to change without prior notice. Due to variations in the printing process, product colors may vary slightly from those shown here.

\* Not furnished by Crane Plumbing. Description for specification purposes only.

CRP/PLD 01/99 Printed in U.S.A.



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Suite 110  
Glen Burnie, MD 21061

PROJECT TITLE

**RESTROOM DESIGN STANDARDS**

SHEET TITLE

**LAVATORIES-3**

SCALE **NONE**

DATE **MARCH 2005**

PROJECT NO.

**TASK 1314.20**

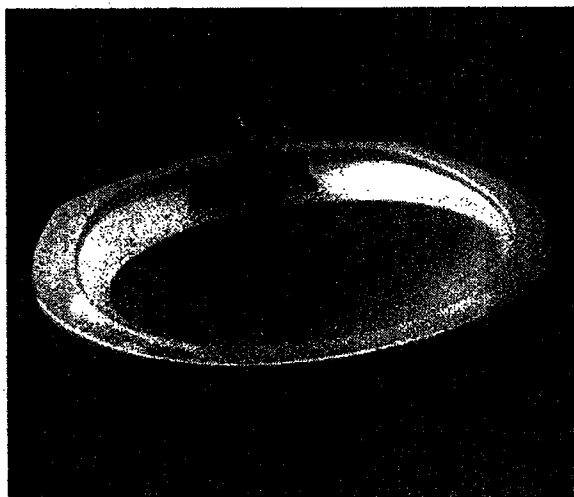
**B-48**

**American Standard**

**ELLISSE™  
COUNTERTOP LAVATORY**  
VITREOUS CHINA

**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

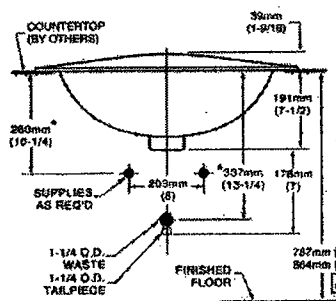
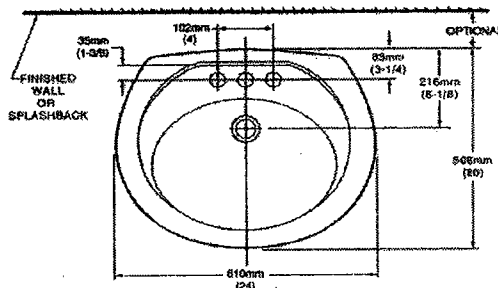
☐ **0076.027 (Illustrated)**  
Faucet holes on 102mm (4") centers

☐ **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



**To Be Specified**

- ☐ Color:
- ☐ Faucet\*:
- ☐ Faucet Finish:
- ☐ Supplies:
- ☐ 1-1/4" Trap:
- ☐ Nipple:

\* See faucet section for additional models available



**MEETS THE AMERICAN DISABILITIES ACT GUIDELINES  
AND ANSI A117.1 REQUIREMENTS FOR PEOPLE WITH  
DISABILITIES**

Countertop 864mm (34") from finished floor.  
Lavatory installed 51mm (2") minimum from front edge.

**NOTES:**  
\* DIMENSIONS SHOWN FOR LOCATION OF SUPPLIES AND "P" TRAP ARE SUGGESTED.  
† FOR COUNTERTOP CUTOUT AND INSTALLATION INSTRUCTIONS USE TEMPLATE SUPPLIED WITH LAVATORY.  
FITTINGS NOT INCLUDED AND MUST BE ORDERED SEPARATELY.  
IMPORTANT: Dimensions of fixtures are nominal and may vary within the range of tolerances established by ANSI Standard A112.19.2.  
These measurements are subject to change or cancellation. No responsibility is assumed for use of superseded or voided pages.

**SPS 0076**

LAV-017

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Revised 6/95

**Baker**

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Suite 110  
Glen Burnie, MD 21061

PROJECT TITLE

**RESTROOM DESIGN STANDARDS**

SHEET TITLE

**LAVATORIES-4**

SCALE **NONE**

DATE **MARCH 2005**

PROJECT NO.

**TASK 1314.20**

**B-49**

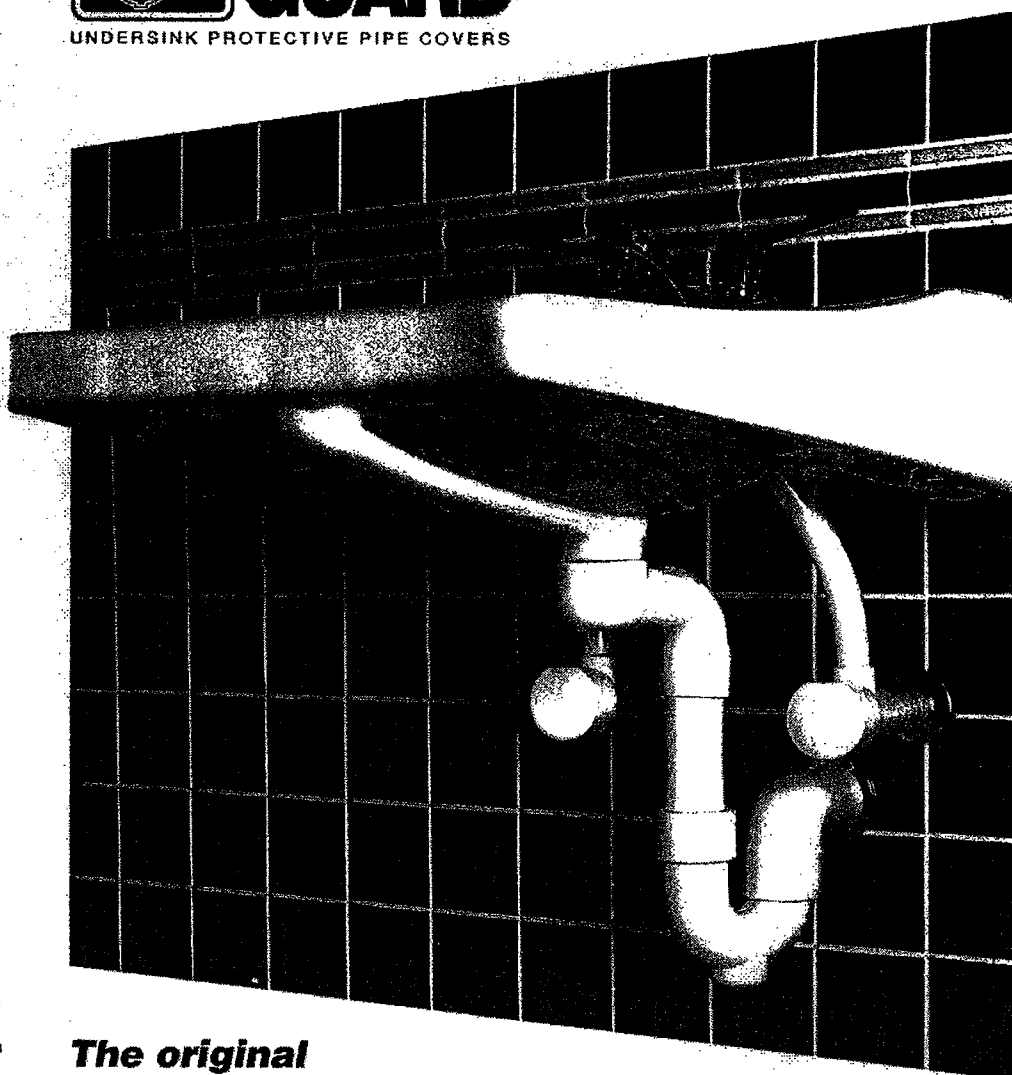




# LAV GUARD™

UNDERSINK PROTECTIVE PIPE COVERS

10800/TF  
Buy Line 9



CLASSIFIED  
**UL**  
LAV GUARD  
CLASSIFIED BY  
UNDERWRITERS  
LABORATORIES INC.®  
IN ACCORDANCE  
WITH ADA article 4.19.4  
22FF

  
Made in the USA

**The original  
ADA-engineered, designer-style  
protective undersink drain piping  
and angle valve supply covers.**

## **B TRUEBRO**

MAKING AMERICA ACCESSIBLE

**Baker**

MICHAEL BAKER JR. INC.  
801 Cromwell Park Drive  
Suite 110  
Glen Burnie, MD 21061

PROJECT TITLE

**RESTROOM DESIGN STANDARDS**

SHEET TITLE

**LAVATORY GUARD-1**

SCALE

**NONE**

DATE

**MARCH 2005**

PROJECT NO.

