MARYLAND AVIATION ADMINISTRATION

2006 Design Standards

BALTIMORE/WASHINGTON INTERNATIONAL Thurgood Marshall AIRPORT

MARTIN STATE AIRPORT

DIVISION OF FACILITIES DESIGN

October 2006

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INTRODUCTION

The 2006 Design Standards incorporates the Maryland Aviation Administration (MAA) Interim Design Standards (DSTs) issued in August 2005 and any new design standards developed to date. It is required that all Designers and Architects/Engineers (A/E) performing work that will be constructed on airport property should perform services consistent with the MAA policies, standards, procedures, and construction requirements contained in the 2006 Design Standards and its appendices. Below highlights the design standards that have been added to the 2006 addition of the Design Standards:

- Airport Name Change (Chapter 1.2.1) – DST 2005-02
- Proposal Preparation/Scoping Meeting (Chapter 4.3) – NEW
- Design Report and Studies (Chapter 4.5) – NEW
- Electronic Non-CAD Document Deliverable Requirements (Chapter 4.10.6) – NEW
- Updated CAD Standards (replaced Appendix C with new standards) – Chapter 4.11/Appendix C) – Issued April 7, 2006
- General Construction and Safety Notes at BWI (Chapter 4.11.1.1) – NEW
- MDE Standard Sheets (Chapter 4.11.1.2/Appendix D) – NEW
- Construction Specification Institute (CSI) MasterFormat 2004 (Chapter 4.12.3) – Revised DST
- Construction Phase Services Directive (Chapter 6.1.20 – DST 2004-06
- Design Criteria for Submitting and Placement of Terminal Evacuation Plans at BWI (Chapter 7.1.2) - NEW
- Use of Lifts on Terminal Tiles at BWI (Chapter 7.12) – DST 2006-02
- Survey Control Manual for Martin State Airport (Chapter 8.1.1.2/Appendix K) – Issued November 11, 2005
- Site Preparation Means and Methods (Chapter 8.1.2) – NEW
- Airfield Pavement Markings (Chapter 8.2.2) - Revised DST 2006-01
- PC Air and 400 Hz Systems and Associated Loading Bridge Requirements (Chapter 9.1.1) – DST 2001-11
- Grounding Protection (Loading Bridges) (Chapter 9.1.2) – NEW
- High Efficiency Green Building Program (Chapter 11.2.1) – NEW
- Asbestos/Removal of Mastic for floor tile – (Chapter 11.6.2) - NEW
- Waterproofing (Chapter 11.6.8) NEW
- HVAC Pipe Flushing (Chapter 13.2) - NEW
- Gas Line on roof of Terminal Building (Chapter 14.1) - NEW
- Dry-Pipe Sprinklers (Chapter 14.1.1) - NEW
- Construction Phasing for Fire Hydrants and Water Mains (Chapter 15.2.4) – NEW
- Security Drawings (Chapter 16.1) - NEW
- Smoke Detectors (Chapter 16.2.1) – NEW
- Ground Rods (Chapter 17.2.1) – DST 2006-03
- Surge Suppression, Bonding, and Grounding for Outdoor Systems (Chapter 17.2.2) – NEW
- Automatic Transfer (Chapter 17.3.1) Revised
- Revisions to the Electrical Cable (Chapter 17.4.2.1) – DST 2000-02
- Updates to the Landscaping specifications (Appendix E)– Revised DST

The intent of the MAA Design Standards is to supplement and complement established codes, regulations, and industry accepted practices and provide guidance and additional information regarding requirements unique to MAA, Baltimore/Washington International Thurgood Marshall (BWI) and Martin State Airports.

If any of the included design standards or requirements contained herein conflict with any codes or regulations, it should be brought immediately to the attention of the Manager, Division of Facilities Design, (410) 859-7093.

SECTION I: GENERAL PROCEDURES AND POLICIES

CHAPTER 1: INTRODUCTION

1.1 PURPOSE

The purpose of the Interim Design Standards is to provide a consolidated format for all existing MAA DSTs. These DSTs help to establish procedures, set standards, and achieve consistency for design and construction projects at both Baltimore/Washington International Thurgood Marshall (BWI) and Martin State (MTN) Airports. These Interim Design Standards are mandated regulations of the MAA.

In this interim DST, the terms A/E, designer, and consultant are used interchangeably.

1.2 BACKGROUND

1.2.1 Baltimore/Washington International Thurgood Marshall (BWI) Airport

On October 1, 2005, Baltimore/Washington International Airport was officially renamed "Baltimore/Washington International Thurgood Marshall Airport." A new airport logo has also been issued to reflect the name change.

All documents and drawings submitted to the Maryland Aviation Administration should conform to the naming convention outlined below, and the new airport logo must be used in lieu of the old logo.

The official name of the airport should read *Baltimore/Washington International Thurgood Marshall Airport*. An abbreviated version which can be used in correspondence, publications, and other communications is BWI Thurgood Marshall Airport.

The acronym "BWI" can still be used in correspondence and other publications where necessary, for example, *Baltimore/Washington International Thurgood Marshall Airport (BWI)*.

Existing Maryland Aviation Administration (MAA) contracts should not be revised for the sole purpose of reflecting the name change. As a contract is amended for other reasons, the contract can be revised at that time to reflect the airport name change.

Please note that the new airport logo has no impact or relationship with the MAA logo. There are no changes in how the MAA logo should be used.

An electronic file of the new airport logo is available; please contact the Chief of the Document Management/Technical Support section, Division of Facilities Design at 410-859-7961 to receive the file.

1.2.2 Martin State (MTN) Airport

An electronic file of the Martin State Airport logo is available; please contact the Chief of the Document Management/Technical Support section, Division of Facilities Design at 410-859-7961 to receive the file.

CHAPTER 2: GENERAL DESIGN AND CONSTRUCTION POLICIES

2.1 SECURITY REQUIREMENTS

2.1.1 Vehicle Access on BWI Airport Movement Area

Access to the movement area (taxiways and runways) is restricted to vehicles with an essential function. An essential function is defined as having a need to be on the movement area, i.e., working on runway edge lights. The intent of this action is to eliminate all convenience crossings. Using the movement area to get to other portions of the airport that can be accessed by alternative routing is not permitted. Any questions regarding accessing the movement area, can be directed to the MAA Operations Center Manager at 410-859-7024.

SECTION II: DESIGN PROCEDURES

CHAPTER 3: GENERAL ARCHITECT/ENGINEER CONTRACT MANAGEMENT

CHAPTER 4: DESIGN PHASE

4.1 AIRPORT CONSTRUCTION PROJECT CHECKLIST

The Maryland Aviation Administration, Division of Facilities Design has created an Airport Construction Project Checklist. All MAA, Division of Facilities Design projects should be performed in accordance with this checklist (located in Appendix A)

The checklist serves as a guide to the requirements and procedures associated with the design of MAA projects. As a guide, it is not intended to be an all-encompassing document addressing every detail, but highlights the minimum requirements for design and administration of MAA projects. The checklist should be completed as design progresses, and must be included with each submission of design documents.

4.2 FAA REQUIREMENTS FOR PROPOSED DEVELOPMENT

Federal Aviation Administration (FAA) requirements for proposed development must be followed at BWI and Martin State Airports. Designers shall take these items into consideration during the design process and develop project schedules accordingly. During preliminary design, designers shall identify to the Maryland Aviation Administration (MAA) Project Manager the impact of each requirement on the project.

Unless otherwise approved by the MAA Project Manager, it shall be the designers' responsibility to submit all required information identified below well enough in advance to receive all FAA approvals and permits prior to advertisement of the construction documents. Construction Notice to Proceed (NTP) shall not be given on any project until all FAA approvals have been obtained.

With prior approval from the MAA Project Manager, Consultants may submit items directly to the FAA on behalf of the MAA. All submissions shall be made to the FAA Washington Airports District Office (WADO) unless otherwise noted.

The following requirements apply:

1. Environmental document coordination for all development projects as follows:

    a. At the initiation of each project, the Consultant shall obtain a determination from the MAA Office of Planning and Environmental Services on the required environmental coordination and documentation needed for each project.

    b. For large/complex projects, designers shall set up a preliminary coordination meeting with the MAA Division of Environmental Planning to coordinate the design with the environmental documentation preparation.

c. For development projects with the potential to be categorically excluded, plans shall be submitted to the MAA Division of Environmental Planning at the same time the review plans are submitted to the MAA Project Manager. MAA needs approximately 30 days to prepare and submit an Environmental Impact Evaluation Form A to the FAA. FAA review time is approximately 15 days. Note: Durations may be longer due to project specifics and the coordination required with state and federal agencies.

2. Pre-design meetings are required for all airfield projects prior to 30% completion.

3. Line of sight (shadow studies), ground radar interference and reflectivity studies for new or modified structures and buildings shall be submitted to the FAA prior to 30% design completion.

4. Seven copies of the construction safety and phasing plans shall be submitted for FAA approval. Designers must include on the Safety and Phasing plans the locations and heights of all structures penetrating any navigational surfaces. Both permanent and temporary structures, including construction equipment, are included in this requirement. Construction equipment heights should be estimated on a worst-case basis and equipment locations should be broadly shown, i.e. envelope locations with coordinates defining the corners.

   The Safety and Phasing Plan shall be submitted well enough in advance to receive approval prior to advertisement of the construction documents. Designers should submit seven copies of the Safety and Phasing plans to the FAA. Upon receipt, the FAA will review and approve the structure locations and heights in conjunction with the safety and phasing. FAA review time is 60-90 calendar days. Once approval is received, designers shall provide a copy of the FAA approved plans to MAA, Division of Airport Facilities Planning.

   MAA's Division of Airport Facilities Planning shall then issue an Airport Zoning Permit to the contractor per the accepted plan. If the Contractor wants to place equipment and/or cranes at locations and heights which differ from the FAA approved plan, they will be required to submit a Notice of Proposed Construction or Alteration (FAA Form 7460-1). Once Form 7460-1 has been approved by the FAA, the Division of Airport Facilities Planning will issue an additional Airport Zoning Permit for those items which differ from the original plan.

5. Completed Modification of Standards (MOS) forms shall be submitted to the FAA for approval for each modification requested. FAA review time is approximately 60 days.

6. Changes to the FAA Part 139 signing and marking plans shall be submitted (on a separate drawing) to the MAA Project Manager and Office of Airport Operations (OPS) for internal review. Upon MAA approval, Consultants shall provide OPS with three copies of the plan(s), which will be forwarded on to the FAA Eastern Region for

coordination and approval. Upon approval, the Eastern Region will send a copy of the approved plan(s) stating that the changes will be added to the next revision of the signage plan to MAA and WADO. The MAA Project Manager will forward an approved copy of the signed plan(s) to the designer. MAA coordination and review time is approximately 14 days, and FAA review time is approximately 30 days.

7. Temporary and permanent changes to the Airport Operations fence lines shall be submitted to the FAA for approval. FAA review time is approximately 30 days.

8. Copies of the plans, specifications, and design report for all projects which MAA plans to request AIP or PFC funding shall be submitted for FAA approval. In addition to the final submission, designers shall submit 60% plans and specifications to FAA for review and comment. MAA shall review the design report internally and submit it directly to the FAA. FAA review time is approximately 14 days.

4.3 PROPOSAL PREPARATION/SCOPING MEETING

For all MAA Facilities Design projects, the MAA Project Manager, Designer, and end-users shall meet to review the capital program request, develop the scope, budget, and schedule for the project, identify the procurement method, identify permit requirements. Based on the meeting, Designer shall prepare a proposal for MAA's review and approval.

4.4 DESIGN MEETING MINUTES

All meeting minutes prepared for MAA Facilities Design projects shall be distributed to all attendees and persons invited to the meeting. The Meeting Notice shall also be attached to the meeting minutes. Refer to Appendix B for the standard Meeting Minute form.

4.5 DESIGN REPORTS AND STUDIES

A draft (submitted with 30% documents) and final (submitted with 100% documents) engineer's report is required for all FAA reviewed and funded projects. For all non-FAA projects, verify with the MAA Project Manager during the proposal preparation phase if an engineer's report is required for the project. All engineer's reports shall be marked as "draft" until approved by the MAA Project Manager. Once approved by the MAA Project Manager, the final report shall be issued.

All design reports and studies shall include an executive summary which discusses alternatives and recommendations.

4.6 DESIGN REVIEWS

4.6.1 Process

All written comments will be responded to in writing by the Designer within two weeks after receipt. All comments which cannot be fully addressed in the two-week period will be responded to in writing when resolved, and prior to the final addendum being issued. This applies to all written comments received by the Designer and the MAA Project Manager.

At the beginning of each project, the MAA project managers will determine who the "client" is within MAA. The client should be invited to all scoping, design, phasing, and review meetings. Project managers and consultants should use their judgment to additional invitees as needed.

4.7 ALP COORDINATION

At the initiation of each project, designers shall confirm with the MAA Office of Planning and Environmental Services that the project is included on an Federal Aviation Administration (FAA) approved ALP. If the project has not been included, the designer shall identify and coordinate with the MAA Division of Airport Facilities Planning all changes to the Airport Layout Plan. FAA review time is approximately 14 days for pen and ink revisions and approximately 60 days for more substantial revisions.

4.8 ENVIRONMENTAL COORDINATION

4.8.1 MDE

All BWI and Martin State Airport projects shall be coordinated with the MDE per the following procedures:

1. Consultants shall designate a Point of Contact to coordinate MDE permitting issues for all of their MAA projects.

2. MDE may review projects in-house or, with MDE approval, MAA may elect to designate a review consultant to expedite the review process. The review consultant previews calculations, evaluates drawings, and provides MDE with approval recommendations. At the beginning of each project, the consultant's Point of Contact shall contact the Reviewer and coordinate all aspects of the project. Consultants may request the Reviewer's name and company information from the MAA Project Manager.

3. Consultants shall expedite the review procedure by involving MDE in the entire design process. Early coordination and prompt responses to questions and comments will facilitate the approval. Coordination requirements include:

    a. For large and/or complex projects, Consultants shall set up a preliminary coordination meeting at 30% design with the Reviewer, MAA, and MDE.

The meeting shall be used to present MDE the project scope and discuss stormwater management and sediment and erosion control design. If follow-up meetings are necessary as design progresses, Consultants shall set up additional meetings with the above-mentioned participants.

b. Consultants shall submit review plans to MDE at the same time they submit review plans to MAA. A copy of the transmittal letter must be faxed to MAA and the Reviewer the day of the submission.

c. The Reviewer may provide Consultants with an advance copy of "draft" comments. Consultants shall assemble their responses to the "draft" comments within reasonable time of receipt. Additional items may be included in the "formal" comments provided by MDE. If additional comments are included, Consultants shall revise their responses accordingly. Consultants shall forward copies of MDE comments to the MAA Project Manager and Reviewer.

d. Prior to submission, Consultants shall provide MAA and the Reviewer with the estimated date submittals and responses to comments shall be submitted. This advance notice will allow the Reviewer to schedule his review accordingly. A cover letter outlining responses to the "draft" and/or "formal" comments shall be included with all resubmittals.

4.9 FAA COORDINATION

4.9.1 Radar Reflectors

The FAA has installed radar reflectors throughout the airfield as part of the surface detection system. All contract documents at BWI Airport shall include the locations of radar reflectors. Radar reflector locations and removal/replacement requirements shall be coordinated with Mr. Charles Freburger, FAA 410-859-7252.

4.10 DESIGN PHASES AND SUBMITTAL REQUIREMENTS

For projects designed for MAA Division of Facility Design, the following information shall be submitted as part of the required percentage design submittal. Exceptions to the submittal requirements must be approved by the MAA Project Manager.

4.10.1 Programming and Schematic Design Submittal

4.10.2 Design Development (30% Review) Submittal

- Drawings
- Specifications – Table of Contents
- Cost Estimate
- Draft Design Report and Calculations

- Preliminary Phasing and Security Concerns
- Sole Source Items

4.10.3 Construction Documents 60% Submittal

- Drawings
- Technical Provisions and Specifications
- Cost Estimate
- Extra Materials (Attic Stock) List

4.10.4 Construction Documents 100% Submittal

- Drawings
- Technical Provisions and Specifications
- Cost Estimate
- Final Design Report and Calculations

4.10.5 Bid Documents

- Final Drawings
- Final Technical Provisions and Specifications
- Final Cost Estimate

4.10.6 Electronic Non-CAD Document Deliverable Requirements

The following requirements should be used for preparation and delivery of all non-CAD related electronic documents for projects at BWI and MTN airports. This serves to outline the requirements, and the formats for delivery of Architectural, Engineering, and Construction non-CAD documents, as well as any document, which is submitted to MAA's Office of Engineering and Construction Management in an electronic format.

The database structure mandates that the format of delivered electronic media should be strictly adhered to. Following are the specifications which apply to the submission of reports, tasks files and specifications:

Reports:
Electronic reports are to be submitted once the task manager has approved the final report. Interim submittals are only required if the duration of the project/task is longer than 90 days and substantial information is available. The final report will be submitted in a bound hardcopy format, as well as electronically in Portable Document Format (PDF) and editable electronic format (i.e. MS Word).