**TASK 1314.20**

**B-50**



### 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/tailpiece 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

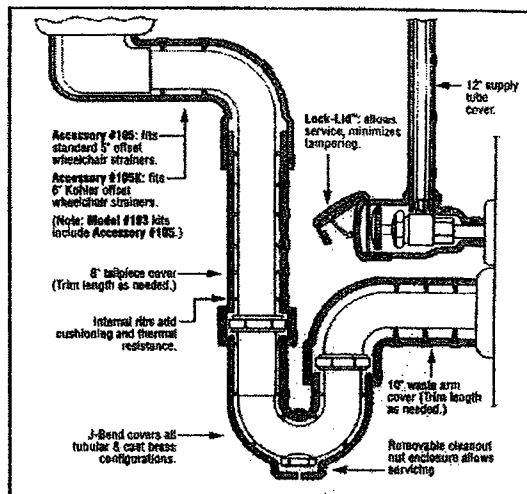
- **ADA-conforming design** protects wheelchair users from scalding and sharp, abrasive surfaces. LAV GUARD protective covers have excellent insulation properties while maintaining a smooth, non-abrasive surface.
- **Retatable, flexible design** makes on-site adjustment and installation easy. The LAV 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 fasteners simplify installation and servicing. New flush, non-abrasive fasteners install in seconds, are self-trimming leaving no sharp edges, and are tamper-resistant.
- **Internal rib design** maximizes safety. 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 chart).
- **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
Durometer	60-70 Shore A
UV Protection	Will not fade or discolor
Fasteners	Reusable snap clips included
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
Flame Characteristics ASTM D 635	(ATB), 0 sec. (AEB), 0 mm
Bacteria Resistance	Antimicrobial vinyl formula

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

### Cross-Section View



### Gray and White Models Available

# 89	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 tailpiece wheelchair strainer cover
#103K	same as #103 with one 6" Kohler offset tailpiece wheelchair strainer cover
<b>Accessories</b>	
#105	one 5" offset tailpiece wheelchair strainer assembly
#105K	one 6" Kohler offset tailpiece wheelchair strainer assembly
<b>Extensions</b>	
#EX99	one 16" extension for supply
#EX100	one 16" extension for waste arm or tailpiece

### 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 \_\_\_\_\_ (white 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 fine TRUEBRO products, contact:

# TRUEBRO

MAKING AMERICA ACCESSIBLE

TRUEBRO, INC.  
7 Main Street • P.O. Box 440 • Ellington, CT 06029  
Outside CT: 800/340-5969 • Inside CT: 860/875-2868  
Fax: 860-872-0300 Internet: <http://www.truebro.com>

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11 R. Patente #5,054,819; 5,147,440; 5,258,814; 5,307,790; 5,450,091; 5,450,901; 5,450,902; 5,450,903; 5,450,904; 5,450,905; 5,450,906; 5,450,907; 5,450,908; 5,450,909; 5,450,910; 5,450,911; 5,450,912; 5,450,913; 5,450,914; 5,450,915; 5,450,916; 5,450,917; 5,450,918; 5,450,919; 5,450,920; 5,450,921; 5,450,922; 5,450,923; 5,450,924; 5,450,925; 5,450,926; 5,450,927; 5,450,928; 5,450,929; 5,450,930; 5,450,931; 5,450,932; 5,450,933; 5,450,934; 5,450,935; 5,450,936; 5,450,937; 5,450,938; 5,450,939; 5,450,940; 5,450,941; 5,450,942; 5,450,943; 5,450,944; 5,450,945; 5,450,946; 5,450,947; 5,450,948; 5,450,949; 5,450,950; 5,450,951; 5,450,952; 5,450,953; 5,450,954; 5,450,955; 5,450,956; 5,450,957; 5,450,958; 5,450,959; 5,450,960; 5,450,961; 5,450,962; 5,450,963; 5,450,964; 5,450,965; 5,450,966; 5,450,967; 5,450,968; 5,450,969; 5,450,970; 5,450,971; 5,450,972; 5,450,973; 5,450,974; 5,450,975; 5,450,976; 5,450,977; 5,450,978; 5,450,979; 5,450,980; 5,450,981; 5,450,982; 5,450,983; 5,450,984; 5,450,985; 5,450,986; 5,450,987; 5,450,988; 5,450,989; 5,450,990; 5,450,991; 5,450,992; 5,450,993; 5,450,994; 5,450,995; 5,450,996; 5,450,997; 5,450,998; 5,450,999; 5,451,000

**Baker**

MICHAEL BAKER JR. INC.  
801 Cromwell Park Drive  
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Glen Burnie, MD 21061

PROJECT TITLE

**RESTROOM DESIGN STANDARDS**

SHEET TITLE

**LAVATORY GUARD-2**

SCALE

**NONE**

DATE

**MARCH 2005**

PROJECT NO.

**TASK 1314.20**

**B-51**

*American Standard*

**TRIMBROOK™ 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

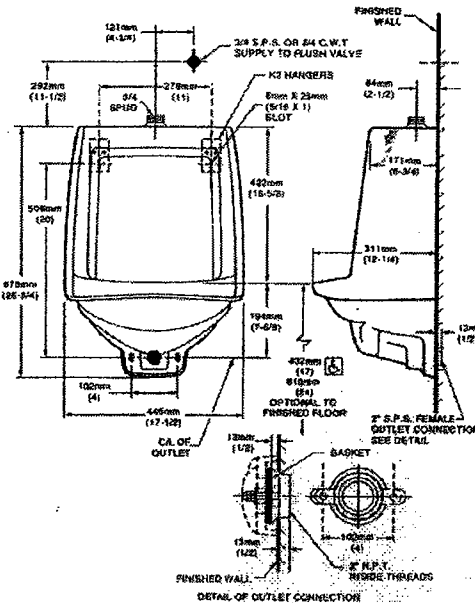
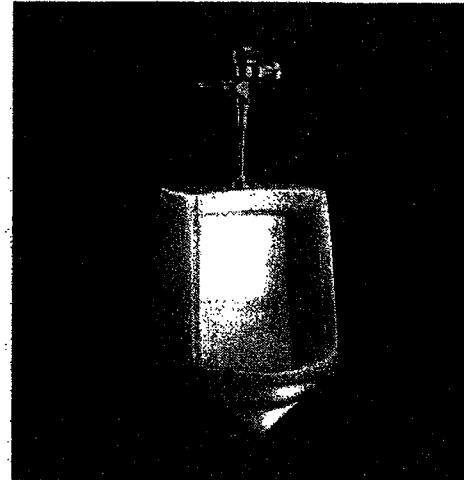
☐ **6561.017 Top spud**


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: ☐ White ☐ Bone ☐ Silver  
☐ Shell ☐ Black
- ☐ Flush Valve: Sloan Royal 186-1
- ☐ 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 SEPARATELY.  
PROVIDE SUITABLE REINFORCEMENT FOR ALL WALL SUPPORTS.  
IMPORTANT: Dimensions of fixtures are nominal and may vary within the range of tolerances established by ANSI Standard A112.19.2.  
These measurements are subject to change or cancellation. No responsibility is assumed for use of superseded or voided pages.

SPS 6561

TBU-065

Revised 6/95

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PROJECT TITLE

**RESTROOM DESIGN STANDARDS**

SHEET TITLE

**URINALS**

SCALE **NONE**

DATE **MARCH 2005**

PROJECT NO.

**TASK 1314.20**

**B-52**

**TOTO®**  
Perfection by Design

# CT 708

## Wall Hung Flushometer Toilet, 1.6 GPF



CT 708 - Wall Hung Flushometer Toilet  
SC534 - Commercial Toilet Seat  
TMT1HMC - 32 - Manual Toilet Flushometer Valve

- ✱ Powerful siphon jet 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**  
1-1/2" back spud inlet, less seat.

☐ **SS114**  
SoftClose: Seat and lid gently close with a touch of a hand. Elongated, closed front seat with lid.

☐ **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.

Colors:  
Standard #01 Cotton  
Optional See price book for additional colors

Recommended flushometer valve:  
TOTO Manual and Electronic Flush Valves are highly recommended for maximum performance.



Reliance Commercial Line

**Baker**

MICHAEL BAKER JR. INC.  
801 Cromwell Park Drive  
Suite 110  
Glen Burnie, MD 21061

PROJECT TITLE

**RESTROOM DESIGN STANDARDS**

SHEET TITLE

**WATER CLOSET-1**

SCALE **NONE**

DATE **MARCH 2005**

PROJECT NO.

**TASK 1314.20**

**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 laboratories. 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"  
Trap dia: 2-1/8"  
Trap seal: 2-5/8"  
Warranty: One Year Limited 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).

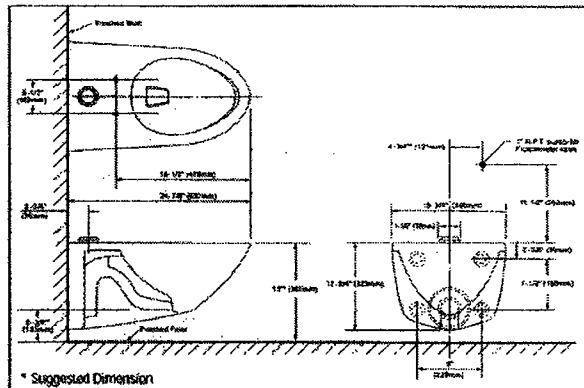
Fixture dimensions and hydraulic performance  
meet or exceed ANSI/ASME standard  
A112.19.2M and CAN/CSA B 45 requirements.

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

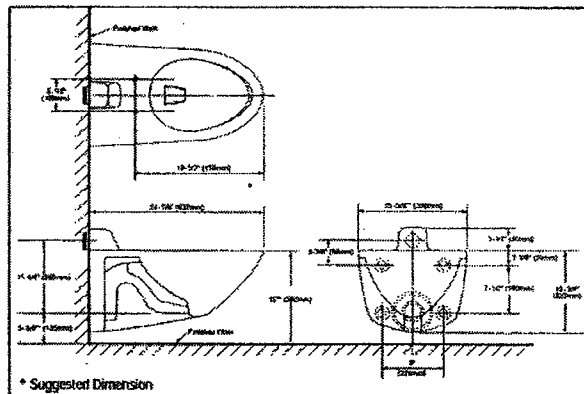


Meets the American Disabilities Act  
Guidelines and ANSI A117.1  
requirements where installed so top of  
rim is 17" from the finished floor.

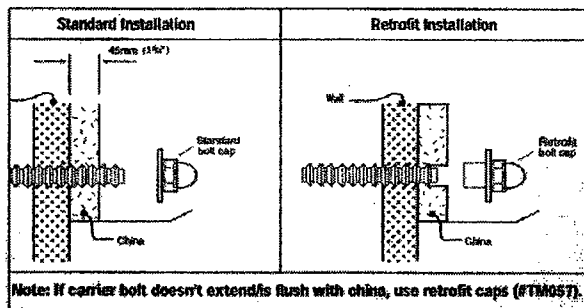
These dimensions and specifications  
are subject to change without notice.