If a task carries more than one report, they will have to all appear as individual files on the submitted CD.

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

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

Please note that generally task numbers may be attributed to reports, however in the case that a contract number is assigned to a task, that number will need to be denoted on the label.

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 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

Final Task File:
Task files are to be prepared of all pertinent letters, memos, and e-mails relating to any individual task. These should all be categorized and arranged in directories and sub directories as follows:

- Task/Subtask XXXX.XX
  - Proposals
  - Construction Cost Estimates
  - Schedules
  - Meeting Minutes
  - Permits
    - MDE
    - SHA
    - CRITICAL AREA
    - COUNTY
    - DNR
    - OTHER
  - FAA
  - Comments
    - 30%
    - 60%
    - 100%
    - Design report
  - Correspondence
    - Transmittals
    - E-mails

  - Letters/memos
  - Reports
- Sketches/Exhibits
- Photos
- Presentations (PPT)
- Misc

Task file documents should comprise of all received and sent documents relevant to the task. This should enable the recreation of a complete history of the Task/Contract from its inception to its completion.

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

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

Task files should be submitted electronically on CD. The CD should contain a separate directory for each of the headings listed above. 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)
- Any other comments necessary to convey the contents of the CD

Meeting Minutes:
Meeting minutes must be transmitted shortly after each meeting following the template and format set by the MAA. Status meeting minutes may be submitted in electronic format by e-mail. Quarterly the status meeting minutes should be compiled on one CD and submitted to the MAA task manager.

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

- Consultant: XXXXXXXXXXXX
- **Status meeting Period:** **XX/XX/XXXX - XX/XX/XXXX**
- **Submittal Date:** **MONTH, DAY, YEAR**
- No. of Documents: XX
- CD # / Total in Set: X or XX

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 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

Specifications:
Engineering specifications usually accompany a CAD document, and could be part of a 30%, 60% or a 100% submittal. These submittals are mandated by the individual task managers and will also include a hardcopy for distribution purposes. The electronic version of the specifications can be transmitted via e-mail to the respective Task Manager and will be included in the final Task File CD, as specified above.

At the bid-set submittal, a CD must accompany the submitted hardcopy documents. This CD will contain the electronic format of the specifications. This CD is in addition to any pertaining CAD document which will be delivered separately.

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

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

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 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

General Requirements:
All Documents should be supplied in the following formats:

1. All Deliverables will be provided to MAA on CD R or CD R/W with the session closed to ensure maximum cross platform readability.
2. Each CD back cover will include an index, or table of contents, indicating list of documents, Title of document, and type of document (format, i.e., .doc, .xls, .pdf, etc.)
3. Each CD will include a computer generated CD cover and label containing all relevant information as discussed above for each category
4. All CDs with multiple files must be hyperlinked with a table of contents which will open individual related documents.
5. As required documents pertaining to a contract shall be provided in a folder structure with the main folder named with the contract or task number and the subfolders named by discipline or category.

6. All related files should be included, in itemized, and properly labeled folders and sub-folders.
7. The native format in which the document is created (i.e. doc, .xls, .tiff, etc.)
8. All documents shall also be provided in Portable Document Format (PDF), noting the following guideline:
    - Multiple page documents should be outputted in PDF as one electronically bound document (not as individual PDF pages)
    - Resolution of scanned documents must enable reproduction of the original document without loss of clarity and definition, not less than 200 dpi.
    - Color pages and large size inserts must be scanned as such enabling the reproduction of the document in its original form, as part of the main document

9. Submitted electronic files should not be compressed (i.e. ZIP).
10. Electronic deliverables (e-mails and CDs) must be virus free.
11. A task is considered closed or complete when the task manager has closed the task and final payment has been made.
12. All CAD deliverables are as currently mandated per the MAA CADD Standards.
13. Refer to the standard for CD label and CD case front and back cover design template.

4.11 DRAWING REQUIREMENTS

All drawing submissions to MAA shall meet the requirements of the CAD Standards Manual contained in Appendix C (CAD standard in Appendix C dated July 2005 replaces previous CAD Standard dated January 1998). A CD of the CAD Standard is available. The CD contains a template which will facilitate conformance to the new CAD Standard. Copies of the CD and/or hardcopy of the document are also available by request to Mr. Marcus Rouhani, Chief Document Management/Technical Support Section at 410-859-7961 or mrouhani@bwiairport.com.

4.11.1 Standard Drawings

MAA has established certain drawings that shall be incorporated within all contract documents. They are found in Appendix D. The AutoCAD files for these drawings are also included with the Design Standard CD.

4.11.1.1 General Construction and Safety Notes at Baltimore/Washington International Thurgood Marshall Airport

To ensure accurate and consistent information is included with each plan set, all designers shall use the established General Construction and Safety Notes Sheets. The majority of the information will remain consistent from contract to contract.

Information to be verified or modified is shown in green on the plan sheet and is listed below:

- General Construction Notes, number 9: Update survey information and change 'General Project Layout' to the appropriate sheet name if another sheet is used.
- General Construction Notes, number 13: Delete if project is not federally funded.
- Site Access, Contractor Staging, Haul Routes, and Material Storage, number 1: Change 'General Project Layout' to appropriate sheet name if another sheet is used.
- Related Documents, items 1.b.i and 1.c.i. reference to Part 77 surfaces and OFZ surfaces appearing on "this sheet". If the sections are moved from this sheet, the references must be updated.

Because of the nature of security requirements at airports, all security notes are subject to change. The notes pertaining to security, site access, and personnel badging should be provided to the MAA Office of Airport Security for review. Any changes to the notes should be submitted to the MAA Office of Engineering and Construction Management so that the changes can be incorporated into a revised note standard.

4.11.1.2 General Construction and Safety Notes at Martin State Airport

Under development.

4.11.1.3 MDE Standard Erosion and Sediment Control Notes and Details

MAA has established Standardized Erosion and Sediment Control Notes, Details and Sequencing Sheets for use for all Consultants/Designers contracted directly or indirectly for MAA. These sheets will be the basis for all projects to ensure standardization of all Erosion and Sediment Control drawings being prepared for MAA projects.

Background:

The Erosion and Sediment Control Package has been assimilated for use for MAA projects at BWI Thurgood Marshall and Martin State Airports. The details used are from the Maryland Department of the Environment *1994 Maryland Standards and Specifications for Erosion and Sediment Control.* Vegetative Stabilization Notes used are from the *Specifications for Performing Landscaping Activities for the Maryland Aviation Administration (Latest Edition),* prepared by the Maryland Aviation Administration Office of Environmental Planning.

These represent the most widely-used Erosion and Sediment Control devices for design. They include the following sheets:

- Erosion and Sediment Control Notes 1

- Erosion and Sediment Control Notes 2
- Erosion and Sediment Control Plan (Border Sheet)
- Erosion and Sediment Control Details I
- Erosion and Sediment Control Details II
- Erosion and Sediment Control Details III
- Erosion and Sediment Control Details IV
- Erosion and Sediment Control Details V
- Vegetative Stabilization Notes

Details and requirements for use are to follow the information and guidelines from the following sources:

1. The Maryland Department of the Environment *1994 Maryland Standards and Specifications for Erosion and Sediment Control.*

2. *Specifications for Performing Landscaping Activities for the Maryland Aviation Administration (Latest Edition),* prepared by the Maryland Aviation Administration Office of Environmental Planning.

3. The *Maryland's Waterway Construction Guidelines* prepared by the Maryland Department of the Environment Water Management Division issued September 1999 and revised November 2000.

4. The *Maryland Erosion & Sediment Control Guidelines for State and Federal Projects*, by the Maryland Department of the Environment Water Management Administration Published January 1990, Revised January 2004 or latest edition.

Instructions for Use:
The following information will guide the Consultant\Designer on the use of the standardized sheets.

General: All title sheet information needs to be completed.

- Key Plan is to match appropriate MAA Airport and Project Location showing drawing layout.
- MDE SF # when provided by MDE
- Project Title
- Contract No.
- Scale (if applicable)
- Date
- Sheet No.
- Designed
- Drawn By
- Checked

- Any Revision No., Revision Dates and Revision Descriptions as necessary

Erosion and Sediment Control Notes I: This is a standard sheet used in the E/S package and therefore no additional changes are required to this sheet.

Erosion and Sediment control Notes II: Standard Erosion and Sediment Control Note 27 (Site Information): This information varies with each contract and should be completed by the Consultant.

A. Total Areas for of Facility represents the total area for each airport as follows:
BWI= 3100 Acres
Martin State= 775 Acres
B. Total Area of Project Site: Site Specific
C. Area Disturbed: Equivalent to Limits of Disturbance (LOD).
D. Area to be roofed or paved: Site Specific
E. Total Cut: Site Specific
F. Total Fill: Site Specific
G. Off-Site Waste/Borrow Area Location: If a location has been provided within the plans refer to respective plan sheet(s). If a location has not been determined then add statement "TO BE DETERMINED".

- Design Certification: Must be signed prior to MDE approval.
- Owner's/Developer's Certification: To be signed by MAA personnel representative such as the MAA Project Manager.
- Sequence of Construction: A general sequence of construction has been provided on the sheet for both an Initial and Final Phase for Erosion and Sediment Control. The designer is to provide the device information and a sequence at the locations where indicated "Consultant To List Devices Used On Plans Here" and "Consultant to Establish Sequencing Here"

Depending upon the complexity of the project, the Sequence of Construction shall be specific the Construction Activity to take place. This may require additional line items which shall be numbered. Please note that on simplified projects a "Final Phase" may not be required. This will be determined on a project by project basis.

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Erosion and Sediment Control Plan(s):

- These plans will be specific for each project and may include more than one plan. Scales should meet MAA requirements.
- The Sediment Control Legend is to remain on each plan sheet. Modifications can be made based upon project specifics and controls that are being used.
- In some instances more detailed Sequence of Construction may be provided on these sheets as necessary.

- Standard Erosion and Sediment Control Note 27 (Site Information): This information varies with each contract and should be completed by the Consultant.

Erosion and Sediment Control Details I-V:

- Several sheets have been provided for use. The designer is to use only the details required for the specific project. Other details not used may be removed.
- If new or unique details are required, the designer may add them to the detail sheet. Final approval for use will be made by MDE.
- Any details not shown on these sheets and/or new details being provided should be provided to MAA for incorporation to the standardized sheets for future distribution.

Vegetative Stabilization Notes:

- This sheet reflects the information from the *Specifications for Performing Landscaping Activities for the Maryland Aviation Administration* and therefore no changes are required. However, if additional requirements are determined above and beyond requirements on this sheet, changes should be made to reflect these requirements.

Additional Drawings:

- If required, the Consultant/Designer may be required to provide additional Plan, Detail, Note, and Sequencing sheets based upon complexity and size of the project.

4.12 CONSTRUCTION SPECIFICATIONS

The items below shall be verified and included in all construction documents prepared for the MAA Division of Facilities Design. The designer should identify, in writing to the MAA Manager, Division of Facility Design, inclusion of any special technical requirements in the contract specifications i.e. pre-qualification for minimum years of experience, dollar value of past work, certifications, etc.; warranties, proprietary procurement, value engineering; etc. MAA will approve the special requirements on a case-by-case basis.

Standard MAA Specifications that are to be utilized on all relevant contracts are included in Appendix E.

4.12.1 General Specification Requirements

1. All contract milestones shall be specified in calendar days from NTP. Specifying "specific dates" must be approved by the MAA.

2. All incentives must be approved by the MAA.

3. All sole source and proprietary items must be approved by the MAA.

4. Performance specifications which require the contractor to design/build shall be identified and brought to the attention of the MAA. The designer should provide justification for using this method.

5. Specifications which require pre-qualification of contractors and suppliers, i.e. the number of years providing specific products or services, previous project experience etc. should be identified and brought to the attention of the MAA. The designer should provide justification for pre-qualification requirements.

6. Specifications which have specific warranty/maintenance requirements beyond the MAA standard of one year shall be identified. The designer should provide justification for extended/additional warranty maintenance requirements.

7. The designer shall provide to the MAA written documentation outlining the basis for liquidated damages. The documentation shall be provided prior to the advertisement submittal.

4.12.2 Building Specification Format

The MAA has adopted the American Institute of Architects (AIA) "MasterSpec®" building construction specifications system, which incorporates the Construction Specifications Institute (CSI) MasterFormat™ 2004 Numbers and Titles. All building contract specifications shall be developed using the current edition of "MasterSpec®."

The "MasterSpec®" Division 01 requirements must be closely coordinated with the MAA "Standard Provisions for Construction" and individual construction management requirements. MAA's "Standard Provisions for Construction" addresses many of the "MasterSpec®" Division 01 requirements, and will take precedence. Generally, Division 01 should only be used to supplement and enhance the MAA "Standard Provisions for Construction Contracts."

4.12.3 Site Work Specifications

The Maryland Aviation Administration (MAA) has adopted the Maryland State Highway Administration revised Standard Specifications for Construction and Materials, dated January 2001 for non-airfield related construction. Projects which start design after April 15, 2004 shall be designed in accordance with the revised standard specifications for all construction contracts.

Copies of the specifications may be purchased by contacting:

Maryland State Highway Administration, Cashier Office
211 E. Madison Street
Baltimore, Maryland 21202
Telephone: 410-545-8490

MAA Standard Provisions (SP) will be used in lieu of the General Provisions (GP) and Terms and Conditions (TC) provided in this document.

Section 700 – Landscaping and Section 920 – Landscaping Materials are **not to be used**. Landscaping and Landscaping Materials for MAA construction projects are included in Appendix E.

4.12.4 Sole Source Specifications

Sole Source Specifications are found in Appendix E.

4.13 COST ESTIMATING

4.13.1 Development of Cost Estimates

Since the MAA utilizes various funding sources for construction projects, the following procedure outlines the requirements for development of construction cost estimates, and supplemental requirements for preparation of quantity plan sheets, tabulation of bids and bid forms.

1. "Design Contingencies" should be included in all construction cost estimates. The percentages should be determined by the design consultant for the individual project components and should be higher for early budget estimates and decreased as the design progresses. The final Engineer's Estimate should not have any design contingency.

2. In addition to the design contingencies discussed above, all estimates should have a "Miscellaneous Work Allowance" added after the subtotal to account for change orders. The amount of Miscellaneous Work Allowance has generally averaged five (5) percent but should be coordinated with the MAA Project Manager.

3. Design contingencies and construction contingencies should be listed as separate line items.

4. Once a project component has been identified in the budget or subsequent estimates, it must be carried forward as a line item in all future estimates. When work is added to the project scope, an additional line item should be included in the estimate to cover that work. Back-up for each line item should be attached.

5. For projects with Federal (AIP) or PFC funding, eligible and non-eligible costs should be separated. For estimates with these costs, a narrative should be attached, briefly outlining which costs are non-eligible and why.

6. For unit price contracts, the quantities for the various line items with different funding sources should be calculated and shown separately in the Quantity plan sheets and Tabulation of Bids.

7. For lump sum contracts, language should be added in the bid forms requiring the Contractor to furnish MAA with a breakdown of the total bid into the project components as necessary to allow the determination of eligible and non-eligible costs under different funding sources.

The MAA standard format for cost estimates should be used for preparing all estimates. It is found in Appendix B.

4.13.2 Liquidated Damages

The designer shall provide to the MAA written documentation outlining the basis for liquidated damages. The documentation shall be provided prior to the advertisement submittal.

CHAPTER 5: BIDDING AND PROCUREMENT

CHAPTER 6: CONSTRUCTION ADMINISTRATION

6.1 SHOP DRAWING/SUBMITTAL REVIEW

6.1.1 Fire Marshal Comments

During construction, the Construction Manager will forward a copy of the appropriate shop drawing/submittals to the Fire Marshal at the same time as the Designer. The Construction Manager will then schedule a meeting one week later with the Fire Marshal, Designer, Construction Manager, and MAA Division of Facilities Construction. At that meeting, all shop drawing issues will be addressed, and a decision will be rendered as to the status of the submittal (approved, approved as noted, rejected). The shop drawings/submittals will be returned to the Construction Manager at that time for further action.

The shop drawing/submittal review meeting will also provide an opportunity for the Designer, Construction Manager, and Fire Marshal to review contract revisions and modifications.

6.1.2 Design Changes

Designers shall NOT use the shop drawing/submittal review process to implement revisions to the original design and construction documents. Revisions to the design should be implemented by Design Clarification Letter (DCL) and/or field revisions.

6.2 REQUEST FOR INFORMATION

The consultant shall review and respond to all Request for Information (RFIs) within the time frames specified in the Construction Documents.

6.3 RECORD DRAWING PREPARATION

At the close of every project, the MAA will provide the Designer with the as-built markups from the contractor. The following requirements should be followed when preparing Record Drawings.

Deliverables shall include:

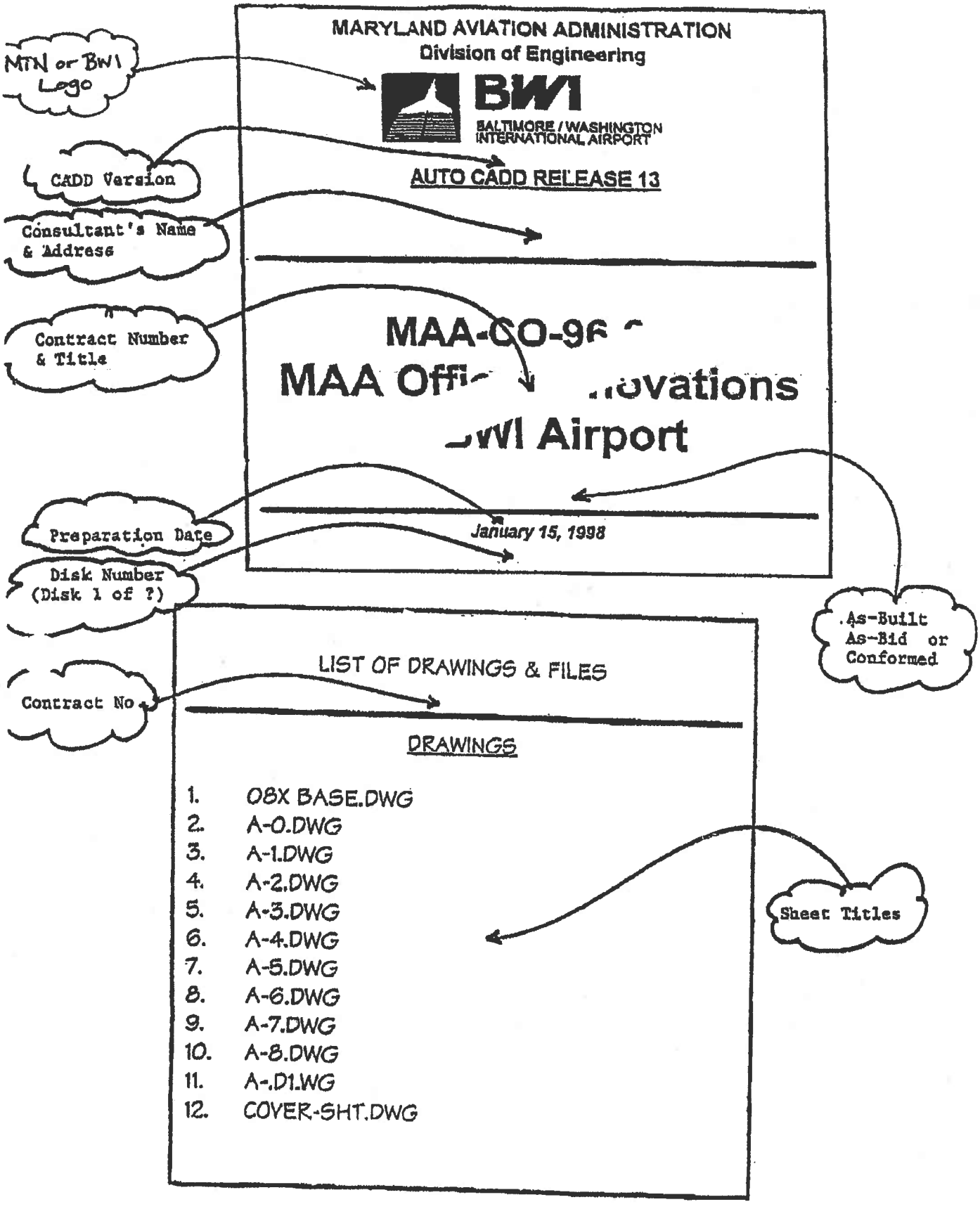
- 1 set of blueline prints (2 sets if AIP funding is used in the project)
- 1 set of reproducible mylar plots
- 2 CDs with electronic files

Drawings shall include:

- Revision block shall be labeled "As-Built" with date of issue.

- The following disclaimer shall be placed on each sheet (including the title sheet): "These record drawings dated... and titled "As-Built" have been developed from the Contractor's record of changes made and may not represent the final project, as constructed, in every detail. The record drawings have been prepared based on information supplied by others and the Engineer has not verified the accuracy or completeness of the information."
- Every drawing shall have the file name clearly located within the sheet border.
- Disks shall be labeled with the contract number, title, date, AIP number (if applicable), disk number, and any other pertinent information.
- CD inserts shall be formatted per *CD INSERTS*.
- All electronic files shall be stand-alone; bind all external reference files.
- All electronic files shall be purged of all unused layers, blocks, and fonts. Only the attributes required for the final CD set should be in the archived file.
- All electronic file names shall be identical to the sheet number or title on the contract documents.
- All drawings shall be in DWG (or TIF for scanned images), DWF and PDF formats. One folder shall be set up for each format and the respective drawings placed in each. The folders shall be labeled "AUTOCAD", "DWF"; and "PDF".
- A standard pen setting should be used to allow the MAA to plot the drawings with the same line weights as the originals. Pc2 files shall be used and embedded into the drawing files.

All fonts must be available in the MAA standard font library. The MAA standard font library includes all fonts delivered with AutoCAD.


MTN or BWI Logo
MARYLAND AVIATION ADMINISTRATION
Division of Engineering
BWI
BALTIMORE / WASHINGTON INTERNATIONAL AIRPORT
CADD Version
AUTO CADD RELEASE 13
Consultant's Name & Address
Contract Number & Title
MAA-CO-96
MAA Offi ovations
wI Airport
Preparation Date
January 15, 1998
Disk Number (Disk 1 of ?)
As-Built As-Bid or Conformed
Contract No
LIST OF DRAWINGS & FILES
DRAWINGS
1. O8X BASE.DWG
2. A-0.DWG
3. A-1.DWG
4. A-2.DWG
5. A-3.DWG
6. A-4.DWG
7. A-5.DWG
8. A-6.DWG
9. A-7.DWG
10. A-8.DWG
11. A-.D1.WG
12. COVER-SHT.DWG
Sheet Titles

CD INSERTS

SECTION III: DESIGN CRITERIA

CHAPTER 7: GENERAL REQUIREMENTS

7.1 CODE REQUIREMENTS

The A/E shall design the project to comply with the MAA Design Standards and applicable codes in these design criteria. The A/E Statement of Work may also designate additional codes or standards applicable to the particular design.

1. APPLICABLE CODES [Code of Maryland Regulations (COMAR)]:
   - COMAR 05.02.01 Maryland Model Performance Code 20 September 2004.
   - COMAR 05.02.07 Maryland Building Performance Standards (MBPS) 20 September 2004.
   - COMAR 29.06.01.07 State Fire Prevention Code 01 August 2004.
   - COMAR 05.02.02 Maryland Accessibility Code 18 March 2002.
   - COMAR 09.20.01 Maryland State Plumbing Regulations 23 July 2001.

2. Applicable Codes above incorporate by reference, and contain amendments to the following Model Codes:
   - International Building Code 2003.
   - NFPA 1 Uniform Fire Code 2003.
   - NFPA 70 National Electrical Code 2002.
   - NFPA 101 Life Safety Code 2003.
   - Americans with Disabilities Act Accessibility Guidelines 23 July 2004.
   - International Mechanical Code 2003.
   - National Standard Plumbing Code Illustrated 2000; 2001 Supplement (Maryland Building Performance Standards).
   - International Plumbing Code 2003 (Maryland Model Performance Code for industrialized buildings).
   - International Energy Conservation Code (IECC) 2003.

Additionally, projects must comply with requirements of several regulatory agencies

- Federal Department of Transportation Regulations
- Federal Aviation Administration Federal Aviation Regulation Subchapters
  - Part 77: Objects Affecting Navigable Airspace
  - Part 107: Airport Security
  - Part 139: Certification and Operations: Land Airports Serving Certified Air Carriers
  - Part 150: Airports
  - Part 151: Federal Aid to Airports
  - Part 152: Airport Aid Program

- Maryland State Highway Administration

- Maryland Department of Transportation (MDOT)
- Maryland Department of the Environment (MDE)
- Occupational Safety and Health Administration (OSHA) codes
- Environmental Protection Agency (EPA) Regulations
- Codes of Anne Arundel and Baltimore Counties
- Federal Department of Agriculture

Landside (non-airfield) projects shall follow the American Association of State Highway and Transportation Officials'(AASHTO) publication "A Policy of Geometric Design of Highways and Streets 1990" for all project design criteria. Design exceptions will only be required if your design falls below AASHTO minimum standards. In such cases, the designer shall obtain SHA approval concurrently with MAA approval.

The A/E shall incorporate appropriate references to nationally accepted standards for the design, fabrication and installation of particular equipment. Also, the A/E shall include in the design appropriate reference to the published MAA Directives. These address such topics as security, vehicle operations, AOA licensing, badging, radio communications, display of signs, and key control.

7.1.1 Fire Egress Analysis

All contract plans should include the Fire Egress Analysis. The Fire Egress Analysis should include, at a minimum, the following information:

1. Floor plan(s) showing egress route(s) and distances.
2. General Requirement information, such as applicable codes, regulations and standards; building conditions data; and occupant load calculation(s).
3. Exit Requirement information, such as exit door requirements; exit access travel; and emergency sign and lighting.
4. Additional Requirement information, such as handicapped accessibility; and fire resistive ratings for interior finish and trim.

Sample analysis and detail follow:

GENERAL REQUIREMENTS

APPLICABLE CODES, REGULATIONS, AND STANDARDS.

1. BOCA National Plumbing Code.
2. BOCA National Mechanical Code.
3. BOCA National Energy Conservation Code.
4. NFPA 70: National Electrical Code.
5. NFPA 101: Life Safety Code

6. Uniform Federal Accessibility Standards 36 CFR Part 1191: Americans with Disabilities Act, Accessibility Guidelines for Buildings and Facilities.
7. Environmental Protection Agency Regulations.
8. Occupational Safety and Health Administration Standards.

BUILDING CONDITIONS DATA.

1. Building occupancy.
   a. Use Group: B, Business (BOCA303.2)
   b. Classification: Business Class (NFPA 4-1.8 & 8-1.4.1)

2. Building construction.
   a. Existing structure construction type: 2A non-combustible/Protected (BOCA 603).
   b. Fire suppression: Existing automatic sprinkler system installed in accordance with BOCA Section 906.2.

OCCUPANT LOAD CALCULATION.

1. Allowance occupant load for Business Use Group (BOCA Table 1008.1.2 and NFPA 9-1.7): Business area (Business): 1175 SF x (1 Person/100 Gross SF) = 12 people.

2. Actual occupancy load: Office area: 12 people.

3. Design occupancy load.
   a. Number of occupants determined by largest number generated by either allowance or actual number method (BOCA 1008.1).
   b. Design occupancy load: 12 people.

EXIT DOOR REQUIREMENTS.

1. Minimum number of exit locations.
   a. For occupancies less than 50 with a maximum travel distance of less than 75 feet: 1 (BOCA 1010.3).
   b. Number of doors provided: 2 Exits.

2. Minimum exit width: 0.15 inches per person (BOCA 1009.2).
   a. Required width: 12 people x 0.15 inches/per person = 1.8 inches.
   b. Minimum door width required at each exit door opening: 32 inches (BOCA 1017.3 and NFPA 5-2.1.3.1)
   c. Exit width provided: 36 inches.

3. Door requirements (BOCA 1017.4 and NFPA 5-2.1.4.1, 5-2.1.4.4, and 5-2.1.5)

a. All doors serving an occupancy of 50 or more shall swing in the direction of egress.
b. Door latch shall release when subjected to a 15-pound force.
c. Door shall be readily openable from "occupied" side without use of a key.

EXIT ACCESS TRAVEL.

1. Maximum length of access travel for business occupancies.
   a. Business Use Group with sprinkler system (BOCA Table 1006.6): 250 FT.
   b. Business Use Group with sprinkler system (NFPA 101, 27-2.6): 300 FT.

2. Actual length of access travel for assembly occupancies.
   a. From remote point A: 57 FT.

EMERGENCY SIGNS AND LIGHTING.

1. Illuminated exit signs are required throughout facility (BOCA 1023.1).
   a. Signs are required over every exit door.
   b. Supplementary (directional) signs are required whenever door signs are not readily visible from occupied areas.
   c. Emergency power source is required to illuminate signs for 1 hour after loss of primary power (BOCA 10234.4).

2. All means of egress are required to be illuminated by artificial light (BOCA 1024.1).
   a. Minimum illumination level required is 1-foot candle at floor (BOCA 1024.2).
   b. Emergency power source is required to illuminate exit paths for 1 hour after loss of primary power (BOCA 1024.4).

ADDITIONAL REQUIREMENTS

HANDICAPPED ACCESSIBILITY (36 CFR Part 1191)

1. Doorways shall have a minimum clear opening of 32 inches from face of door in 90-degree position and face of stop in frame. (Approximately 33 ½" minimum door width, nominal 36" wide door).

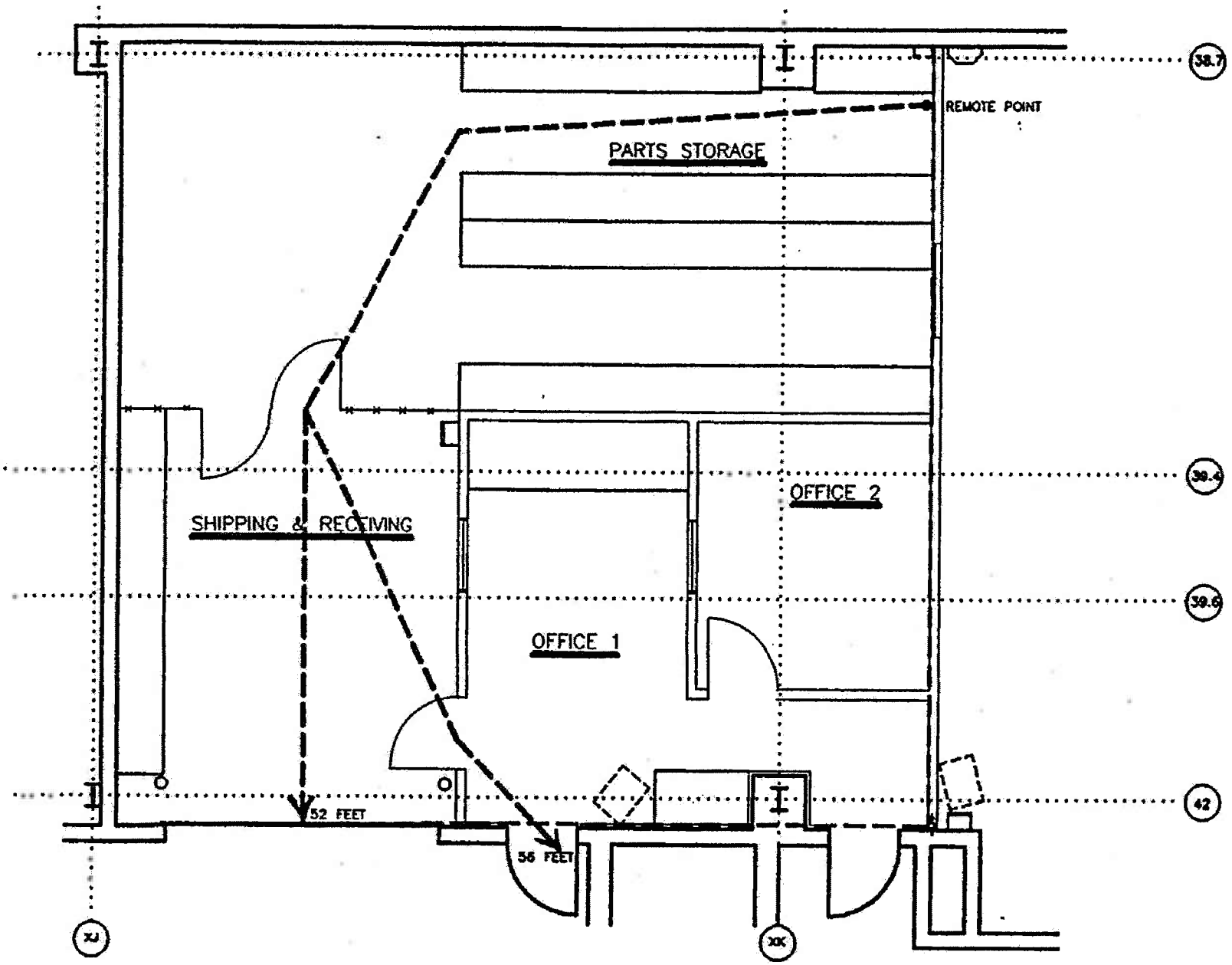
FIRE RESISTIVE RATINGS FOR INTERIOR FINISH AND TRIM

1. Exit Access Corridors – Minimum Class II, 26-75 flame spread.
2. Rooms or Enclosed Spaces – Minimum Class III, 76-200 flame spread.
3. Interior Trim – Maximum of 10% Class I, II, or III (927.6) where limited above.