CT 708 Top Spud



CT 708V Back Spud



**TOTO®**  
Perfection by Design

TOTO U.S.A., INC. • 1155 Southern Road, Morrow, GA 30260  
Tel. (770) 282-8686 • Fax. (770) 282-8701 • www.totousa.com  
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PROJECT TITLE

**RESTROOM DESIGN STANDARDS**

SHEET TITLE

**WATER CLOSET-2**

SCALE NONE

DATE MARCH 2005

PROJECT NO.

**TASK 1314.20**

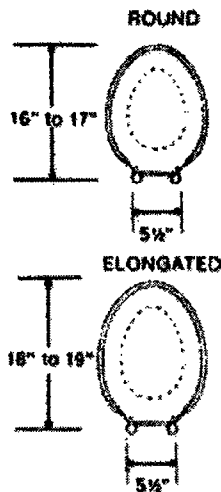
**B-54**

**MOLTEX®**  
**HEAVY DUTY**  
**SOLID PLASTIC**  
**HIGH IMPACT**

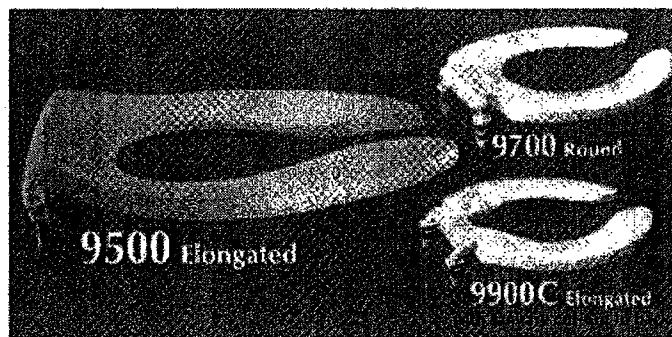


**9500C**  
 (5320.114)

Extra heavy duty  
 Moltex  
 comfort seat, solid  
 Duraloy plastic  
 elongated, open front  
 toilet seat, built-in  
 bumpers, rugged  
 unbreakable external  
 check with stainless  
 steel posts.



\_\_\_ White  
 \_\_\_ Black



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gt-wc-14

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PROJECT TITLE

**RESTROOM DESIGN STANDARDS**

SHEET TITLE

**WATER CLOSET-3**

SCALE NONE

DATE MARCH 2005

PROJECT NO.

**TASK 1314.20**

**B-55**

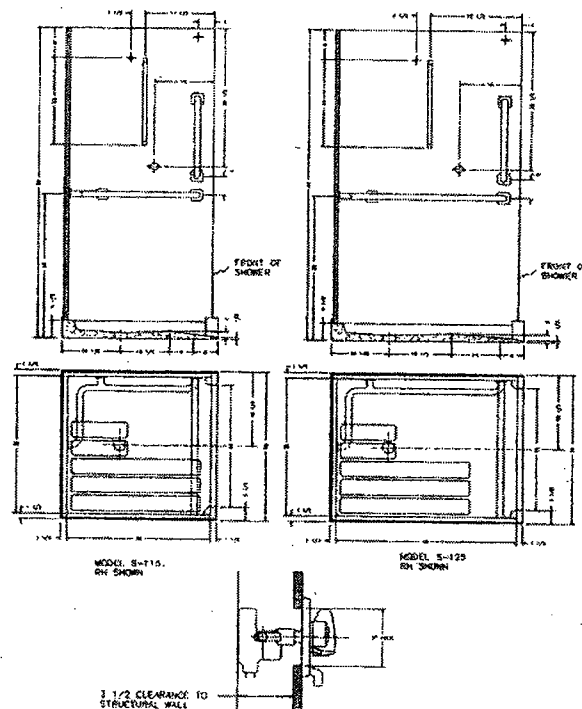
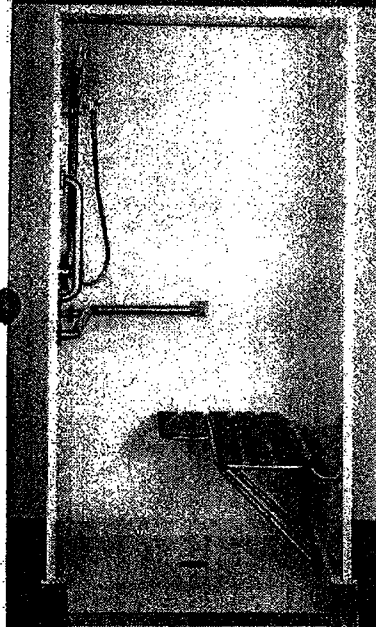
Designed for demanding institutional applications. Available in six models, all made with easy to clean Wonder-Wall sandwich panels. Models S-115 and S-125 made for the physically challenged.

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 compliant. 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 1/2" 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 steel curtain rod is hung on brass chromium-plated brackets. A 10 oz. GSA approved curtain, pins and brass chromium-plated soap dish 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.

### S-115/S-125 FOR THE PHYSICALLY CHALLENGED



NOTE: RIGHT HAND SHOWN; FOR LEFT HAND REVERSE DIMENSIONS SHOWN.

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PROJECT TITLE

**RESTROOM DESIGN STANDARDS**

SHEET TITLE

**SHOWERS-1**

SCALE **NONE**

DATE **MARCH 2005**

PROJECT NO.

**TASK 1314.20**

**B-56**

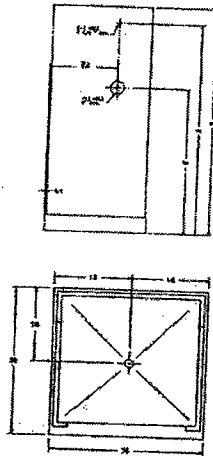
# COMMANDER® SHOWER CABINETS

Commander shower cabinets are made for demanding institutional use. Special Wonder-Wall panels and top frame are made of galvanized-bonded 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.

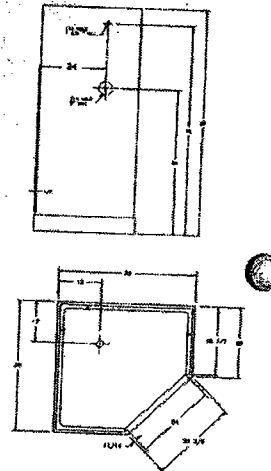
On Commander models with back and side walls, panels are joined with anodized aluminum extruded molding.

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.

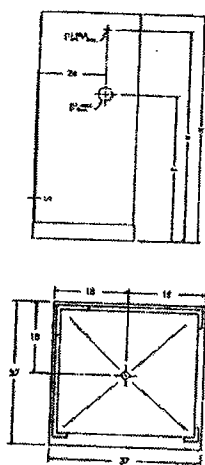
S-86 SINGLE ACCESS FRONT OPENING



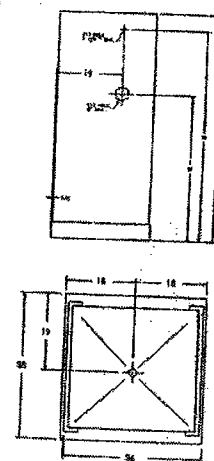
S-101 SINGLE ACCESS, FRONT OPENING NEO-CORNER



S-92 DOUBLE ACCESS CORNER OPENING



S-91 DOUBLE ACCESS WALK-THROUGH



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PROJECT TITLE

**RESTROOM DESIGN STANDARDS**

SHEET TITLE

**SHOWERS-2**

SCALE **NONE**

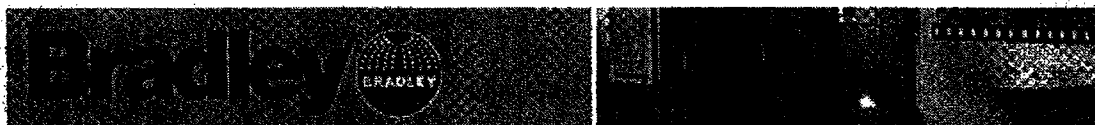
DATE **MARCH 2005**

PROJECT NO.

**TASK 1314.20**

**B-57**



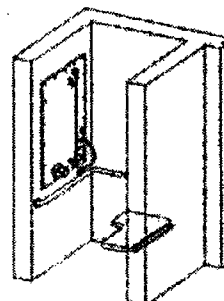

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## PRODUCT INFORMATION

### Plumbing Fixtures: Showers

#### HN200 Barrier-Free Shower - Title 24 Compliant Model HN200

- No Frame Required for Installation
- Ideal for Barrier-Free Shower Rooms
- Flexible Supply Hoses Make Rough-In Easier
- Completely Preassembled, Recess-Mounted Wall Unit
- Hydrostatically Tested to 150 PSI



Tech Data	CAD Files	Installation Instructions	Valve Selections	Send m liter
<a href="#">Tech Data Sheet PDF (100k)</a>  <a href="#">Introduction to Bradley Showers (247k)</a>  <a href="#">Shower Accessories</a>		<a href="#">HN200 Barrier-Free Shower - Title 24 Compliant (with hand-held hose spray) (236k)</a>  <a href="#">Shower Operation &amp; Service Guide (767k)</a>	<a href="#">Hot &amp; Cold Equa-Flo Pressure Balancing Mixing Valve</a>  <a href="#">Tempered</a>	<a href="#">Plumbing F Sweets</a>



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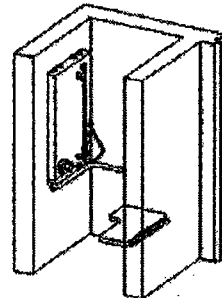
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## PRODUCT INFORMATION


### Plumbing Fixtures: Showers

#### HN250 Barrier-Free Shower - Title 24 Compliant Model HN250

- Ideal for Barrier-Free Shower Rooms
- Flexible Supply Hoses Make Rough-In Easier
- Completely Preassembled, Surface-Mounted Wall Unit
- Hydrostatically Tested to 150 PSI



Tech Data	CAD Files	Installation Instructions	Valve Selections	Send m liter
<p>Tech Data Sheet PDF (100k)</p> <p>Introduction to Bradley Showers (247k)</p> <p>Shower Accessories</p>		<p>HN250 Barrier-Free Shower - Title 24 Compliant (with hand-held hose spray) (245k)</p> <p>Shower Operation &amp; Service Guide (767k)</p>	<p>Hot &amp; Cold Equa-Flow Pressure Balancing Mixing Valve</p> <p>Tempered</p>	<p>Plumbing Fi Sweets</p>

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**SHOWERS-4**

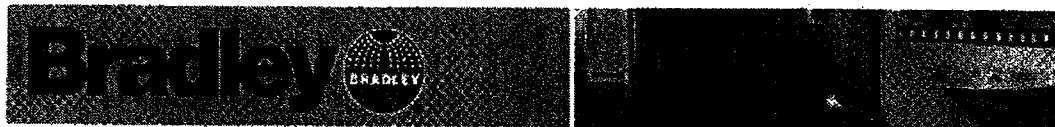
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PROJECT NO.