4. Floors – Minimum requirement of DOC FF-1.

SHEET TITLE: SAMPLE FIRE EGRESS PLAN

DATE: APRIL 2005



FLOOR PLAN

1/8" = 1'-0"

7.1.2 Terminal Evacuation Plans

The MAA Office of Engineering and Construction Management (OECM), in coordination with BWI Fire and Rescue Department (FRD), are only responsible for assisting in the development, approval, and location of all written Evacuation Plans and drawings. Responsibility for submitting written Evacuation plans and drawings to MAA for review and approval shall be the Designer of Record under MAA Capital Program projects, and the tenant organization and/or the tenant organization's General Construction Contractor under the MAA Building Permit process. Upon approval of the Evacuation plans and drawings, and as directed by MAA, the General Construction Contractor for the Capital Program project or the tenant organization shall be responsible for the placement of the Evacuation Plan Drawings.

7.2 RUNWAY, TAXIWAY, AND TAXILANE CLOSURES

7.2.1 Runway 10-28 and 15R-33L Intersection Closure

Construction of utilities within the safety areas of the intersection of Runways 10-28 and 15R-33L, which will require simultaneous closure of both major runways, will not be permitted. Alternate routes or methods, such as crossing one runway point at a time and remaining clear of the adjacent runway safety area should be used. The Director of Engineering and Construction Management must approve any project that requires closure of both runways.

This allows BWI to maintain airport capacity during utility construction by keeping at least one major runway open. It provides additional periods of time for accessing work areas for utility installation, which would be limited if both runways required closing. It also alleviates closures of both major runways for subsequent maintenance, emergency repairs, periodic inspections, tie-ins, etc. These types of occurrences are even more problematic, as they may be unscheduled and occur at peak times.

7.3 USE OF LIFTS WITHIN THE TERMINAL BUILDING

The following information shall be added to construction documents for any construction that may require the use of lifts on the terminal floor tiles at BWI Thurgood Marshall Airport:

All man-lifts to be used on or transported across the ceramic, porcelain, and/or terrazzo floor tile in the terminal shall conform to the following requirements:

1) All lifts shall be equipped with pneumatic tires
2) All lifts shall be transported and parked on ¾" plywood protection panels at all times.

7.4 SAFETY AND SECURITY DURING CONSTRUCTION

Refer to Section 4.11.1.1 and Appendix D for the Standard Construction Safety and Notes Sheets.

7.4.1 Traffic Cones

Twelve (12") inch traffic controlling cones shall not be used for projects at BWI and Martin State Airports. State Highway Administration (SHA) studies have found that larger cones decrease accident rates. For slower traffic, 18" cones shall be used. For highway and nighttime traffic, 28" cones shall be used. In addition, during nighttime work, 28" cones must have reflective collars. This information may be obtained from SHA's Traffic Control Booklet #6.

7.4.2 Dust Control

Additional consideration should be given to dust control during construction. Utilize sound engineering judgment in the development of dust control plans and specifications.

CHAPTER 8: SITE DEVELOPMENT

8.1 GENERAL SITE WORK AND UTILITIES

8.1.1 Survey Control

8.1.1.1 BWI Airport Surveying Monuments
Under development

8.1.1.2 Martin State Airport Surveying Monuments

A network of 9 survey control points, including 3 points established by NGS, have been established at Martin State Airport to provide a reliable and accessible system of control for all surveys performed on the airport. Please refer to Appendix F.

Consultants shall use the Martin State Airport Survey Control for all design and construction projects. All project surveys must be tied to the Martin State Airport Survey Control Network shown on the Survey Control Drawing and described in the Survey Control Manual. All contract drawing sets must contain the Martin State Airport "Survey Control" Plan Sheet and a 2nd geometric layout sheet containing the specific geometric layout and coordinate data for the project. This drawing shall also include any and all points set by the contractor for the specific project stating traverse closures and which Martin State Airport control points were used.

The survey control for Martin State Airport is based horizontally on the Maryland State Plane Coordinate System which is tied to the North American Datum of 1983 (NAD 83), and vertically on the North American Vertical Datum 1988 (NAVD 88). Data supplied in the manual meets or exceeds 1st order horizontal survey control accuracies and is equal to or less than 3rd order vertical accuracies as indicated on the individual monument recovery sheet. All monuments are cast in place concrete, 48" deep with aluminum disks stamped "Martin State Airport – Survey Control", and with a point ID.

All monuments are described on monument recovery sheets. Each monument recovery sheet contains "How to reach" descriptions for each control point, coordinates, elevations and pictures of each monument as well as reference sketches. The scale factor given on the recovery sheet is the measure of the linear distortion that has been mathematically imposed on ellipsoid distances so they may be projected onto a plane. These monuments were set in the fall of 2005 and have a stability rating of "C", points subject to surface motion.

Elevations of monuments are based on the North American Vertical Datum of 1988 (NAVD88). Elevations are derived from GPS observations of NGS

benchmark stations MARTAIR AZ (a third order vertical monument), CLOVER (a second order vertical monument), GIS58 (a third order vertical monument), and GIS70 (a third order vertical monument). Elevations are in U.S. Survey Feet.

The consultant is responsible for quality control checking of all new and existing monumentation prior to using the monuments in accordance with standard survey practices. Please notify the Assistant Airport Manager of Martin State Airport (410-859-8826) of damaged and destroyed monumentation immediately.

8.1.2 Site Preparation

1. In all disturbed areas which do not receive pavement, landscaping, or structures, the areas shall be topsoiled a minimum of 3", seeded and mulched or sodded.

2. Temporary Support of Excavation: Construction documents should refer to the Interim Standard Provisions Addenda, SP-6.09 for specifications on Temporary Support of Excavation. This section of the ISPA has been included in Appendix G to this document.

3. Designers shall be sensitive to construction means and methods when developing the design and construction documents. For example, in the area of the terminal MAA would ask the Designer to evaluate whether pile driving would cause damage to the exterior glazing. Also for example, in areas with existing utilities and sensitive FAA equipment, MAA would ask the Designer to evaluate whether certain demolition equipment would cause equipment failure and recommend any restrictions on construction means and methods.

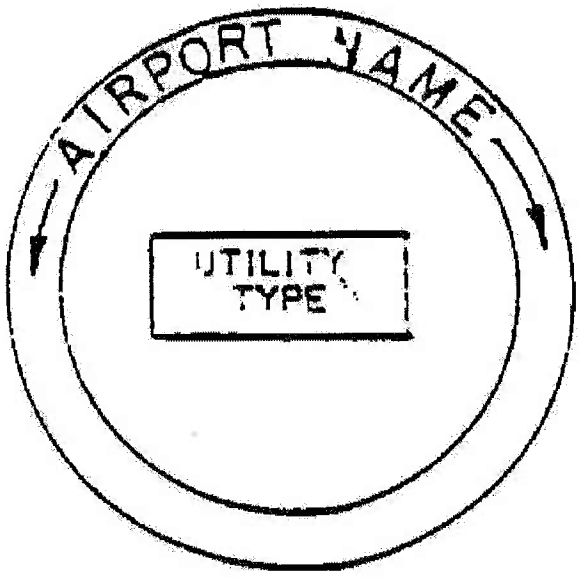
8.1.3 Underground Utility Trenches, Utility Markings, and Manhole/Handhole Covers/LIDS

Utility Markings: The design and construction of all BWI and Martin State Airport projects shall include the requirement to mark all underground utilities with magnetic tape. The tape should be 3" wide and positioned at a maximum 8"-12" deep below top of ground, or 4" wide and positioned at a maximum 3"-6" deep below the bottom of pavements.

Manhole/Handhole Covers/Lids: All new and replacement manhole/handhole covers/lids shall include customized cover/lid surface lettering as follows:

All Airport manhole/handhole covers/lids shall include the name "BALTIMORE/WASHINGTON INTERNATIONAL AIRPORT" or "MARTIN STATE AIRPORT" and the type of utility: "ELECTRIC", "STORMWATER", "SANITARY SEWER", "WATER", "GAS", "TELEPHONE." Lettering shall be Helvetica, medium, capitalized and 1 ½ inches in height.

"ELECTRIC"
"STORMWATER"
"SANITARY SEWER"
"WATER"
"GAS"
"TELEPHONE"



SHEET TITLE: MANHOLE/HANDHOLE COVER LIDS	DATE: APRIL 2005

8.1.4 Water Mains

8.1.4.1 Backflow Prevention

Refer to Chapter 14 Plumbing for Backflow Prevention standards.

8.1.5 Sanitary Sewers

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.

If a lift station or ejector pit is required, this MUST be brought to the attention of the MAA Office of Engineering and Construction Management during the design process. The exact requirements of the design will then be provided for inclusion in the project construction documents.

SEWAGE EJECTOR PIT DESIGN: All projects with sewage ejector pits should be designed with the ejector motors, pumps, impellers and related equipment outside the actual "sewage pit." One acceptable method is to construct a wetside/dryside pit. All motors, pumps, impellers, and equipment would be installed on the dryside with pipe connections to the wetside (sewage pit side). The dryside of the pit would be sealed tight to prevent water and sewer gases infiltration. Other concepts will require the approval of the MAA Division of Facilities Design project manager and the Division of Maintenance. Refer to the Restroom Design Standards in Appendix-for further information on sewage ejection pit design.

8.1.6 Electric/Phone/Telecommunications

8.1.6.1 Parking Facility Public Telephones

Parking facilities shall be equipped with public telephones. The Contractor should install the concrete pad and necessary conduits at the phone location. The telephone company (Verizon) should pull wiring and install housing and telephone.

8.1.7 Miscellaneous Site Elements

8.1.7.1 Bollards

All bollards shall be a minimum of six (6) inches in diameter steel pipe and concrete filled.

8.2 AIRFIELD CIVIL/SITEWORK

8.2.1 Pavement Design

1. No. 2 Stone: The design and construction of all Martin State (MTN) Airport projects shall include the requirement of placing an additional layer of No. 2 Stone under the design pavement section. Due to the excessive amount of unsuitable material located at MTN, MAA recommends the consultant place No. 2 Stone and filter fabric over the entire paved area. The unsuitable material shall be removed and backfilled as determined by the engineer. No. 2 Stone shall then be placed at a depth determined by the engineer prior to the placement of the subbase material. In addition, the engineer shall require filter fabric to be placed below and above the section of No. 2 Stone. Refer to exhibit on the following page titled "*MARTIN STATE AIRPORT SECTION*" dated April 2005.

2. Subbase and Base Course: Cement Treated Base Course materials shall not be used in the design and construction of flexible pavements in projects at BWI or Martin State Airports.

9.2.1.1 Federal Aviation Administration (FAA) Specification Incentives

The Federal Aviation Administration (FAA) P-501 Portland Cement Concrete Pavement specification and the P-401 Plant Mix Bituminous Pavement specification includes an incentive for flexural strength.

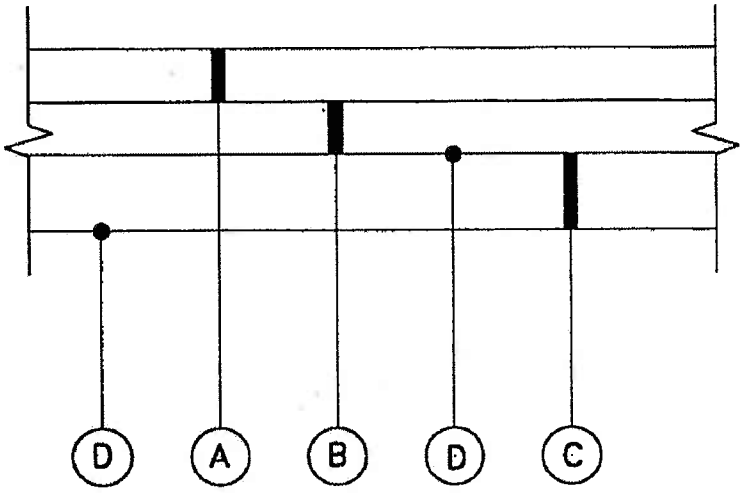
In order to accommodate the increased costs associated with the incentive, without issuing a change order, MAA is providing the following directions for preparation of the contract specifications and bid tabulation forms:

In the specifications, add the following to the P-501 Basis of Payment Section:

"An allowance has been included as Item P-501-8.1c. Payment of any or all of the bid amount for P-501-8.1c will be based on any adjusted payment in excess of 100 percent when computed in accordance with Paragraph 501-8.1a.

Payment will be made under:

Item P-501-8.1c (__)*-inch Portland Cement Concrete Pavement Incentive."
* filled in by designer



TYPICAL SECTION

NOT TO SCALE

LEGEND

(A) PORTLAND CEMENT CONCRETE/ BITUMINOUS ASPHALT PAVEMENT *

(B) CRUSHED AGGREGATE BASE COURSE *

(C) NO. 2 STONE *

(D) FILTER FABRIC

* DEPTH TO BE DETERMINED BY THE ENGINEER

SHEET TITLE: MARTIN STATE AIRPORT SECTION	DATE: APRIL 2005

In the bid tabulation forms, add a Portland Cement Concrete Incentive allowance item. The allowance amount should be calculated by multiplying the estimated costs for Portland Cement Concrete Pavement by 0.06.

In the specifications, add the following to the P-401 Basis of Payment Section:

"An allowance has been included as Item P-401-8.1c. Payment of any or all of the bid amount for P-401-8.1c will be based on any adjusted payment in excess of 100 percent when computed in accordance with Paragraph 501-8.1a.

Payment will be made under:

Item P-401-8.1c Bituminous Concrete Pavement Incentive."

In the bid tabulation forms, add a Bituminous Concrete Pavement allowance item. The allowance amount should be calculated by multiplying the estimated costs for Bituminous Concrete Pavement by 0.06.

8.2.2 Pavement Marking

All permanent pavement markings on the airfield at both Baltimore/Washington International Thurgood Marshall Airport and Martin State Airport, with the exception of black markings, shall be waterborne paint containing glass beads.

Paint shall be waterborne in accordance with Federal Specification TT-P-1952D, Type I or Type II depending on usage [Type I has a standard drying time (no pick-up when tested in accordance with ASTM D 711), Type II may be used for striping where faster curing is desirable]. Paint shall be furnished in [white (37925), yellow (33538 or 33655), red (31136), black (37038), and pink (1 part red – 31136 to two parts white – 37925)] in accordance with Federal Standard Number 595. Black paint should be used to outline a border at least six inches wide around markings on all light colored pavements. Black paint shall not contain glass beads.

Glass beads shall meet the requirements for Federal Specification TT-B-1325C, Type III. Glass beads shall be treated with all compatible coupling agents recommended by the manufacturers of the paint and reflective media to ensure adhesion and embedment.

8.3 LANDSIDE CIVIL/SITEWORK

8.3.1 Roadways and Parking

8.3.1.1 Concrete Curb

Only Combination Curb and Gutter shall be used as per MDSHA Standard 620.02. Straight Curb shall not be used under any circumstances.

8.3.2 Pavement Design

The preferred pavement mixes used on the landside shall be from this list:

1. 9.5 mm PG 64-22 Level 2
2. 9.5 mm PG 64-22 Level 2 HPV
3. 9.5 mm PG 64-22 Level 4
4. 9.5 mm PG 64-22 Level 4 HPV
5. 9.5 mm PG 76-22 Level 4
6. 9.5 mm PG 76-22 Level 4 HPV
7. 9.5 mm PG 76-22 Level 4 GAP
8. 12.5 mm PG 64-22 Level 2
9. 12.5 mm PG 64-22 Level 2 HPV
10. 12.5 mm PG 64-22 Level 4
11. 12.5 mm PG 64-22 Level 4 HPV
12. 12.5 mm PG 76-22 Level 4
13. 12.5 mm PG 76-22 Level 4 HPV
14. 12.5 mm PG 76-22 Level 4 GAP
15. 19.0 mm PG 64-22 level 2
16. 19.0 mm PG 64-22 Level 4
17. 25.0 mm PG 64-22 Level 2
18. 25.0 mm PG 64-22 level 4

Landside (Superpave) Pavement Lift Thicknesses

Nominal Aggregate Size	Lift Thickness
9.5 mm	1.0 to 2.0"
12.5 mm	1.5 to 3.0"
19.0 mm	2.0 to 4.0"
25.0 mm	3.0 to 5.0"

Airside (P-401) Pavement Lift Thicknesses

Maximum Aggregate Size	Lift Thickness
1/2"	1.0 to 2.0"
3/4"	1.5 to 3.0"
1"	2.0 to 4.0"
1-1/4"	3.0 to 5.0"

8.3.3 Landscaping

The MAA Office of Planning and Environmental Services has developed Landscaping, Topsoil, Seeding, and Sodding specifications for MAA owned and operated Airports. The specifications are found in Appendix D and should be used in the design and construction of projects at BWI and Martin State Airports. Design of Forest

Conservation Plans and exceptions to the specifications must be coordinated with the Manager, Division of Environmental Planning.

CHAPTER 9: PASSENGER BOARDING BRIDGES

9.1 GENERAL

Projects which install and/or modify loading bridges should be designed and specified to allow operation from the forward 2 passenger doors of the aircraft where applicable.

9.1.1 Pre-Conditioned Air and 400 Hertz Systems (and Associated Loading Bridge Requirements

1. An airline (tenant) assigned gates on a preferential use basis will be responsible for the installation and maintenance of PC and 400 Hz equipment on its preferential use passenger boarding bridges. Upon terminating the preferential use of the gate, the airline shall remove, at its sole expense, the PC Air and 400 Hz equipment.

2. MAA, which owns and assigns the common use gates, will be responsible for the installation and maintenance of the PC Air and 400 Hz equipment on the common use passenger boarding bridge(s). MAA will determine the need and timetable for providing this equipment.

9.1.1.1 Design and Construction Requirements

1. Loading Bridge Requirements: Loading Bridges shall be specified to readily accept PC Air and 400 Hz equipment. In circumstances where the PC Air and 400 Hz equipment is to be installed at a later date, the loading bridge shall be specified to allow installation of the heaviest Point of Use (POU) equipment which satisfies the largest aircraft requirements of that gate.

2. All PC Air and 400 Hz equipment for preferential use and common use gates shall be designed and constructed to include separate metering, allow separate billing of electrical usage, and connection to MAA's METASYS Building Management System.

3. All PC Air and 400 Hz equipment installed at existing gates and passenger boarding bridges shall be POU units.

4. All PC Air and 400 Hz equipment installed at newly constructed terminals and concourses shall be POU units. Centralized systems will be considered by MAA when the installer can meet the following requirements:

   a. Demonstrates through cost benefit analysis the viability of the central system.
   b. Agrees to lease all areas associated with the central system equipment.
   c. Satisfies all concerns related to location of equipment in the building and on the aircraft ramp, line-of-sight issues, aesthetic issues, real estate issues, and operational issues.

d. For centralized PC Air, the glycol loop piping shall be constructed with soldered or welded joints (not threaded), and will be placed in the lower level only, keeping it out of public spaces. All main supply piping for the glycol loop shall be located in the interior of the building.
e. For 400 Hz systems, all main supply conduits and wires shall be located in the interior of the building, except for branch conduit and wire needed for connection to the passenger boarding bridge.

5. 400 Hz systems are known to produce harmonics. In order to mitigate the harmonic effects, each piece of 400 Hz equipment must comply with the following performance criteria:

a. Harmonics content: total harmonic distortion of the input current wave form, as measured at the input terminals, shall be 30% of the lower whenever load is 50% of rated output or higher.
b. Power factor: the power factor measured at the input terminals shall be 90% or higher whenever load is 50% of rated output or higher.

6. All PC Air and 400 Hz units shall be located on the underside of the passenger boarding bridges, and not on the ground. In situations where supporting equipment from the underside of the passenger boarding bridge is not possible and requires ground mounting, equipment must be located to allow efficient and safe snow removal and ramp operations. All proposed locations of PC Air and 400 Hz ground mounted equipment must be approved by MAA.

7. Installation of the PC Air and 400 Hz equipment on the passenger boarding bridge should not affect the structural integrity, operation, or the warranty of the passenger boarding bridge.

8. Building Permit Approval: An airline (tenant) installing PC Air and 400 Hz equipment at its preferential use gate(s) will be required to obtain an MAA building permit. Notwithstanding the other requirements of the building permit process, the airline will be required to coordinate the installation of PC Air and 400 Hz equipment with MAA's passenger boarding bridge repair and maintenance contractor. MAA's contractor will review and inspect the installation. In addition, catalog cuts and data for all proposed equipment should be submitted to MAA for review and approval.

9.1.2 Grounding Protection

A ground rod is required at each passenger boarding bridge pedestal base. The ground rod shall be connected to the pedestal in accordance with Chapter 18.3.1 Grounding.

CHAPTER 10: ENVIRONMENTAL PROCEDURES AND REQUIREMENTS

Also refer to section 4.8 for Environmental Coordination.

10.1 SEDIMENT CONTROLS AND STORMWATER MANAGEMENT

10.1.1 Sediment and Erosion Control

Refer to Chapter 4.11.1.2 for Standard MDE Sediment and Erosion Control Notes and Plans.

10.1.2 Stormwater Management Facilities (SWM)

The MAA Office of Planning and Environmental Services has developed a Design Criteria Manual for Stormwater Management Design and Stream Restoration, and Comprehensive Stormwater Management Plans for BWI Thurgood Marshall and Martin State Airports. The requirements of these three documents must be followed in the design and construction of projects at BWI and Martin State Airports.

The following information outlines the general requirements for SWM at BWI Thurgood Marshall and Martin State Airports, more specific information is provided in the Design Criteria Manual for SWM Design and Stream Restoration.

A. BWI Thurgood Marshall Airport

Designers must comply with the Maryland Department of the Environment's (MDE's) stormwater management requirements as set forth in MDE's *2000 Stormwater Design Manual*. The regulations outlined in this manual must be used during the design of all new stormwater management facilities on MAA-owned property on or near BWI Thurgood Marshall Airport. MDE requires both quantity and quality control of stormwater and establishes goals for both in the *2000 Stormwater Design Manual* (MDE, 2000).

Designers must also comply with enforceable guidance set forth by FAA. To ensure the safety of the traveling public, Designers must adhere to FAA's enforceable guidance set forth in Advisory Circular (AC) No. 150/5200-33 "*Hazardous Wildlife Attractants on and Near Airports*".

The FAA AC presents enforceable guidance for minimizing wildlife strike hazards through the reduction of wildlife attractants. FAA defines a wildlife attractant as:

> *Any human-made structure, land use practice, or human-made or natural geographic feature that can attract or sustain hazardous wildlife within the landing or departure airspace, aircraft movement area, loading ramps or aircraft parking areas of an airport. These attractants can include but are not limited to*

architectural features, landscaping, waste disposal sites, wastewater treatment facilities, agricultural or aquacultural activities, surface mining, or wetlands.

The AC also provides guidance on placement and design of these facilities to achieve water quality goals while minimizing the potential for creation of a wildlife attraction. FAA's siting criteria for potential wildlife attractants state that wildlife attractants should not be within 10,000 feet of an airport's aircraft movement areas (including loading ramps and parking areas) or within 5 statute miles of approach or departure airspace, if the attractant may cause hazardous wildlife movement into or across the approach or departure airspace. When facilities that create open water exist within 5 statue miles of the airport, FAA's enforceable guidance requires that they drain within 24 hours following a one- or two-year storm event and within 48 hours following a ten-year storm event.

MDE recommendations strive to treat and store the water quality volume according to specific minimum detention times to improve water quality, but the holding times frequently exceed the holding times associated with FAA's wildlife guidance. Because MDE's stormwater management requirements and FAA's enforceable guidance conflict in some areas, MAA has developed specific criteria and innovative designs to fulfill MDE and FAA criteria (see Table 2.1).

10.1.2.1 Stormwater Management Requirements

Stormwater Management Ponds

MDE's *2000 Stormwater Design Manual* requires that stormwater management ponds constructed in Use III (Piny Run) and Use IV (Stony Run) watersheds are designed with a maximum detention time of 12 hours for the channel protection storage volume (i.e., the one-year storm event). MDE also requires the installation of a 3-inch low-flow orifice to prevent the pipe from clogging and to help ensure that the pond can drain in accordance with the designated time. These requirements are essential to preventing prolonged periods of standing water and support the FAA criteria.

FAA recommends the use of steep-sided, narrow, linear-shaped detention basins as opposed to retention basins, which retain the water quality volume for longer periods of time. MDE recommends the use of long flow paths (minimum ratio of 1.5:1 of length to width) and irregularly-shaped ponds, which coincides with the FAA criteria.

Stormwater Wetlands

Stormwater wetlands are typically used to treat and store the water quality volume through the use of small permanent pools and extended detention periods. As in the case of stormwater management ponds, MDE requires that flow paths be maximized and the surface area of a stormwater wetland be at least 1% of the

total drainage area of the facility. MDE also requires that at least 25% of the total water quality volume be in deepwater zones, with a minimum depth of 4 feet, and a minimal coverage of 50% in the planting zones after the second growing season. Both of these requirements can create large areas containing surface water and vegetation that are very attractive to wildlife. FAA prohibits the construction of stormwater wetlands and artificial marshes within 5 miles of an approach or departure surface.

Filtering Systems

MDE recommends that sand filters be designed to drain within 40 hours and that bioretention facilities be designed to drain within 48 hours and requires that the top few inches of colored material be removed and replaced with fresh material when the water remains on the surface of the filter bed for more than 72 hours. FAA requires that stormwater management facilities drain within 24 hours following a one- or two- year storm event and within 48 hours following a ten-year storm event.

MDE requires that underground sand filters be constructed with a gate valve located just above the filter bed for dewatering in the event of clogging. This drainage recommendation supports the FAA guidance, because it prevents conditions that would create standing water and attract hazardous wildlife.

Infiltration Systems

Infiltration is an important factor in predicting and reviewing drainage time, because many stormwater management detention ponds are used to store and treat the water quality volume in the bottom of the stormwater management ponds. Therefore, infiltration is paramount in preventing the formation of standing water for prolonged periods. MDE requires infiltration rate testing to ensure that the infiltration rate be no less than 0.52 inch per hour for infiltration trenches and basins. If the infiltration rate is less than 0.52 inch per hour for a surface sand filter or a bioretention facility, MDE requires the installation of an underdrain. In addition, MDE requires that infiltration tests be performed during the final plan phase and the grading permit phase. These requirements are essential for ensuring that infiltration facilities drain within reasonable periods.

Open Channel Systems

Open channel systems are usually designed with check dams to capture and treat the full water quality volume within dry or wet cells. MAA requires an underdrain for the dry swale to ensure this maximum ponding time is met and vegetation to mask the ponded water using appropriate species as presented in *Specifications for Performing Landscape Activities for the Maryland Aviation Administration* (see Appendix E).

Vertical Clearance Guidelines for Groundwater Table

In addition to the infiltration rate requirements, MDE provides vertical clearance guidelines for the groundwater table. If the groundwater table is intercepted, it can create volumes and periods of standing water that exceed those addressed by the original design. MDE's vertical clearance guidelines for the groundwater table reduce the potential for prolonged periods of standing water and support FAA and MAA goals for stormwater management facilities within the Airport Zone.

10.1.2.2 Facility Locations and Restrictions

To further reduce wildlife attractiveness associated with stormwater management facilities for BWI Airport, MAA has designated Wildlife Hazard Management (WHM) zones in which various types of stormwater management facilities are appropriate. WHM Zone A includes all property within Aviation Boulevard as well as all aircraft approach and departure airspaces to a distance of 5 statute miles. WHM Zone B includes all other property within 5 statute miles of BWI.

Within WHM Zone A, no new stormwater management facilities with open water components may be constructed. This includes, but is not limited to, detention and retention facilities, bioretention facilities, artificial marshes and wetland mitigation projects. *To achieve water quality and quantity associated with new MAA development within WHM Zone A, stormwater management facilities must be constructed underground.*

Within WHM Zone B, open water stormwater management facilities are permissible; however, as stated in the FAA AC, they must drain within 24 hours of 1- and 2- year storm events and within 48 hours of 10- year storm events. Appropriate masking techniques should be implemented if the facility retains water for more than 24 to 48 hours or if the facility attracts potentially hazardous wildlife (see Appendix E).

10.1.2.3 Landscaping Guidance

MAA provides guidance for landscaping (including appropriate seed mixtures) in its *Specifications for Performing Landscaping Activities for the Maryland Aviation Administration* (see Appendix E). In this document, MAA details appropriate species to utilize during design of new stormwater management facilities.

Table 2-1

Summary of MAA's Design Criteria for Stormwater Management Facilities

Facility	MDE Regulation	FAA Guidance	MAA Design Criteria
Stormwater Management Ponds	• Maximum detention time of 12 hours for channel protection volume (i.e., the one-year storm). • Long flow paths (minimum ratio of 1.5:1). • Permanent pool to meet water quality volume requirements.	• Maximum detention time of 12 hours. • Long flow paths (minimum ratio of 1.5:1). • No permanent pools (open water is considered to be a wildlife attractant.	• Maximum detention time of 12 hours. • Long flow paths (minimum ratio of 1.5:1). • No permanent pools (open water is considered to be a wildlife attractant.
Stormwater Wetlands	• Typically used to treat and store the water quality volume through the use of small permanent pools and extended detention periods.	• Neither stormwater wetlands nor artificial marshes should be constructed within 5 miles of an approach or departure surface.	• Neither stormwater wetlands nor artificial marshes should be constructed on MAA property within 5 miles of an approach or departure surface.
Filtering Systems	• Sand filters should drain within 40 hours. • Bioretention facilities should drain within 48 hours and replaced when water remains for more than 72 hours.	• FAA requires standing water to drain within 24 hours following a 1- or 2- year event, and within 48 hours following a 10- year event	• Design all filtration systems to drain within 24 hours following a 1- or 2- year event, and within 48 hours following a 10- year event. • Replace filter material when water remains on the surface of the filter bed for more than 24 hours following a 1- or 2- year event, or more than 48 hours following a 10- year event.

Table 2-1

Summary of MAA's Design Criteria for Stormwater Management Facilities

Facility	MDE Regulation	FAA Guidance	MAA Design Criteria
Infiltration Systems	• All infiltration systems must dewater the entire water quality volume with 48 hours of a storm event. • An observation well must be installed in every trench to measure and ensure that the trench drains properly.	• FAA requires standing water to drain within 24 hours following a 1- or 2- year event, and within 48 hours following a 10- year event.	• All infiltration systems must dewater the entire water quality volume within 24 hours following a 1- or 2- year event, and within 48 hours following a 10-year event.
Open Channel Systems	• The maximum allowable ponding time within an open channel be less than 48 hours. • Provide an underdrain for the dry swale to ensure this maximum ponding time is met.	• FAA requires standing water to drain within 24 hours following a 1- or 2- year event, and within 48 hours following a 10- year event.	• FAA requires standing water to drain within 24 hours following a 1- or 2- year event, and within 48 hours following a 10- year event. • Provide an underdrain for the dry swale to ensure this maximum ponding time is met. • Provide vegetation to mask the ponded water using appropriate species as presented in *Specifications for Performing Landscape Activities for the Maryland Aviation Administration* (see Appendix E).
Vertical Clearance Requirements	• MDE provides vertical clearance guidelines for the groundwater table to reduce the potential for prolonged periods of standing water.	• FAA guidance warns against the creation of standing water for prolonged periods	• Adhere to Section 4.4 of MDE's guidance for the minimum depth to the seasonally high water table.

10.1.2.4 Stormwater Management Facility Design Guidance

During Phase II of its Comprehensive Stormwater Management Plan Update, MAA analyzed stormwater runoff from existing and proposed future development for each of the 22 subwatersheds associated with BWI Thurgood Marshall Airport. Based on this data, MAA identified the need for retrofit SWM facilities within each subwatershed to provide improved control for impervious areas developed since 1993, and identified water quality control needs fro development within each subwatershed, as proposed in its Draft Airport Layout Plan.

Designers should coordinate with the MAA Project Manager and Office of Planning and Environmental Services to determine if the watershed improvements are required as part of their proposed projects.

Existing Conditions and Immediate Stormwater Management Needs

During the Phase II investigation, MAA identified six of the 22 subwatersheds associated with BWI Thurgood Marshall Airport and MAA property require additional SWM facilities to achieve the goals of MDE's recent guidelines. Table 3-1 summarizes these results.

Table 3-1

Existing Conditions
Channel Protection and Overbank Flood Protection Volume Requiements
(acre feet)

Drainage Basin	Additional Channel Protection Storage Volume	Additional Overbank Flood Protection Volume
Tributary of Sachs Branch	0	0
Sachs Branch	0	0
Kitten Branch	0	0
King Branch	0	0
Tributary North of King Branch	0	0
Bowden Branch	0	0
Signal Branch	0	0
Hawkins Branch	0	0
Clark Branch	0	0
Tributary of Stony Run	Data not available	Data not available
Tributary of Piny Run	Data not available	Data not available
Sawmill Creek	0.48	2.40
Sawmill 2 Tributary South of Runway 15R-33L)	0.25	1.16
Sawmill 3 (Tributary 22B)	0	0
Fork Branch	0.47	2.33
Phelps Branch	0	0

Tributary at Southeast Corner	0	0
Irving Branch	1.36	4.95
Tributary to Irving Branch	0	0
Southwest Branch	0	0
Muddy Bridge Branch	0	0
Cabin Branch	1.16	11.86

Future Stormwater Management Requirements:

Future stormwater management needs were projected for each subwatershed based on projects proposed in the BWI Thurgood Marshall Airport Draft Airport Layout Plan. Table 3-2 details future requirements for water quality, recharge, channel protection storage, and overbank flood protection volumes.