**TASK 1314.20**

**B-59**

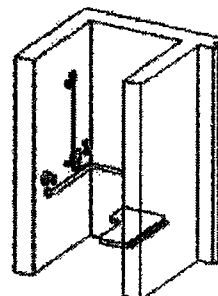

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## PRODUCT INFORMATION

### Plumbing Fixtures: Showers

#### HN300 Barrier-Free Shower - Title 24 Compliant Model HN300

- Ideal for Barrier-Free Shower Rooms
- Hydrostatically Tested to 150 PSI



Tech Data	CAD Files	Installation Instructions	Valve Selections	Send me literature
<a href="#">Tech Data Sheet PDF (100k)</a>  <a href="#">Introduction to Bradley Showers (247k)</a>  <a href="#">Shower Accessories</a>		<a href="#">Shower Operation &amp; Service Guide (767k)</a>	<a href="#">Hot &amp; Cold Equa-Flo Pressure Balancing Mixing Valve</a>  <a href="#">Tempered</a>	<a href="#">Plumbing Fixtures Sweets</a>



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**SHOWERS-5**

SCALE **NONE**

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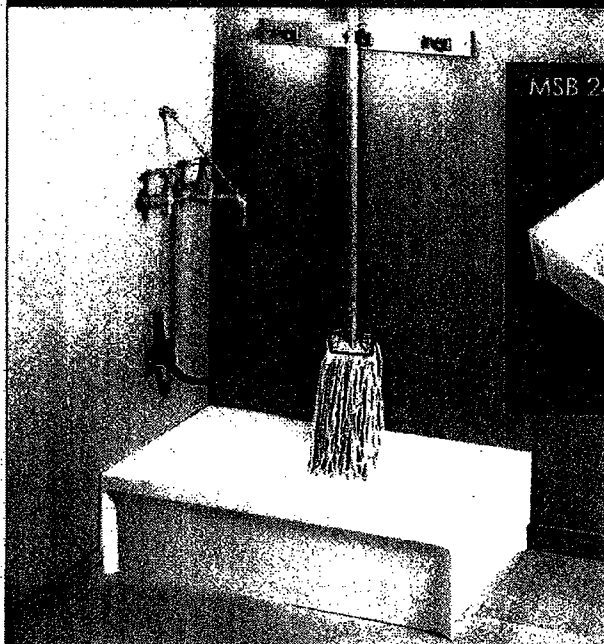
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**TASK 1314.20**

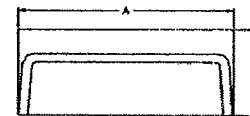
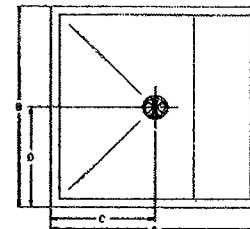
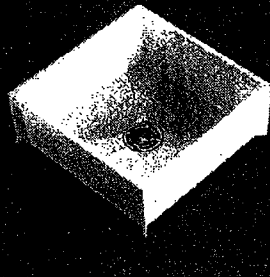
**B-60**

# MOP SERVICE BASINS

MSB 3624



MSB 2424



ROUGHING IN DETAILS

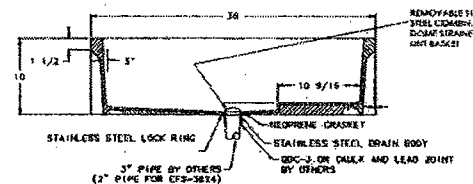
MODEL NO.	A	B	C	D	E
MSB-2424	24"	24"	12"	12"	10"
MSB-3624	36"	24"	18"	12"	10"

## SPECIFICATIONS

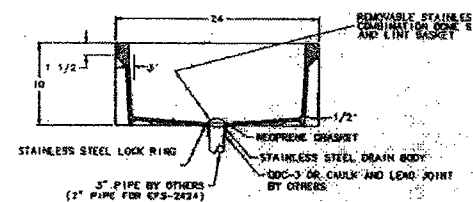
### MODELS: MSB-3624; MSB-2424

The MOP SERVICE BASIN shall be a Molded-Stone® product as manufactured by Flat Products. The molding shall be done in matched metal dies under heat and pressure, resulting in a one-piece homogeneous product. Color: White.

Both models shall have 10" high walls with not less than 1" wide shoulders. MSB-3624 only shall have an integrally molded shelf 10<sup>9</sup>/<sub>16</sub>" where indicated. The factory installed drain body shall be stainless steel and designed to allow for a lead caulk or optional QDC-3 gasket for 3" pipe. A combination dome strainer and lint basket made from stainless steel shall be included. Optional QDC 3-2 available for 2" pipe. Also available with factory installed stainless steel drain body for lead caulked joint to accept a 2" pipe with optional flat strainer (Model No. 1453-BB) for residential use (Model Nos. EFS-3624 and EFS-2424).



MSB 3624 (WITH SHELF)



MSB 2424 (LESS SHELF)

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RESTROOM DESIGN STANDARDS

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JANITORS CLOSET 1

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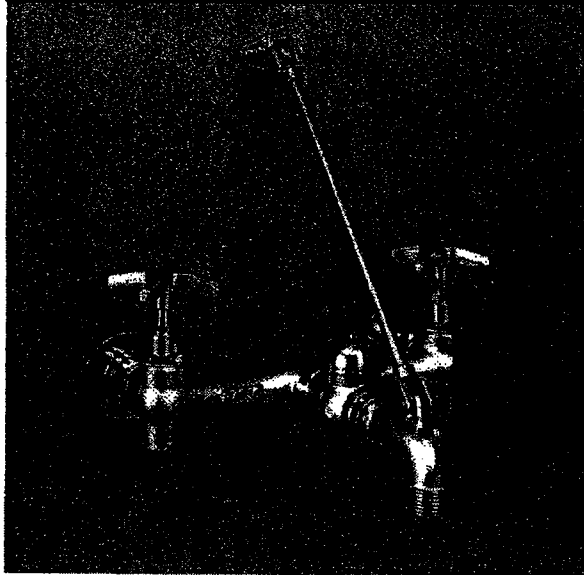
PROJECT NO.

TASK 1314.20

B-61

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.

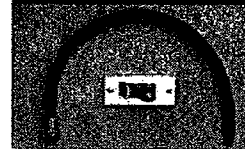
## 830-AA SERVICE FAUCET



Wall mounted fitting. Chrome plated with vacuum breaker, integral stops, adjustable wall brace, pail hook and 3/4" hose thread on spout. Body inlets 8" center to center, four arm handles. Center of spout outlet from back of wall flange 8". The 830-AA faucet meets or exceeds all of the requirements of ANSI A-112.18.1-1975, "Finished and Rough 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 4811 01.

## ACCESSORIES

### HOSE & HOSE BRACKET



Model 832-AA 30" long flexible 1/2" duty 5/8" rubber hose, cloth reinf. with 3/4" chrome coupling of one Bracket is 5" long x 3" wide, stainless with rubber grip.

## ACCESSORIES

### MOP BRACKET



Model 887-CC 24" long x 3" wide, stainless steel with three (3) rubber foot grips.

### STAINLESS STEEL BUMPERGUARDS

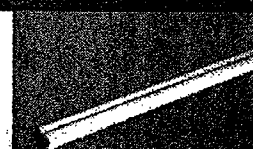


Model E-68-AA For Molded-Stone Mop Basins.

### VINYL BUMPERGUARDS



Model 1239-BB For Terrazzo Mop Basins.



Model E-77-AA For Molded-Stone Mop Basins.

### ALTERNATE STRAINER



Model 1453-BB Flat type stainless.

### SILICONE SEALANT



Model No. 833-AA

### WALL GUARD



For use with either Molded-Stone or precast Terrazzo Mop Basins, made of heavy gauge stainless steel and is used to protect walls adjacent to the receptor. Two panels are supplied for corner installations, a third panel is required for a recessed installation. The wall guard models are identified as follows:

MSG 3424; MSG 3232;  
MSG 3624; MSG 3436

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**JANITORS CLOSET-2**

SCALE **NONE**

DATE **MARCH 2005**

PROJECT NO.

**TASK 1314.20**

**B-62**

### 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: 1 5/8" (35mm),  
1 3/4" (44mm), 2 1/4" (57mm)

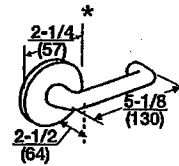
#### LWB

Lever: Wrought  
Rose: Cast  
Door thickness: 1 5/8" (35mm),  
1 3/4" (44mm), 2 1/4" (57mm)



#### LSA

Lever: Cast  
Rose: Wrought  
Door thickness: 1 5/8" (35mm),  
1 3/4" (44mm), 2 1/4" (57mm)



#### LSB

Lever: Cast  
Rose: Cast  
Door thickness: 1 5/8" (35mm),  
1 3/4" (44mm), 2 1/4" (57mm)

\* Dimensions:  
Inches  
millimeters

ML2000.8

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PROJECT TITLE

**RESTROOM DESIGN STANDARDS**

SHEET TITLE

**MORTISE LOCKSET DOOR LEVER**

SCALE NONE

DATE MARCH 2005

PROJECT NO.