Table 3-2

Water Quality, Recharge Volume, Channel Protection and Overbank Flood Protection Volume Requirements- Future Conditions

Drainage Basin	Future Requirements (acre- feet)			
	Water Quality Volume	Recharge Volume	Channel Protection Storage Volume	Overbank Flood Protection Volume
Tributary of Sachs Branch	0.80	0.17	0.71	2.66
Sachs Branch	7.3	0.38	11.10	18.40
Kitten Branch	6.52	0.65	11.83	26.59
King Branch	0.30	0.04	0.63	1.96
Tributary North of King Branch	0	0	0	0
Bowden Branch	0.81	0.11	0.99	2.48
Signal Branch	3.29	0.61	3.10	6.24
Hawkins Branch	11.65	2.89	14.49	28.39
Clark Branch	4.97	1.52	4.36	14.23
Tributary of Stony Run	3.07	0.74	6.17	10.38
Tributary of Piny Run	8.13	1.4	9.92	14.31
Sawmill Creek	1.77	0.45	2.16	3.99
Sawmill 2 (Trib. South of Runway 33L)	0.35	0.12	0.17	0.69
Sawmill 3 (Tributary 22B)	0.11	0.03	0.02	0.23
Fork Branch	0.92	0.19	0.73	2.86
Phelps Branch	0.52	0.18	0	0.25
Tributary at Southeast Corner	0.37	0.13	0	0.26
Irving Branch	0.81	0.17	0.53	2.21
Tributary to Irving Branch	0.13	0.03	0.12	0.40

Southwest Branch	0.34	0.07	0.35	1.24
Muddy Bridge Branch	4.15	0.66	8.06	17.27
Cabin Branch	2.53	0.58	3.70	10.63

Stormwater Hotspots

MDE requires developers to provide additional water quality treatment (WQv) for any new facility that has the potential to generate hydrocarbons, trace metals, or toxicants at concentrations that exceed those found in typical stormwater runoff. For BWI Thurgood Marshall, additional water quality treatment is required for sites that are used for aircraft deicing vehicle washing, fueling, or maintenance; and fuel storage including outdoor loading and unloading locations. MDE regulations refer to these locations as hotspots and requires either structural best management practices or pollution prevention practices to pretreat stormwater discharges prior to its release to the stormwater system and ultimately to the groundwater through infiltration or surface streams.

Proposed development for the planning period from 2000 to 2010 includes three potential "hot spots": the Concourse F gates, the expansion area of Pier E gates, and the hold block deicing pad proposed at the west end of Runway 10-28. These areas are all locations where deicing fluids would be applied during the deicing season. As with existing concourse gate areas at BWI Airport and other deicing pad locations, the design of Concourse E expansion, Concourse F, and the 10-28 deicing pad would include a storm drain collection system to collect runoff containing deicing fluid. The collected fluid would be diverted to storage facilities located in the fuel farm and discharged to the sanitary sewer system for treatment at the Patapsco Wastewater Treatment Plant.

MAA Stormwater Management Design Guidance

Table 3-3 details the design guidance provided by MAA for appropriate stormwater management facilities within the BWI Thurgood Marshall Airport WHM Zones.

Table 3-3

Maryland Aviation Administration Stormwater Management Siting Criteria and Design Guidance

Facility	Zone A	Zone B

Stormwater Management Ponds	• Cannot be sited within WHM Zone A	• Can be sited within WHM Zone B; however, standing water must drain within 24 hours following a 1- or 2-year event, and within 48 hours following a 10- year event. • Long flow paths (minimum ratio of 1.5:1) • No permanent pools (open water is considered to be a wildlife attractant).
Stormwater Wetlands	• Cannot be sited within WHM Zone A- Neither stormwater wetlands nor artificial marshes should be constructed on MAA property within 5 miles of an approach or departure surface.	• Cannot be sited within WHM Zone B- Neither stormwater wetlands nor artificial marshes should be constructed on MAA property within 5 miles of an approach or departure surface.
Filtering Systems	• Cannot be sited within WHM Zone A if an open water component exists.	• Can be sited within WHM Zone B; however, standing water must drain within 24 hours following a 1- or 2-year event, and within 48 hours following a 10- year event. • Filter material must be replaced when water remains on the surface of the filter bed for more than 24 hours following a 1- or 2- year event, or more than 48 hours following a 10- year event.

Table 3-3

Maryland Aviation Administration Stormwater Management Siting Criteria and Design Guidance

Facility	Zone A	Zone B
Infiltration Systems	• Cannot be sited within WHM Zone A if an open water component exists.	• Can be sited within WHM Zone B; however, all infiltration systems must dewater the entire water quality volume within 24 hours following a 1- or 2-year event, and within 48 hours following a 10- year event.
Open Channel Systems	• Cannot be sited within WHM Zone A	• Can be sited within WHM Zone B; however, all infiltration systems must dewater the entire water quality volume within 24 hours following a 1- or 2-year event, and within 48 hours following a 10- year event. • Underdrain must be provided for the dry swale to ensure this maximum ponding time is met. • Vegetation must be provided to

		mask the ponded water using appropriate species as presented in Specifications for Performing Landscape Activities for the Maryland Aviation Administration (see Appendix C).
Vertical Clearance Requirements	• Adhere to Section 4.4 of MDE's guidance for the minimum depth to the seasonally high water table.	• Adhere to Section 4.4 of MDE's guidance for the minimum depth to the seasonally high water table.

10.1.3 Stream Restoration

In its Phase II: Existing and Future Stormwater Management Needs Comprehensive Stormwater Management Plan Update, MAA identified streams that were unstable due to stormwater-related channel bed and bank erosion. MAA proposes stream restoration to restore stability and improve water quality conditions in these locations. MAA identified potential stream restoration projects for stream channels identified as unstable in Table 4-1.

Designers should coordinate with the MAA Project Manager and Office of Planning and Environmental Services to determine if the stream improvements are required as part of their proposed projects.

Table 4-1

Geomorphic Stability:
Existing Conditions at BWI Airport

Drainage Basin	Geomorphic Stability
Stony Run	NA
Sachs Branch	Unstable
Kitten Branch	Unstable
King Branch	NA
Tributary North of King Branch	NA
Bowden Branch	Stable
Signal Branch	Unstable
Hawkins Branch	Unstable
Clark Branch	Unstable
Tributary of Piny Run	NA
Tributary of Stony Run	NA
Sawmill Creek	Unstable
Sawmill 2 (Tributary South of Runway	Unstable

15R-33L)	
Sawmill 3 (Tributary 22B)	Unstable
Fork Branch	Stable
Phelps Branch	Unstable
Tributary at Southeast Corner	NA
Irving Branch	Unstable
Tributary of Irving Branch	NA
Southwest Branch	NA
Muddy Bridge Branch	Stable
Cabin Branch	Stable

NA= Data are not available because the channel is ephemeral or extends beyond MAA property.

Designers should follow the general design methods and guidance presented in the following sections to ensure that the designs prepared for these restoration projects minimize the potential for attracting potentially hazardous wildlife to the restored streams.

Compliance with FAA Design Guidance

To comply with FAA's enforceable guidance MAA's stream restoration projects must be developed using MAA's *Specifications for Performing Landscaping Activities for the Maryland Aviation Administration.* (Copies of this document can be procured from MAA's Environmental Planner, Office of Facilities Planning.)

MDE Design Guidance

MDE provides general design guidance for stream restoration projects in its publication: *Maryland's Guidelines to Waterway Construction.* In general, stream flow should be diverted by means of a pump around/diversion to temporarily dewater in-channel construction sites. Use of any live stakes, live fascines, brush layering or mattresses, live crib walls, or root wads must conform to MAA's Approved Species List, which is presented in Appendix E.

MAA recommends that stream restoration projects be designed following a natural channel design process that includes:

- A quantitative, field-based method of stream channel geomorphic assessment to understand existing aggradation/degradation processes;
- An identification of stream conditions that would be stable for the restored channel; and
- Restoration design based upon the stable form (i.e., the reference reach). [1]

[1]A discussion of the natural channel design process is presented in: *The Reference Reach, A Blueprint for Natural Channel Design*, 1998, by David Rosgen, Wildland Hydrology, Pagosa Springs, CO.

A quantitative understanding of existing conditions requires the following:

- A field survey of representative pool and riffle cross-sections and a long profile through each reach of the stream channel to be restored,
- Pebble counts,
- Pavement and subpavement sampling and analysis,
- Estimates of bank erosion, and
- Sediment transport rates.

Hydrologic and hydraulic modeling must be performed to understand the response of the existing channel to storm flow events. The results obtained from the model and the field measurement data can be combined to provide a complete quantitative understanding of existing conditions.

The natural channel design method requires field survey at nearby gage sites and a reference reach site. In the design process, the gage site data is used to validate field observations of bankfull discharge. The stable reference reach data is used to determine the dimensionless hydraulic geometry that forms the basis of the design (plan views and typical riffle and pool cross-sections) for the stream restoration project.

To minimize the attractiveness of the stream restoration project area, the plans set, specifications, and special provisions must be prepared using *Specifications for Performing Landscaping Activities for Maryland Aviation Administration* in Appendix E, which provide temporary and permanent seed mixes appropriate for dry and wet conditions. Proposed plantings must be selected from the list of landscape plants provided in the specifications.

B. Martin State Airport
Under development.

10.2 BIRD DETERRENT SYSTEMS

10.2.1 Waterfowl Deterrent System for Sediment Traps at BWI Airport

There is a need to discourage ducks and other waterfowl from being attracted to stormwater in sediment traps. The system proposed for BWI will interfere with the ducks' landing pattern by installing a grid using lightweight wire above the surface of the trap. As they approach a water-filled trap, ducks, geese and other waterfowl will see the grid wires and not attempt to land. A perimeter fence

consisting of two wire strands strung around the posts will keep birds from walking onto the traps.

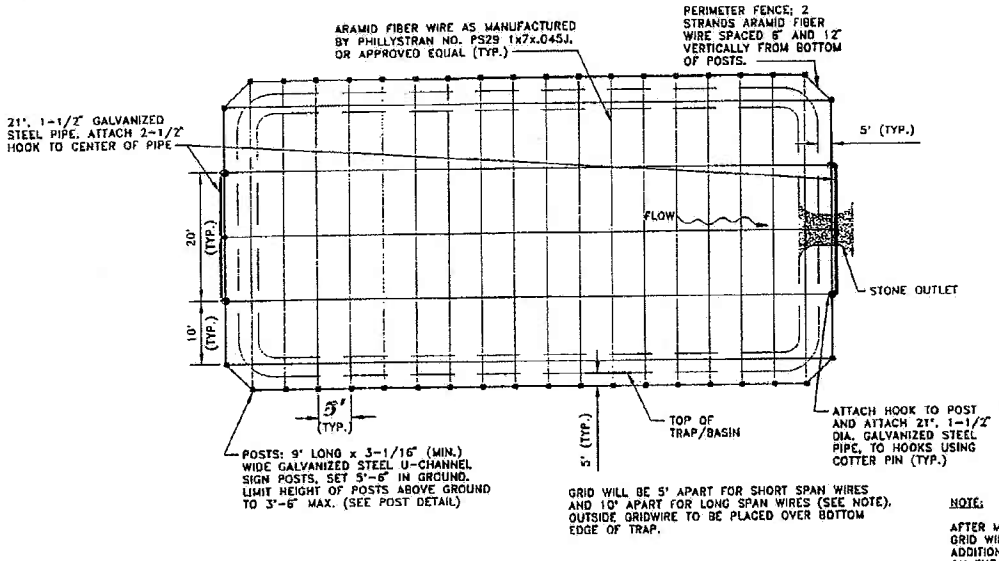
Initial grid spacing will be five feet for short spans and ten feet for long spans. See details for a typical layout. After monitoring the effectiveness of this system, MAA may require installation of additional long spans to decrease spacing to five feet. The ends of the grid wires will be strung from hooks placed on posts three feet above the ground. It is expected that the wires will sag as much as two feet and will exert a maximum line tension of thirty-five pounds.

Grid wire will be high-strength, lightweight synthetic material made from aramid fiber as manufactured by Phillystran, Inc., Part No. PS29 1x7x.045J, or approved equal.

Posts will be nine-foot long galvanized steel U-channel signposts, driven five and one half feet into the ground. The height above ground shall be no more than three and one half feet. Three holes will be drilled into each post to attach one 2 ½ inch hook and two 1 ½ inch eye bolts.

An access gate will be installed on the short end opposite the outlet to facilitate trap cleanout. Each gate consists of a twenty foot long, 1 ½" diameter horizontal pipe placed three feet above ground and spanning two posts spaced twenty feet apart. When sediment is to be cleaned out from the trap, the long pipe is removed. An identical horizontal pipe will also span the stone outlet weir at the opposite end of the trap. Each pipe will have a hook placed in the middle to attach the grid wire.

BIRD DETERRENT SYSTEM FOR SEDIMENT TRAPS AND SEDIMENT BASINS

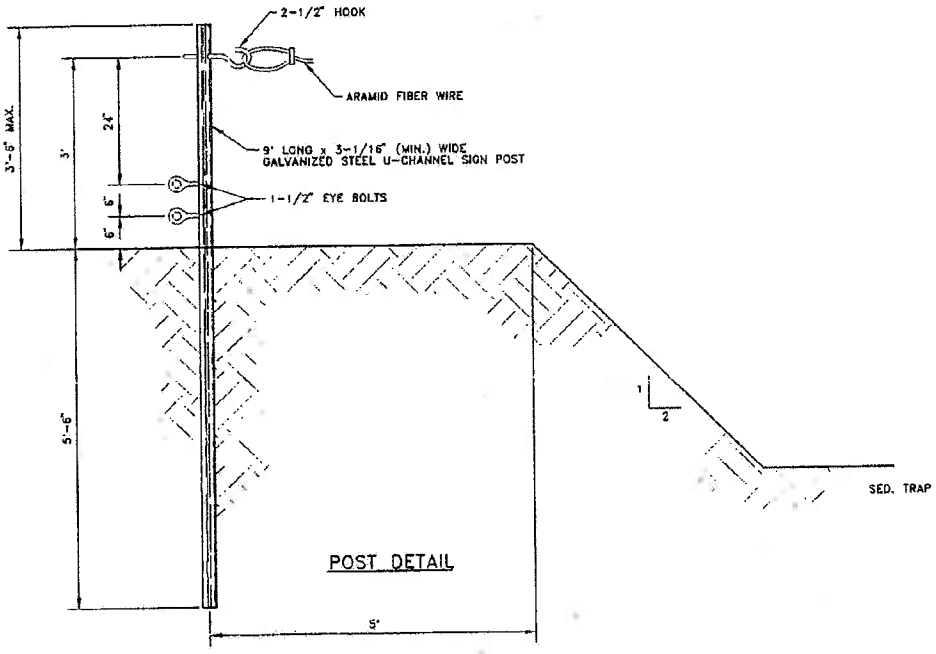


NOTE:

AFTER MONITORING THE EFFECTIVENESS OF THE GRID WIRE SYSTEM, THE ENGINEER MAY ORDER ADDITIONAL POSTS AND WIRES TO BE INSTALLED ON THE LONG SPAN, TO DECREASE SPACING TO 5-FEET.

BIRD DETERRENT SYSTEM FOR SEDIMENT TRAPS AND SEDIMENT BASINS

N.T.S.



POST DETAIL

CONSTRUCTION SPECIFICATIONS

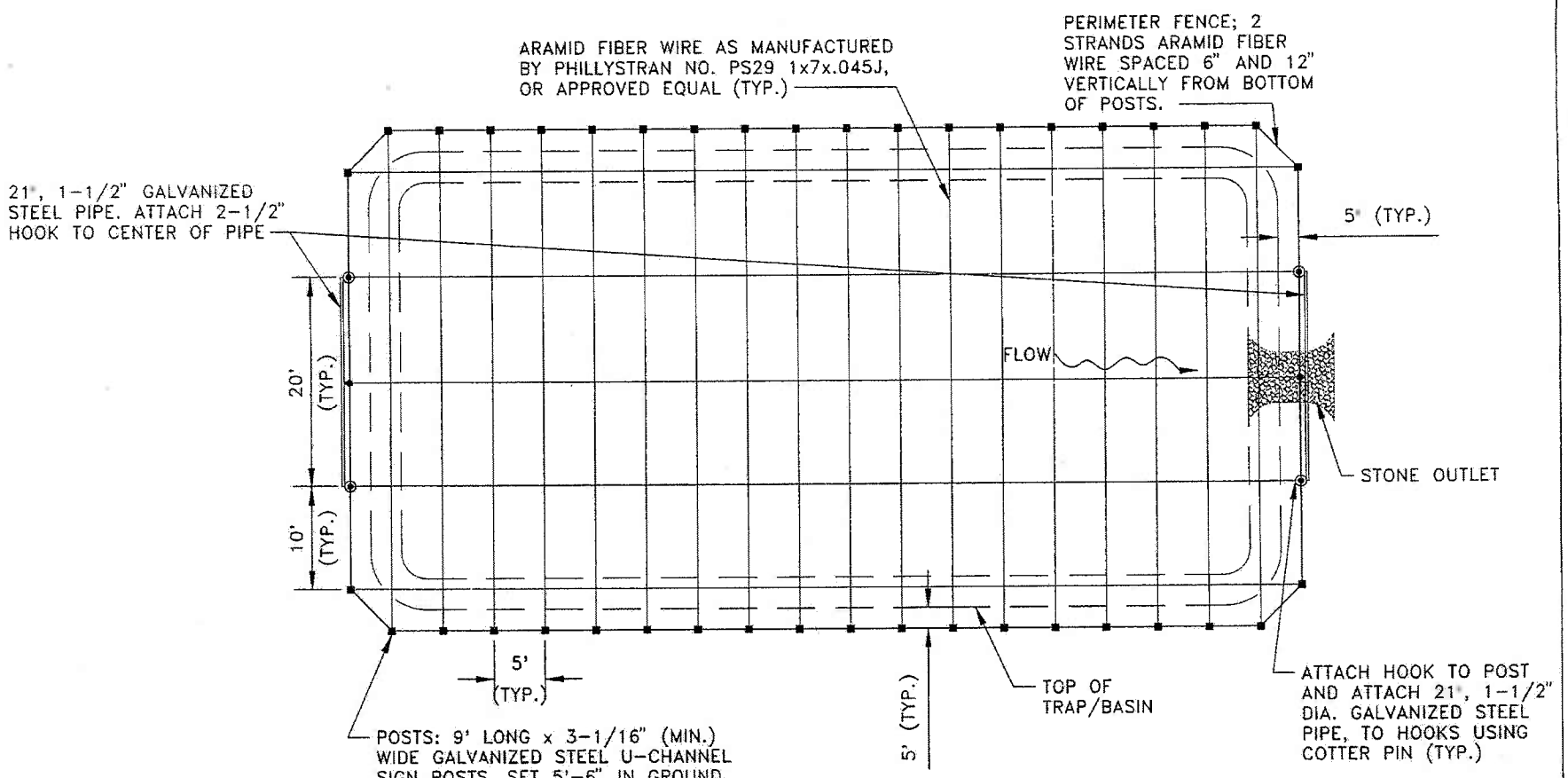
AFTER EACH SEDIMENT TRAP/BASIN IS CONSTRUCTED, POSTS ARE PLACED FIVE FEET OUTSIDE OF THE TOP EDGE OF THE TRAP/BASIN, SPACED FIVE FEET ON CENTER ON THE LONG SIDES AND TEN FEET ON CENTER ON THE SHORT SIDES, LEAVING ONE 20-FOOT GAP FOR THE GATE AND ANOTHER 20-FOOT GAP TO STRADDLE THE OUTLET WEIR. AFTER MONITORING FOR EFFECTIVENESS, INSTALLATION OF ADDITIONAL LONG SPANS MAY BE ORDERED BY THE ENGINEER. ATTACH HOOKS TO POSTS. ATTACH BEAMS TO POSTS STRADDLING OUTLET WEIR AND ACCESS GATE. GRID WIRES WILL THEN BE SIZED AND LOOPS ASSEMBLED ACCORDING TO MANUFACTURER'S DIRECTIONS. GRID WIRES ARE THEN ATTACHED TO POSTS STARTING WITH THE LONG DIMENSION FIRST SO THAT THE LONGER WIRES WILL SAG BELOW THE SHORTER STRANDS. WIRE LENGTHS SHOULD BE SIZED TO ALLOW THEM TO BE PULLED TIGHT WITH TWO FEET SAG IN THE MIDDLE OF THE SPANS. AFTER THE GRID IS IN PLACE, THE TWO-STRAND PERIMETER FENCE CAN BE INSTALLED.

WHEN SEDIMENT NEEDS TO BE CLEANED OUT, DISCONNECT AND STORE THE GRID WIRES. THIS CAN BE DONE WITH A TWO-MAN CREW, ONE ON EITHER END OF THE WIRE. EACH PERSON SHALL DISCONNECT THE WIRE FROM THE HOOK AT THE SAME TIME, WALK BEYOND THE TRAP/BASIN, HOLDING THE WIRE TAUT, AND PLACE THE WIRE ON THE GROUND. THE CREW THEN MOVES TO THE NEXT WIRE AND REPEATS THE PROCEDURE UNTIL ALL THE WIRES HAVE BEEN REMOVED. NEXT, THE CREW SHALL REMOVE THE PERIMETER FENCE STRANDS AT THE ACCESS GATES AS WELL AS THE 21-FOOT LONG HORIZONTAL BEAM. CONTRACTOR'S EQUIPMENT CAN THEN ENTER THE TRAP/BASIN TO REMOVE SEDIMENT. AFTER SEDIMENT REMOVAL, THE CREW SHALL RE-INSTALL GRID ASSEMBLY AS DESCRIBED ABOVE.

SHEET TITLE:	BIRD DETERRENT SYSTEM FOR SEDIMENT TRAPS AND SEDIMENT BASINS	DATE: APRIL 2005

SHEET TITLE: WATER FOWL DETERRENT SYSTEM FOR SEDIMENT TRAPS

DATE: APRIL 2005



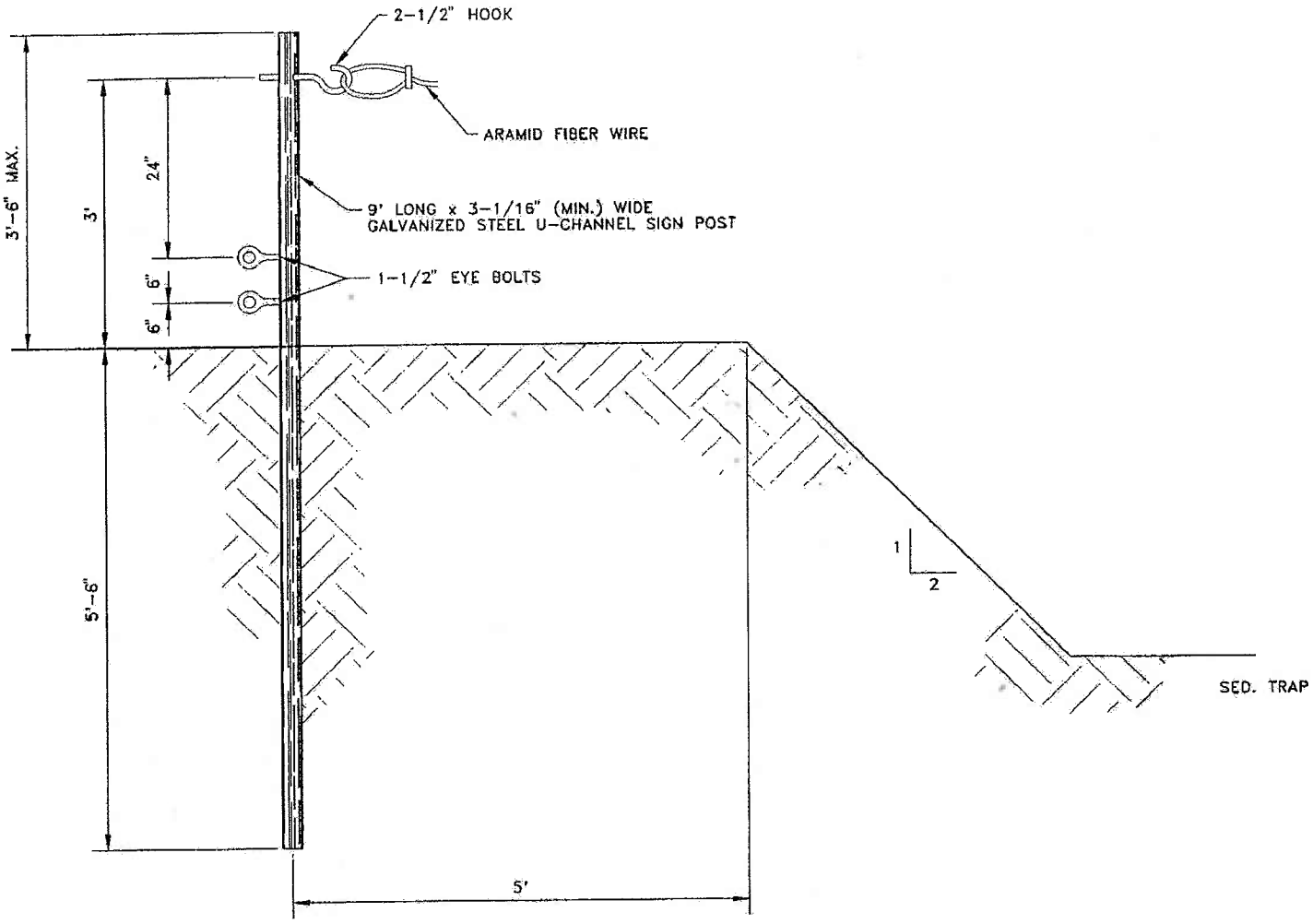
GRID WILL BE 5' APART FOR SHORT SPAN WIRES AND 10' APART FOR LONG SPAN WIRES (SEE NOTE). OUTSIDE GRIDWIRE TO BE PLACED OVER BOTTOM EDGE OF TRAP.

NOTE:

AFTER MONITORING THE EFFECTIVENESS OF THE GRID WIRE SYSTEM, THE ENGINEER MAY ORDER ADDITIONAL POSTS AND WIRES TO BE INSTALLED ON THE LONG SPAN, TO DECREASE SPACING TO 5-FEET.

BIRD DETERRENT SYSTEM FOR SEDIMENT TRAPS AND SEDIMENT BASINS

N.T.S.



POST DETAIL

SHEET TITLE: WATER FOWL DETERRENT SYSTEM FOR SEDIMENT TRAPS	DATE: APRIL 2005

Sediment Trap Bottom Dimensions, ft.	Approximate length per Gridwire, ft.	Number of Gridwires	Total length of Gridwire ft.	Total length of Perimeter Fence ft.	Number of Posts
40' x 85'	113'	5	565'	362'	44
	68'	18	1,224'		
	Trap TOTAL:		**1,789'**		
40' x 70'	98'	5	490'	332'	38
	68'	15	1,020'		
	Trap TOTAL:		**1,510'**		
30' x 105' (2 traps)	125'	4	500'	350'	50
	50'	22	1,100'		
	Trap TOTAL:		**1,600'**		
30' x 150'	175'	4	700'	450'	70
	50'	32	1,600'		
	Trap TOTAL:		**2,300'**		
30' x 155'	170'	4	680'	440'	68
	50'	31	1,550'		
	Trap TOTAL:		**2,230'**		
GRAND TOTAL:			**11,029'**	**2,284'**	**320**

TOTAL LENGTH OF GRIDWIRE: 11,029 + 2 x 2,284 = 15,597 feet

Procedure for Installing and Removing Grid Wire System

After each sediment trap is constructed, posts are placed five feet outside of the top edge of the traps, spaced five feet on center on the long side of the trap and ten feet on center on the short sides, leaving one twenty foot gap for the gate. After monitoring for effectiveness, installation of additional long spans may be ordered by MAA. Attach hooks to posts. Attach beams to posts straddling outlet weir and access gate. Grid wires will then be sized and loops assembled according to manufacturer's directions. Grid wires are then attached to posts starting with the long dimension first so that the longer wires will sag below the shorter strands. Wire lengths should be sized to allow them to be pulled tight with two feet sag in the middle of the spans. After the grid is in place, the two-strand perimeter fence can be installed.

When sediment needs to be cleaned out, disconnect and store the grid wires. This can be done with a two-man crew, one on either end of the wire. Each person shall disconnect the wire from the hook at the same time, walk beyond the trap, holding the wire taut, and place the wire on the ground. The crew then moves to the next wire and repeats the procedure until all the wires have been removed. Next, the crew shall remove the perimeter fence strands at the access gates as well as the twenty-one foot long horizontal beam. Contractor's equipment can then enter the trap to remove sediment. After sediment removal, the crew shall re-install grid assembly as described above.

10.3 UNDERGROUND STORAGE TANKS (UST)

Underground Fuel Storage Tanks (UST) shall be in compliance with the most recent: COMAR 26.10, Maryland Department of the Environment, Oil Pollution and Tank Management Regulation; National Fire Protection Association Code; COMAR 12, State of Maryland Fire Prevention Code; and all related EPA or Federal regulatory requirements.

In addition, UST's shall meet the following requirements:

1. Underground storage tanks shall be one of the following: double-walled fiberglass, double walled steel fiberglass-clad, or jacketed steel with secondary containment. All UST shall have interstitial monitoring capability.

2. UST product and return piping shall be one of the following: UL approved double-walled fiberglass, or UL approved double-walled flexible piping, including the installation of product containment sumps.

3. UST monitoring system shall be one of the following: automatic tank gauging including interstitial monitoring, containment sump, and/or dispenser sump monitoring, with UST high level alarm.

4. UST shall be anchored by means of appropriately sized concrete dead-men or hold-down slab.

5. UST excavation shall be lined with geotextile fabric.

10.4 ABOVE GROUND STORAGE TANKS

Aboveground Fuel Storage Tanks (AST) shall be in compliance with the most recent: COMAR 26.10, Maryland Department of the Environment, Oil Pollution and Tank Management Regulation; all applicable codes of the National Fire Protection Association, including but not limited to, NFPA 1, 30 & 30A, 58, 59, 59A, 70, 385, and 395; COMAR 12, State of Maryland Fire Prevention Code; and all related EPA or Federal regulatory requirements.

In addition, UST's shall meet the following requirements:

1. Aboveground Storage Tanks shall be Double-Wall Vaulted including the Underwriter's Laboratory approval for UL-2085, Fire-Resistant tank. Installation shall be in accordance with manufacturer's specifications. An AST with a storage capacity greater than 10,000 gallons shall be surrounded by a continuous containment dike capable of holding the total tank volume, including a lockable drain valve, in accordance with COMAR 26.10.01.12B-1.

2. AST aboveground piping shall be Schedule 40 galvanized steel. Underground product piping shall be one of the following: UL approved double-wall fiberglass, or UL

approved double-wall flexible petroleum fuel piping including polyethylene conduit, or equal, including the installation of product containment sumps for dispensing units and transition points from aboveground to underground piping.

3. AST monitoring system shall include a tank gauging system, interstitial monitoring, containment sump and/or dispenser sump monitoring, and high-level alarm.

4. Provide a site specific Spill Prevention Control and Countermeasures Plan (SPCC) for review and approval by the MAA Manger of Environmental Compliance.

10.4.1 Glycol ASTs

1. All glycol ASTs shall be compliance wit the most recent regulations of Code of Maryland Regulations (COMAR) 26.10, Oil Pollution and Tank Management and all related Environmental Protection Agency or Federal regulatory requirements.

2. All glycol ASTs shall be in compliance with all applicable codes of the National Fire Protection Association (NFPA), particulary NFPA 1, 10, 30 & 30A, 70, 415, and 704; COMAR 12, State of Maryland Fire Prevention Code, Code of Federal Regulations, and BWI Tenant Directives as follows:

   a. NFPA 1, Fire Prevention Code
   b. NFPA 704, Identification of Fire Hazards
   c. NFPA 10, Fire Extinguishers
   d. NFPA 30, 30A, Flammable & Combustible Liquids Code
   e. NFPA 70, National Electric Code
   f. NFPA 101, Life Safety Code
   g. NFPA 415, Airport Terminal Building, Fuel Ramp Drainage
   h. NFPA 704, Identification of Fire Hazards, Signs/Signal System
   i. Code of Maryland Regulations (COMAR) 26.10, Maryland Department of the Environment Oil Pollution and Tank Management
   j. COMAR 12.03.01.02, Fire Prevention Code
   k. Code of Federal Regulations 40 CFR 112.7, Spill Prevention Control and Countermeasure Plan
   l. BWI Tenant Directive 215.1, Deicing Procedures at Baltimore/Washington International Thurgood Marshall Airport
   m. BWI and MTN Tenant Directive 007.1, Building Permits – Baltimore/Washington International Thurgood Marshall Airport
   n. BWI Tenant Directive 502.1, Airport Fuel/Oil and Hazardous Material Spill Procedures for Legal Reporting Responsibilities
   o. BOCA National Plumbing Code

3. Transport trailer tanks are not permitted for glycol storage.

4. The MAA will permit glycol ASTs to be placed only at those pier locations where gate deicing is permitted (See BWI Tenant Directive 215.1 Deicing Procedures at Baltimore/Washington International Thurgood Marshall Airport). Positioning of tanks shall not interfere with:

    - Emergency terminal exits
    - Fire protection equipment
    - Vehicle traffic
    - Other airport operations
    - Line of sight concerns from the Air Traffic Control Tower

5. Request for tank locations must be approved by the MAA Director of Operations Center prior to submittal of building permit or conceptual design for MAA Facilities Design Division.