**TASK 1314.20**

**B-63**

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# **APPENDIX H**

## **AIRPORT WIDE STANDARD FOR INTERFACE OF FIRE ALARM, LIFE SAFETY, AND SECURITY SYSTEMS AT BWI AIRPORT**

Appendix H – The Airport Wide Standard for Interface of Fire Alarm, Life Safety, and Security Systems at Baltimore/Washington International Thurgood Marshall Airport is currently being revised. Please refer to the MAA Project Manager, the Fire Marshal, and the Building Permit Coordinator for any specific design requirements.



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# APPENDIX I

## TEMPORARY SUPPORT OF EXCAVATION

## **TEMPORARY SUPPORT OF EXCAVATION**

### **1.0 GENERAL**

In general, excavations shall be supported. The support of excavation shall consider and protect all existing and new utilities, foundations, underground or above ground structures, underground tanks, etc. which are adjacent to or within the limits of excavation. However, if sufficient space is available, the Contractor can use open excavations with suitable side slopes. The open excavation shall be designed by a qualified geotechnical engineer in accordance with OSHA Regulations described in Federal Register, Volume 54, No. 209, October 31, 1989, Rules and Regulations. Open cuts, including partial sloping cuts above the proposed support, shall be reviewed on a case-by-case basis. Unless noted otherwise in this specification, the design and details of the temporary support of excavation shall meet the requirements of the following Codes, Standards or Manuals:

- (a) AASHTO - Standard Specifications for Highway Bridges, 1992.
- (b) Maryland Department of Transportation, State Highway Administration Standard Specifications for Construction and Materials, 1993.
- (c) USS Steel Sheet Piling Design Manual, Updated and Reprinted by FHWA, July 1984.
- (d) Federal Register, Volume 54, No. 209, October 31, 1989, Rules and Regulations.

## **2.0 TEMPORARY VERTICAL-WALLS AND COFFERDAMS**

### **2.1 Description**

The design of temporary structures required for the support of excavations shall be the sole responsibility of the contractor. Design calculations and drawings stamped and prepared by the Contractor's Registered Professional Engineer specializing in Geotechnical Engineering with a minimum of five years experience and registered in the State of Maryland are required.

The Contractor must submit 3 copies of the Support of Excavation shop drawings and calculations to the Engineer at least 7 days prior to the start of the construction for support of excavation. The shop drawings and calculations should be submitted, along with a cover letter, certifying that support of excavation design has been done in conformance with these Support of Excavation specifications. The support of excavation shop drawings and calculations will not be reviewed or approved by the Engineer. The submission of these documents are for the purpose of inspection by the Engineer.

The following list of items summarizes the minimum conditions which shall be considered in the design of temporary vertical-walls or cofferdams.

### **2.2 Earth Pressures and Surcharge Loadings**

The active earth pressure coefficient,  $K_a$ , and the passive earth pressure coefficient,  $K_p$ , shall be estimated assuming wedge theory based upon a planar surface of sliding as defined by Coulomb theory. The effective angle of internal friction and unit weight used to compute  $K_a$  and  $K_p$  shall be based upon available geotechnical

information at the site with appropriate consideration given to assigning effective  $\phi$  values for cohesive material where the sloping surcharge case must be considered. The value of the friction angle,  $\delta$ , between the soil and the retaining wall, used for computing the value of  $K_a$  and  $K_p$ , shall not exceed one-third of the value of the effective angle of internal friction,  $\phi$ , of the soil. The effect of the slope angles,  $\beta$  and  $\beta'$ , shall be considered when evaluating  $K_a$  and  $K_p$ .

### 2.3 Width of Discrete Wall Elements

Where discrete vertical wall elements (soldier beams) are used for support, the width of each vertical element shall be assumed equal to the width of the flange or diameter of the element for driven sections and the diameter of the concrete-filled hole for sections encased in concrete.

### 2.4 Simplified Earth Pressure Distribution from a Retained Granular Soil on a Temporary Flexible Cantilever Retaining Wall or a Temporary Flexible Retaining Wall Supported by One Tier of Bracing or Tie Backs; Reference - AASHTO, 92

A triangular earth pressure diagram shall be used, having a horizontal ordinate equal to  $K_{a1}\gamma'_1h$  at any depth  $h$  (see Figures 1 and 4).

Where:

$\gamma'_1$  = effective unit weight of retained soil

$h$  = any depth of excavation

$K_{a1}$  = coefficient of active earth pressure of retained soil

**2.5 Simplified Earth Pressure Distribution from a Retained Cohesive Soil on a Temporary Flexible Cantilever Retaining Wall or Temporary Flexible Retaining Wall Supported by One Tier of Bracing or Tiebacks; Reference - AASHTO, 92**

A triangular earth pressure diagram shall be used. At the top of the wall, the lateral ordinate of the triangle shall be zero, increasing linearly to a value equal to  $\gamma'_1 H - 2s_{u1}$  at the final excavation level, i.e. at the total depth, H, from the top of the wall (see Figures 2 and 3).

Where:

$s_{u1}$  = undrained shear strength of the retained cohesive soil.

H = total depth of excavation

Also, the addition of water pressure shall be considered on the supporting wall due to the possibility of water in tension cracks. Also, the following restrictions shall apply:

- 2.5.1** The active earth pressure shall not be less than 0.25 times the effective overburden pressure at any depth.
- 2.5.2** For sloping cuts above the proposed support system, use the effective shear strength parameters ( $c=0$ ,  $\phi$ ) and the simplified earth pressure distribution in accordance with Section 2.4 of this specification.

**2.6 Simplified Earth Pressure Distribution on a Portion of Continuous Vertical Wall Element of a Temporary Flexible Cantilevered Wall or the Portion of Temporary Flexible Wall Supported by One or More Tiers of Bracing or Tiebacks Embedded in Granular Soils; Reference - AASHTO, 92**

A triangular diagram for the resultant or net passive resistance shall be used, having a horizontal ordinate equal to  $(K_{p2} - K_{a2})\gamma'_2 \cdot d - K_{a2}\gamma'_1 H$  at any depth,  $d$ , below the final excavation (see Figures 1 and 2).

Where:

$\gamma'_2$  = effective unit weight of soil below the final excavation

$d$  = any depth of embedment below the final excavation

$K_{a2}$  = coefficient of active earth pressure of soil below final excavation

$K_{p2}$  = coefficient of passive earth pressure of soil below final excavation

**2.7 Simplified Earth Pressure Distribution on a Portion of Continuous Vertical Wall Element of Temporary Flexible Cantilevered Wall or the Portion of a Temporary Flexible Wall Supported by One or More Tiers of Bracing or Tiebacks Embedded in Cohesive Soils; Reference AASHTO, 92**

A rectangular diagram for the resultant or net passive resistance shall be used, having a horizontal ordinate equal to  $4s_{u2} - \gamma'_1 H$  (see Figures 3 and 4).

Where:

$s_{u2}$  = undrained shear strength of the cohesive soil below the final excavation.

**2.8 Simplified Earth Pressure Distribution from Granular or Cohesive Soils on the Embedded Portions of Discrete Vertical Wall Elements of Temporary Flexible Cantilevered Walls or of Temporary Flexible Walls Supported by One or More Tiers of Bracing or Tiebacks; Reference - AASHTO, 92**

The procedure for determining the resultant passive resistance of a discrete vertical element embedded in soil shall be based on the net passive resistance mobilized by three times the element width or diameter, not to exceed the soldier pile spacing. A depth of 1.5 times the width of the element shall be discounted in developing passive lateral resistance (see Figures 5 through 8).

**2.9 Construction Equipment and Traffic Loading Surcharge**

Surcharge pressures must be added to the earth pressures computed in accordance with Sections 2.4 through 2.8 of this specification. A minimum construction loading surcharge of 600 psf shall be applied to all design cases. A higher value shall be used if applicable. The effect of restricting construction loads from the face of the supporting wall also may be considered.

**2.10 Ground Water Pressures**

Ground water pressures must be added to the earth pressures computed in accordance with Sections 2.4 through 2.8 of this specification. Where soldier piles with timber lagging are used ground water is generally assumed to be below subgrade of the interior excavation. When the wall is intended to prevent all leakage of ground water (tight sheeting), maximum exterior ground water pressures should be used.

### **3.0 SIMPLIFIED DESIGN PROCEDURE FOR RETAINING WALLS**

#### **3.1 Cantilever Walls**

- (a) Determine earth pressure diagram and net passive resistance diagram in accordance with Sections 2.2 through 2.10 of this specification.
- (b) Sum moments about toe of the embedment to determine the embedment depth,  $D_o$ , for which the net passive resistance is sufficient to provide equilibrium.
- (c) Determine the depth at which the shear in the wall is zero.
- (d) Calculate the maximum bending moment at the point of zero shear.
- (e) Calculate the design depth ( $D_d$ ) of embedment,  $D_d = 1.2 D_o$  to  $1.4 D_o$ .

#### **3.2 Walls Supported by One Tier of Tiebacks**

- (a) Determine earth pressure diagram and net passive resistance diagram in accordance with Section 2.2 through 2.10 of this specification.
- (b) Sum moments about the location of brace or tieback to determine the embedment depth,  $D_o$ , for which the net passive resistance is sufficient to provide equilibrium.
- (c) Sum horizontal forces to determine the horizontal force in the brace or tieback.
- (d) Determine depth below the brace or tieback at which the shear in the wall is zero.



- (e) Calculate the maximum bending moment at the point of zero shear.
- (f) Calculate the design depth ( $D_d$ ) of embedment,  $D_d = 1.2 D_o$  to  $1.4 D_o$ .

**4.0 SIMPLIFIED EARTH PRESSURE DISTRIBUTIONS FROM VARIOUS SOILS ON TEMPORARY FLEXIBLE WALLS SUPPORTED BY TWO OR MORE TIERS OF TIEBACKS OR BRACES; REFERENCE - AASHTO, 92**

- 4.1 For granular soils, a rectangular earth pressure diagram shall be used, having a horizontal ordinate equal to  $0.65 K_a \gamma' h$  at any depth,  $h$ , below the top of the wall.
- 4.2 For soft to medium stiff clay, a trapezoidal earth pressure diagram shall be used with horizontal ordinate increasing from zero at the top of the wall, to  $K_a \gamma H$  at a depth equal to  $0.25H$ . The horizontal ordinate shall remain constant at  $K_a \gamma H$  from depths between  $0.25H$  and  $H$ .

Where:

$K_a = 1 - m(2q_u / \gamma H)$  but not less than 0.25

$m = 1$  for overconsolidated clays

$= 0.4$  for normally consolidated clays

$\gamma$  = total unit weight of clay

$q_u$  = unconfined compressive strength of clay

- 4.3 For stiff to hard clay, a trapezoidal earth pressure diagram shall be used with the horizontal ordinate increasing from zero at the top of wall to  $0.4\gamma H$  at a depth equal to  $0.25H$ . The horizontal ordinate shall remain constant at a rectangular earth pressure diagram  $0.4\gamma H$  for depths between  $0.25H$  and  $0.75H$ , and then decrease to zero at a depth equal to  $H$ .

- 4.4** Surcharge and water pressure shall be added to the earth pressures in accordance with Sections 2.9 and 2.10 of this specification.

**5.0 SHEETING, WALERS, BRACES, TIEBACKS AND STRUTS**

- 5.1** Struts, braces and walers should be sized for the above loads at normal allowable working stresses to which it will be subjected in the various construction stages using the appropriate pressure diagrams computed in accordance with Section 4 of this specification. The effect of combined axial and flexural loading, unsupported span lengths and lateral stability of the members must be considered.

For the design of braces, tiebacks, struts, walers and sheeting, the appropriate pressure diagrams computed in accordance with Section 4 of this specification shall be applied for final excavation conditions assuming struts, walers and sheeting to be hinged at brace points, except the uppermost brace point.

- 5.2** Sheeting, walers, braces, tiebacks and struts must be designed for each intermediate loading condition when portions of the structure or facilities are completed and the lower tiebacks, braces, or struts are removed. Consideration must be given to the possible increase in loading on the upper tiebacks, braces, or struts remaining in place, using some reasonable allowance for arching in the span between the completed structure and the lowest tieback, brace, or strut then in place.

## **6.0 TIMBER LAGGING**

Structural grade timber lagging shall be of the following thicknesses, unsurfaced:

Depth	Required Thickness of Timber Lagging for Clear Spans (S) of:	
	$5' < S < 8'$	$8' < S < 10'$
From ground surface to 25 feet	3"	4"
From 25 feet to 60 feet	4"	5"

The lagging shall be of a timber specie and grade that will provide an allowable working stress of not less than 1,100 psi. In the case of greater soldier pile spacing or the presence of unusually heavy construction surcharge on particularly soft cohesive soils, greater thicknesses of lagging may be required.

## **7.0 WORKING STRESS METHOD**

All members in the support structure should be sized using the Working Stress Method as discussed in the AISC Code. Design calculations must consider the effects of combined axial, torsional and flexural loads in the structure. Also, the stability of laterally unsupported members and unsupported span lengths shall be considered.

## **8.0 TIEBACKS OR BRACES**

In general, excavations deeper than 12 feet must be braced or supported by tiebacks. The vertical spacing of tiers of tiebacks or braces below the first tier should not

exceed 16 feet center to center during excavation. Where the excavation is near a structure and it is desired to minimize movement of the structure, in lieu of underpinning, the vertical spacing shall not exceed 12 feet, center to center, during excavation. The necessity to remove intermediate braces or tiebacks during construction should be compensated for by increased stiffness of soldier piles.

## **9.0 SOLDIER PILE AND LAGGING WALL**

Soldier piles shall be driven or installed in prebored holes. The installed soldier piles should be within a vertical tolerance of 3 inches per 25 feet of length.

Concrete spacers or other approved non-corrosive centering devices shall be used at sufficient intervals to insure concentric spacing for the entire length of pile installed in pre-bored holes.

After placing the soldier pile, the shaft shall be filled with concrete, having a 28-day strength of 3,500 psi from the bottom of the drilled shaft to the dredge line. A lean mix shall be placed in the remainder of the drilled shaft, where lagging is to be installed, completely encasing the pile. Concrete shall be allowed to cure for 72 hours before any excavation may take place.

As the excavation in front of the wall proceeds, timber lagging shall be wedged behind the flange of the soldier piles. The maximum height of unlagged face of excavation shall be established by the designer but shall, in general, not exceed two feet. The unlagged face shall not exceed 15 inches if water flows from face of excavation or if the soil face moves toward the excavation.

Packing shall be done to establish tight contact between the excavation face and the

lagging. Openings between lagging shall be packed with suitable material which will not decay and will allow free drainage of water without loss of soil or packing.

If unstable material is encountered during excavation, measures shall be taken to contain the unstable material in place and prevent ground displacement.

Sufficient quantity of material shall be maintained on hand for lagging, shoring, bracing and other operations for protection of work and for use in case of accident or emergency.

#### **10. WORKING OR SHOP DRAWINGS**

Details on working drawings shall show appropriate means of posting of struts and walers, lacing struts in both vertical and horizontal planes to provide lateral stability, web and connection stiffeners, brackets, and provisions for wedging and jacking of struts to prevent horizontal movement. Details are a vital element in the adequacy and safety of temporary earth retaining structures and shall be shown completely on the working drawings in conjunction with the methods and sequence of installation of all elements of the structure. Particular attention shall be given to procedures for wedging or jacking of all bracing members to maintain tight contact and to provide for uniformity of load distribution.

Complete details of tiebacks, if used, shall be shown in the shop drawings.

#### **11. CONTRACTORS SUBMISSION**

The Contractor's submission shall include computations for each stage of the installation of the support system, whether it is supported by cantilevering or bracing.

The design shall indicate that the system is stable both internally and externally. It shall also show that the embedment is sufficiently deep to prevent piping and potential ground loss at the bottom.

No overstress shall be allowed in the design of members in compression.

**12. CONTROL OF GROUND WATER**

The Contractor shall control ground water at the site. This shall include control of stormwater runoff from adjacent ground and structures, methods to control and prevent erosion, and methods to control loss of ground during excavation.

**13. ADJACENT STRUCTURES**

The design of all members must include the effects of loads of street traffic, construction equipment, supported utilities, adjacent structures which are not underpinned, and any other loads that must be carried by the support of excavation system during the construction period.

**14. METHOD OF MEASUREMENT AND BASIS OF PAYMENT**

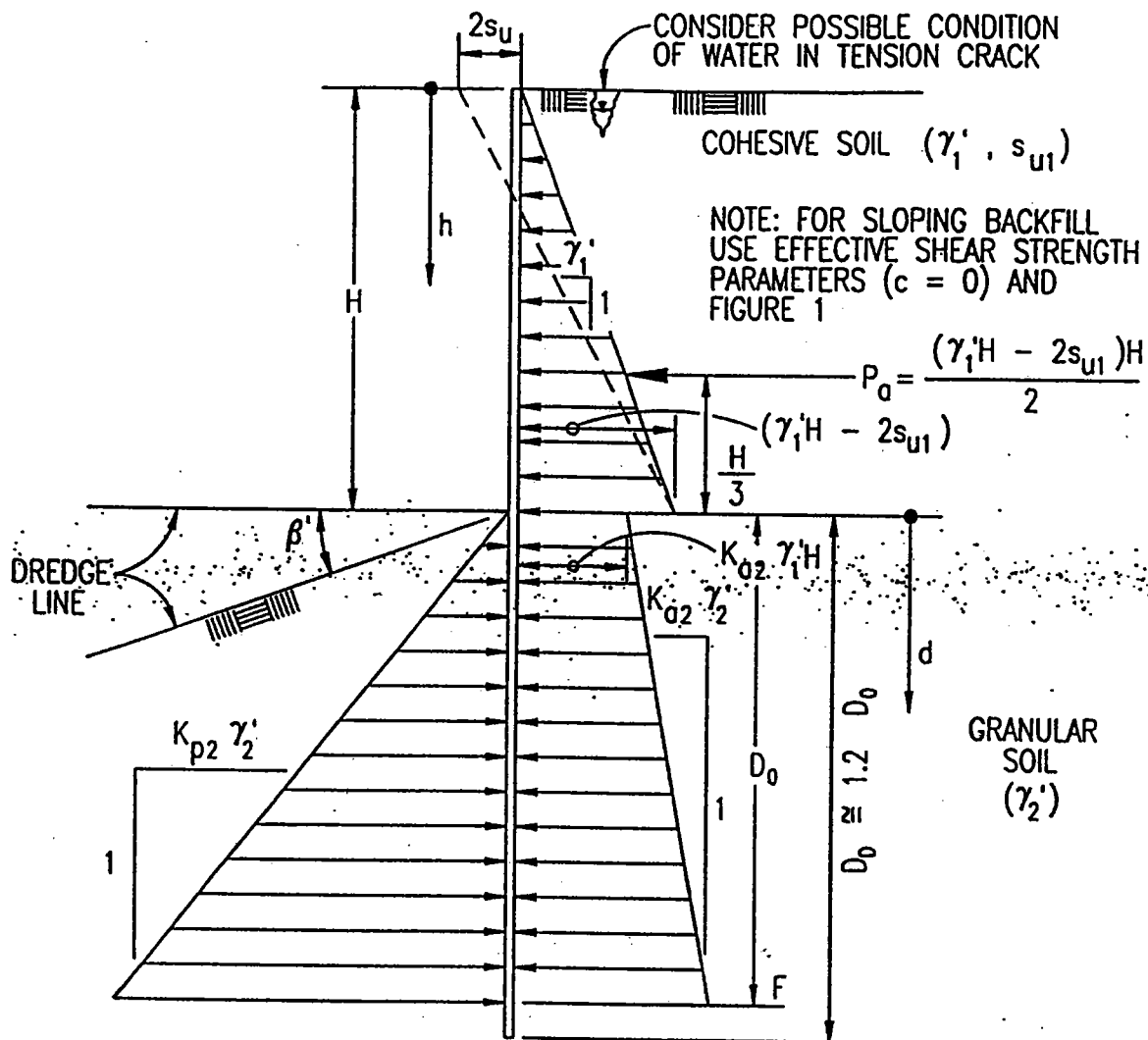
The work of designing, preparing shop drawings, furnishing, installing, maintaining, and removing the support of excavation system, where required, will not be measured for payment. Rather, the support of excavation system is considered to be incidental to the work required for excavation including the segregation of the excavated material into suitable and unsuitable materials, hauling, storing, rehandling, depositing, backfilling, compacting, disposal, etc. All costs associated with the designing, preparation of shop drawings, furnishing, installation, and removal of the

support of excavation system including pumping, bailing, draining, dewatering devices, and removal thereof, and all other labor, equipment, tools, and incidentals necessary to complete the item, shall be incidental to other items in the Bid.



SIMPLIFIED EARTH PRESSURE DISTRIBUTION FOR TEMPORARY FLEXIBLE CANTILEVER WALLS WITH CONTINUOUS VERTICAL WALL ELEMENTS - RETAINING GRANULAR SOIL WITH EMBEDMENT IN GRANULAR SOIL

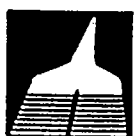


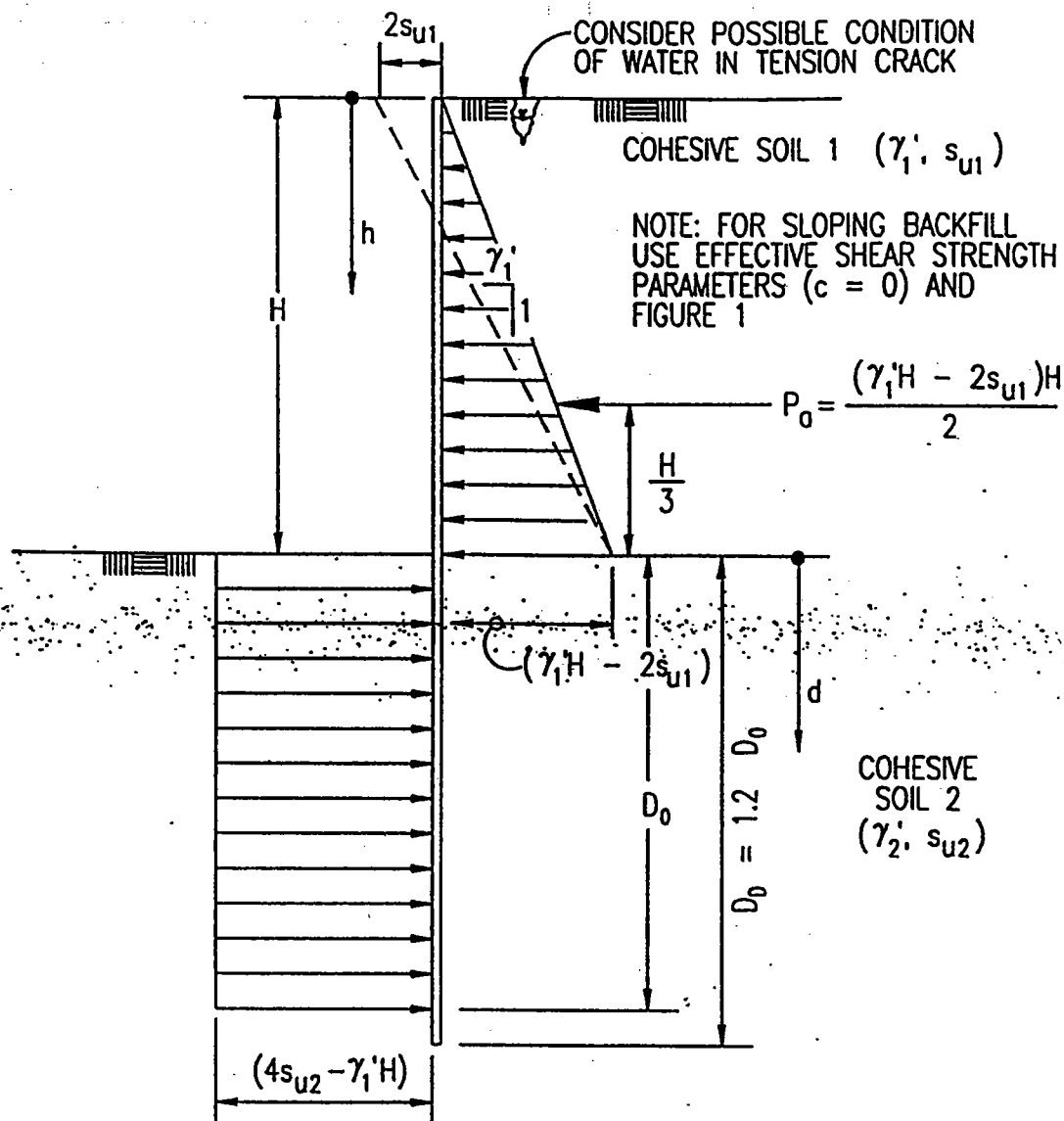


### PRESSURE DISTRIBUTION

- NOTES:**
- (1) SURCHARGE AND WATER PRESSURES MUST BE ADDED TO THE ABOVE EARTH PRESSURES.
  - (2) FORCES SHOWN ARE PER HORIZONTAL FOOT OF VERTICAL WALL ELEMENT.

SIMPLIFIED EARTH PRESSURE DISTRIBUTION FOR TEMPORARY FLEXIBLE CANTILEVER WALLS WITH CONTINUOUS VERTICAL WALL ELEMENTS - RETAINING COHESIVE SOIL WITH EMBEDMENT IN GRANULAR SOIL





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SIMPLIFIED EARTH PRESSURE DISTRIBUTION FOR TEMPORARY FLEXIBLE WALLS WITH CONTINUOUS VERTICAL WALL ELEMENTS – RETAINING COHESIVE SOIL WITH EMBEDMENT IN COHESIVE SOIL

**Freiner**  
ER, INC.  
CONSULTING ARCHITECTS/ENGINEERS  
BETHESDA, MARYLAND



**BWI**

MARYLAND DEPARTMENT OF TRANSPORTATION  
MARYLAND AVIATION ADMINISTRATION  
DIVISION OF ENGINEERING

BALTIMORE/WASHINGTON  
INTERNATIONAL AIRPORT

TITLE

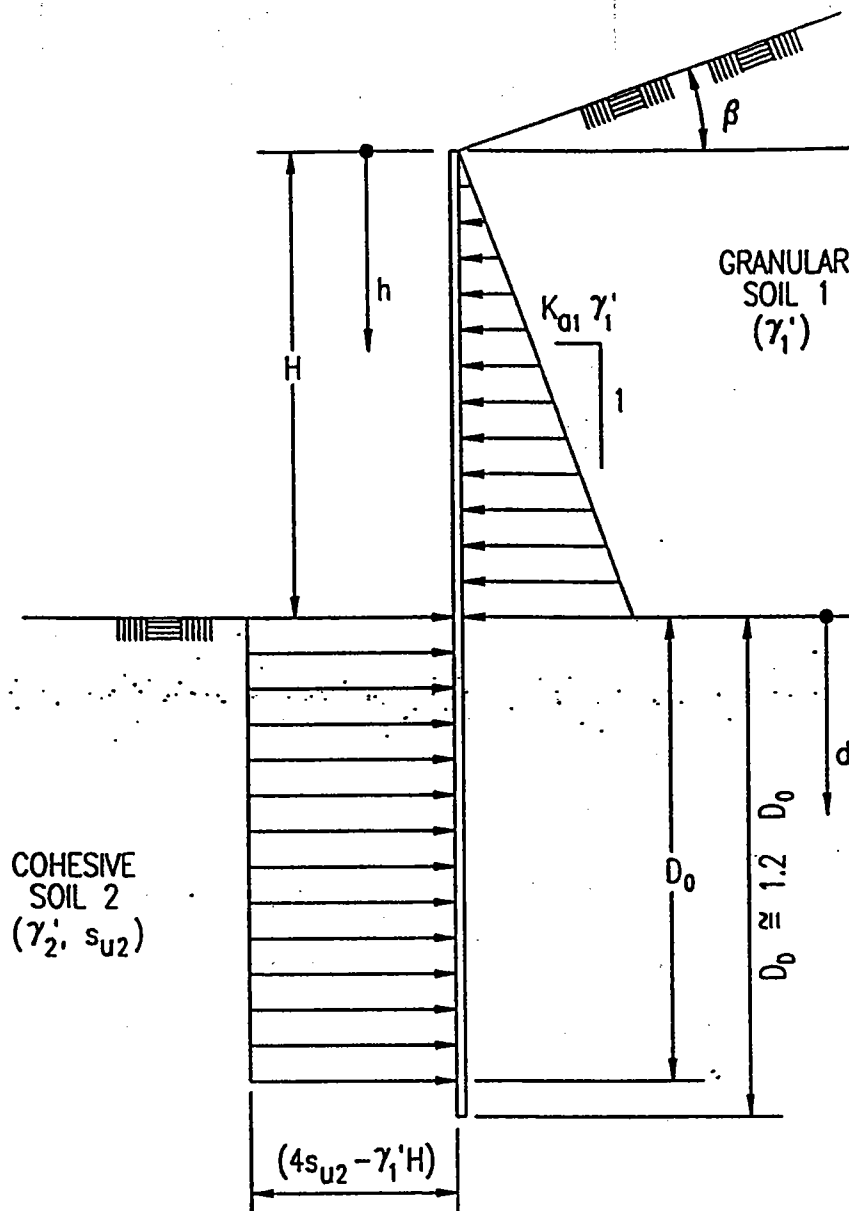
SIMPLIFIED EARTH PRESSURE  
DISTRIBUTION FOR TEMPORARY  
SUPPORT OF EXCAVATION

DATE

JULY, 1995  
(REV. FEB. 1996)

FIGURE NO.

3

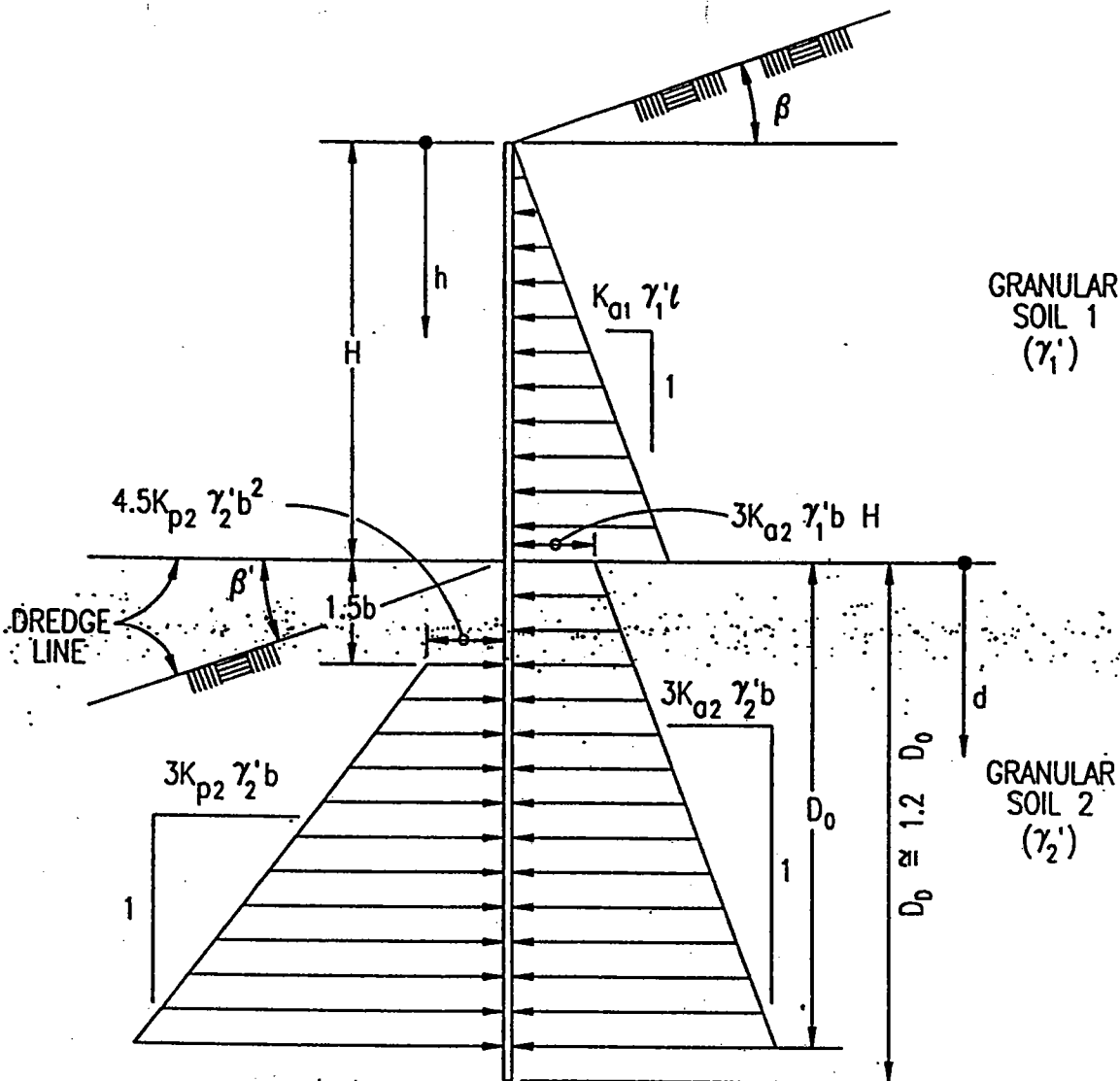


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**SIMPLIFIED EARTH PRESSURE DISTRIBUTION FOR TEMPORARY FLEXIBLE WALLS  
WITH CONTINUOUS VERTICAL WALL ELEMENTS – RETAINING GRANULAR  
SOIL WITH EMBEDMENT IN COHESIVE SOIL**





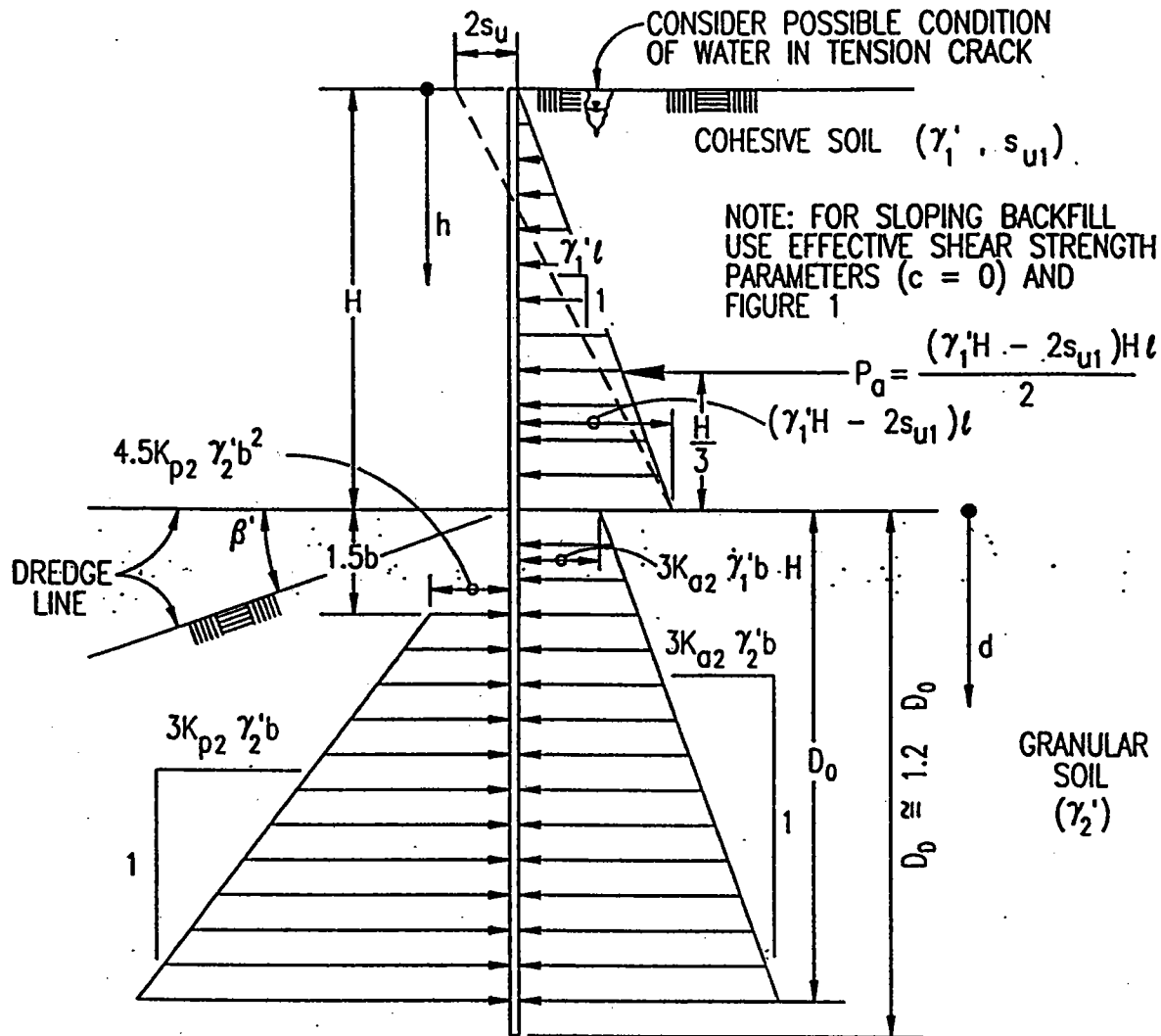
$l$  = CENTER TO CENTER SPACING OF DISCRETE VERTICAL WALL ELEMENTS  
 $b$  = WIDTH OF DISCRETE VERTICAL WALL ELEMENT

### PRESSURE DISTRIBUTION

**NOTE:** SURCHARGE AND WATER PRESSURES MUST BE ADDED TO THE ABOVE EARTH PRESSURES.

SIMPLIFIED EARTH PRESSURE DISTRIBUTION FOR TEMPORARY FLEXIBLE CANTILEVER WALLS WITH DISCRETE VERTICAL WALL ELEMENTS - RETAINING GRANULAR SOIL WITH EMBEDMENT IN GRANULAR SOIL





l = CENTER TO CENTER SPACING OF DISCRETE VERTICAL WALL ELEMENTS  
b = WIDTH OF DISCRETE VERTICAL WALL ELEMENT

### PRESSURE DISTRIBUTION

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SIMPLIFIED EARTH PRESSURE DISTRIBUTION FOR TEMPORARY FLEXIBLE CANTILEVER WALLS WITH DISCRETE VERTICAL WALL ELEMENTS – RETAINING GRANULAR SOIL WITH EMBEDMENT IN GRANULAR SOIL