6. All glycol ASTs shall be, at a minimum, steel or noncombustible material, UL Listed single walled construction. Installation is to be in accordance with the manufacturer's specifications.

7. All glycol ASTs and associated pumps, piping and equipment, regardless of capacity shall be installed within a steel containment dike capable of holding 110% of the total tank volume, providing protection from collision, and shall include a lockable drain valve, in accordance with COMAR 26.10.01,12B-1. Penetrations through the tank must be watertight.

8. The tank owner must develop procedures to respond to a spill. The spill response procedures must be submitted to the MAA Environmental Compliance Section. The spill procedures must be developed according to BWI Tenant Directive 502.1, Airport Fuel/Oil and Hazardous Material Spill Procedures for Legal Reporting Responsibilities, to address any possible spills or leaks that may occur. In addition, the procedures shall include a process for emptying stormwater from the containment dike area. The procedure shall be developed to prevent stormwater from reaching a level that will decrease the capacity of the containment dike area below the storage capacity of the tank. The tank owner must also have a spill kit available at the tank location. The kit must contain drain protection booms or mats.

9. Tank owner must visually inspect tanks weekly and keep records of tank inspections.

10. All leaks and spills must be addressed immediately by the tank owner. Immediate measures must be taken to prevent the migration of spilled material into stormwater drains. The MAA Airport Operations Center must be notified immediately of a leak or spill.

11. When required, tanks must be placed on concrete pads of sufficient strength to support the tank's full weight (including other necessary structural support).

12. All tanks must be provided with a flow meter with a totalizer applicable for glycol usage. They must be capable of providing a reading of the total amount of glycol discharged from the tank. An annual calibration must be performed according to manufacturer's recommendations. The meter must be accessible to the MAA at all times.

13. All tanks shall have a label affixed identifying their contents and tanks' maximum capacity, e.g., Propylene Glycol, Type IV, 5,000 gallons. The NFPA-704 symbol shall also be displayed.

14. All connections to potable water supply must have a back-flow preventer.

15. All glycol AST equipment must be secure from tampering and unauthorized use and must be limited to personnel trained by the tenant according to its company's standards.

16. All operator hoses must be in good working order and be securely fastened in an upright manner to prevent leaking. Valves must be in closed position when not in use.

17. The MAA Project Manager and Resident Architect must approve the color of the tanks.

10.5 ASBESTOS AND OTHER HAZARDOUS MATERIALS

Current Federal and State environmental statutes require that certain potentially hazardous materials that may be affected by building improvements or modifications involving activities such as construction, repair, maintenance, alterations, and renovations be identified and removed prior to conducting these activities. The requirements mandate that hazardous materials be identified in order to comply with worker and occupant/tenant safety, environmental, and disposal requirements. The primary materials of concern include, but are not limited to, asbestos-containing materials (ACM), lead-based paint, PCB and mercury-containing building elements.

Prior to developing a scope of work for the proposed improvements or modifications, the Designer, contractor and/or tenants are required to coordinate with the Division of Environmental Compliance to obtain recent hazardous materials surveys and to arrange for a Hazardous Materials Site Assessment. An MAA contractor will inspect the area and provide a report describing the hazardous materials that will be affected by the proposed activities and recommendations for their removal or management. Hazardous materials removal services will be arranged and managed by the MAA or by the tenant. In either case, "third party" abatement oversight will be provided by the Division of Environmental Compliance.

This second page addresses the post abatement deliverables from abatement contractors and provides a consistent method of reporting required information. This is designed to be included in contracts or agreements between MAA and abatement contractors.

Contract Language for Office of Engineering to Provide to Abatement Contractors:

The Abatement Contractor shall perform work in accordance with the contract terms, applicable Federal and State regulations, and approved Abatement Design. Within thirty (30) days of project completion the Contractor shall provide an Abatement Closure Report. The submittal shall consist of two hard copies of the Closure Report and one electronic version in PDF format. The Closure Report must include a Title Page containing the site or renovation area, project name (what was removed from where), Contractor name and information, contract number, and dates of abatement. An Abatement Summary must be provided that describes the materials removed, controls used, work procedures, total amount removed and location(s) of removal. Indicate if "all" materials were removed or if remnant materials remain and where.

The following appendices must be provided:

* Copies of Abatement Design/Work Plan
* Copies of EPA Notifications or permits (as applicable)
* Copies of Contractor Supervisor and Worker certificates/licenses
* Copies of Daily Sign in Logs and Inspection Logs
* Copies of Air Sample Results
* Copies of Waste Manifests

The hard copy and electronic reports shall be submitted to Joanne Brooks, Environmental Program Manager, Division of Environmental Compliance for review and acceptance.

10.5.1 Renovation Work

For renovation work, a checklist should be formulated to insure all possible sources of asbestos have been removed, i.e., ceiling tile, floor tile, insulation, etc. If asbestos is suspected, the MAA Environmental Compliance Officer shall be contacted to initiate the proper documentation and testing of the site and determination of the proper abatement procedures.

10.5.2 Lead Paint

The Designer shall determine if the project has potential lead exposure. Where the potential for lead exposure exists, request the MAA Environmental Compliance Officer to test the project site for potential areas which may result in lead exposure above the action level. Test locations and results shall be shown on the contract plans. Incorporate the following into the Special Provisions:

"The Contractor shall fully comply with the requirements of COMAR 09.12.32 – 'Occupational Safety and Health Standard – Occupational Exposure to Lead in Construction Work,' dated November 28, 1988, and as may be amended.

"The Maryland Aviation Administration (MAA) had conducted preliminary tests of the project site to determine the potential lead exposure to workers above the action level. The location and results of those tests are shown in the contract documents.

"The MAA has conducted the tests and made the results available as a matter of courtesy to prospective contractors. This information in no way relieves the Contractor from performing his own tests or complying with the requirements set forth in COMAR 09.12.32."

Project inspectors shall follow-up and insure the requirements of COMAR 09.12.32 – "Occupational Safety and Health Standard – Occupational Exposure to Lead in Construction Work" are being complied with.

10.5.3 Asbestos

1. Column Covers: Many of the column covers in the terminal building consist of preformed asbestos cement. Because this material is non-friable, there is no health hazard associated with its undisturbed presence. Any cutting, sawing, drilling, or work which disturbs the column will require a licensed asbestos abatement firm to properly isolate, contain, and dispose of debris produced.

10.6 GLYCOL COLLECTION

Underground Diversion Vaults, Lift Stations, and other similar structures related to glycol collection system shall be designed with Schedule 80 CPVC pipe and fittings. Ductile iron pipe will be accepted as an alternate piping material only if there is a potential for hydrocarbons, e.g. or fuel or oil to enter the piping system. Support brackets, clamps, and braces shall be non-metallic, and use non-corrosive materials. Hardware shall be corrosion resistant.

The deicing collection system shall communicate with the existing BWI Airport Metasys Facility Management System (FMS). Refer to Chapter 12.

10.7 FUEL TRUCK PARKING

The design of all facilties at BWI and MTN, involving fuel loading and/or parking areas for mobile or portable fuel/oil storage containers must meet 40 Code of Federal Regulations, Part 112 requirements of the Environmental Protection Agency's Spill Prevention and Control Countermeasures (SPCC).

The MAA requires all owners of existing fuel operations at BWI and MTN to construct the required secondary containment as soon as possible, but no later than February 18, 2005. New facilities must construct the required secondary containment prior to beginning operation. The requirements for secondary containment applies but is not limited to, the following conditions:

1. Fuel truck parking areas where filled and parked fuel trucks are left unattended. The fuel truck parking areas must be provided with secondary containment capable of holding the volume of the largest tank.

2. Truck loading/unloading areas. Areas where fuel is loaded or unloaded from a tank truck to a storage tank, or vice-versa, must be provided with secondary containment capable of holding at least the maximum capacity of any single compartment of a truck using the facility.

CHAPTER 11: ARCHITECTURAL / BUILDINGS

11.1 DESIGN CONTINUITY

The Designer shall coordinate their design approach with MAA's Resident Architect prior to and during the concept and schematic design phases for all projects. In addition, the Resident Architect shall review and approve all architectural materials. Prior to the proposal preparation, the A/E, MAA's Project Manager, and Resident Architect shall identify any specialty architectural sub-consultants required for interior design, graphics, furnishings, etc.

11.1.1 Domestic Terminal Baggage Claim Areas

The Designer shall match the standard wall covering, solid surface wainscot and terrazzo floor finish. The red wall covering used on the back wall is "Tretford 570" manufactured by Eurotex. Signage shall match the Airport's standard.

11.1.2 Domestic Terminal Ticketing Concourse

The present design of the ticket counter facing the public shall be maintained. All plastic laminate visible to the public shall match the existing black plastic laminate. The ticket counter module and baggage well size shall match the existing unless approved in advance by the MAA. The provider of the inserts shall be identified during the concept design phase. The design of the back wall, including airline signage and graphics, must be approved by the MAA. Signage required by the Federal Aviation Administration (FAA) must be maintained. The MAA must approve any objects placed by tenants in the public space. Ticket counters shall be designed to have an accessible counter level for the disabled per ADA's current regulations.

Queuing areas may be a maximum of twenty feet (20') from the face of the ticket counters on the upper level of the terminal. Temporary exceptions to these limits may be allowed when needed to accommodate a large number of patrons; however, a minimum of twelve feet (12') of clear corridor must be maintained at all times. Stanchions shall be manufactured by Lavi Industries, Model #60-50-3000CL with plastisol coating on the base and a nylon webbed belt that will extend 6 feet. The logo and color of the tenat/designer's choice shall be silk-screened on the belt.

LED and Blade signs shall match existing.

11.1.3 Domestic Terminal Security Checkpoints

Terminal Security Checkpoints shall comply with all regulations issued by the Transportation Security Administration (TSA) for security checkpoint equipment, signage, screens, search rooms, etc. Wall covering and solid surfacing wainscot shall match the Airport's standard. Column covers shall be stainless steel. The checkpoint area shall be separated from the egress corridor with full height clear butt-glazed partition. Designers must provide a private search room for dignitaries and an office

for the security personnel. In addition, convenient storage for personal items belonging to security personnel shall be provided. This may be a closet or a cupboard in the casework. Lockers, which are visible to the public, are not acceptable.

11.1.4 Domestic Terminal and Pier E Holdrooms

The furnishings and finishes in the preferential use Domestic Terminal Holdrooms are the responsibility of the airlines, if required by the lease agreements. Changes in the finishes must be submitted to the MAA for approval. The furnishings and finishes in the International Terminal and common use Domestic Terminal Holdrooms are the responsibility of the MAA. Ticket and lift and gate podium design shall match existing unless approved by MAA.

11.1.5 Commercial Storefronts and Signage

Some latitude is allowed in the design of storefronts and signage in the Domestic Terminal. The preliminary design must be approved by the MAA Resident Architect prior to commencement of Construction Documents (CDs). The roll down grilles shall be aluminum and approved by the MAA Resident Architect. Storefronts and signage in the International Terminal shall conform to the current design. Roll-down grilles shall be clear aluminum and approved by the MAA Resident Architect.

11.1.6 Service Areas

Back-of-house corridor walls should be constructed of painted gypsum board, painted concrete block, or glazed concrete block. When using gypsum board, vinyl bumpers and corner guards shall be provided to protect walls from impact damage. Consider using a wainscoting material such as Kydex or approved equal at the elevator entrances and/or other areas especially subject to damage.

11.1.7 Offices

The design of office space shall be coordinated with the MAA Resident Architect.

11.1.8 FIDS/BIDS Enclosures

The design of FIDS/BIDS enclosures and displays shall be coordinated with the MAA Resident Architect.

11.1.9 Bomb Mitigation Design

Criteria exists for the design of terminal and building facilities to mitigate a potential vehicle bomb attack at the terminal curbside. This criteria can be obtained by contacting the MAA Manager of Facilities Design.

11.2 AESTHETICS

11.2.1 Sustainable Design Innovation

All projects designed and constructed for the Maryland Aviation Administration shall comply with the 2001 Maryland Green Building Council "High Efficiency Green Building Program".

The standard is mandatory for all state owned/leased buildings and is established in accordance with Executive Order 01.01.2001.02 "Sustaining Maryland's Future with Clean Power, Green Buildings, and Energy Efficiency".

In accordance with this standard, all new building construction larger than 7,500 gross square feet must achieve a Leadership in Energy and Environmental Design (LEED) Silver Certification or higher as established by the LEED Rating System of the United States Green Building Council (USGBC). Exempt buildings are listed in the 2001 Maryland High Efficiency Green Building Program.

11.3 TENANT IMPROVEMENTS

11.3.1 New International Pier Millwork

MAA would like to maintain the architectural standard and structural integrity of the New International Pier millwork. Accordingly, modifications to the ticket counter and holdroom millwork should be designed, reviewed, and constructed using the following general guidelines. Deviations from the following will require approval on a case by case basis by the MAA Resident Architect.

1. Cabinet Work or Shell
   - Top, front, and sides of counters that are visible to the public should not be altered. The continuity of design that is presented to the public should be maintained.
   - Modifications for inserts should be done in a manner which insures that support is provided for all parts of the shell independent of the inserts.
   - The rear counter work surface can be modified, provided that supports are added so that the work surface can support itself without the use of inserts.
   - When modifications such as cut outs are made, all visible edges should be finished by qualified case work specialist with plastic laminate, or solid surfacing material to match original design.

2. Baggage Scales
   - Stainless steel surrounding the scales and the scales should not be modified in any manner. The continuity of design that is presented to the public should be maintained.

- Readouts should not be modified or relocated. The continuity of design that is presented to the public should be maintained.

3. Hardware
   - Hinges for the flip-up counter top work surface in front of the monitors should be concealed or located in such a manner so that clothing cannot be damaged.
   - Visible hardware, such as locks and hinges, should be the same as or compatible with the original design.
   - All hardware should be commercial grade.

4. Inserts and Equipment
   - New inserts should match original design with respect to colors, finish, plastic laminate, solid surface material, etc.
   - Monitors should have a mental angle or wood stops to prevent them from resting on the back of the front counter wall.
   - Scale readouts should remain on the side panels as originally designed. They should not be placed in the counter top work surface.
   - Telephones, outlets, etc. shall not be placed in areas that are visible to the public.

5. Plastic Laminate
   1. Plastic laminate shall be Nevamar; MR-6-7-CR, PHANTOM GRAY MATRIX.

6. Solid Surface

   2. Solid surface material shall be Wilsonart; Surfacing veneer D315-TM, PLATINUM TEMPEST.

11.4 PUBLIC AREA MATERIALS, FINISHES AND COLORS

11.4.1 Restrooms

Refer to Restroom Design Standards in Appendix G for materials, finishes, and colors of restrooms.

11.5 ROOF SYSTEMS

All projects at BWI THURGOOD MARSHALL and Martin State Airports shall comply with the Department of General Services (DGS) Statewide Roofing Policy and specifications, as well as the following criteria:

1. Design shall include a 60-year life cycle cost analysis for all new construction projects. Reroofing rehabilitation projects are exempt from this requirement. Any method of analysis is acceptable as long as assumptions include: 1) 20-year life for built-up and modified bitumem roofs, 2) biannual maintenance performed.

2. If the proposed roofing system has not been previously approved by DGS, designers shall submit the system to Mr. William Gluck, Chief Project Management Design, DGS Engineering, for review and approval. Mr. Gluck can be reached at 410-767-4439. DGS review time is approximately 14 days.

3. Based on project specifics, DGS may waive the requirement to install vapor retarders for roof installation and/or replacement projects. DGS shall evaluate the need for vapor retarders on a case-by-case basis. Requests for waivers shall be submitted to Mr. Gluck.

4. All projects shall be specified to insure qualified contractors perform the work. Qualified contractors shall be approved by the manufacturer, have a minimum of 5 years of experience in the installation of roof systems, and meet the following guarantee and warranty requirements:

    a. Provide Manufacturer's roof warranty, including the following minimum criteria:

        - Complete coverage of the cost of the labor and materials for repair of leaks due to poor workmanship or materials failure.
        - Complete systems warranty must include each and every component of the roofing system.
        - Non-prorated, non-penal sum (no dollar limit), twenty (20) year warranty period.

    Note: The use of polyisocyanurate (Iso) insulation, to make up the two layers of insulation (base and tapered layer) needed to achieve a 20-year no dollar limit roof, is no longer allowed unless a ½" cover board is applied. Roof systems in which felts are attached directly to the Iso boards shall be rejected and must be remedied.

        - Coverage of the cost of removal and replacement of damaged or wet insulation which is a result of leaks from poor workmanship or failed materials.
        - No exclusion from coverage for damage to the roof system as a result of wind gusts less than 55 mph.

    b. Submit and provide components required by the roofing system manufacturer for the specific warranty.
    c. At the completion of the work, the contractor shall guarantee in writing to the Maryland Aviation Adminstration (MAA) representative that the roofing system, flashing, sheet metal work and all associate components as installed are

of the highest quality, weathertight, waterproof and free from defects due to improper or defective materials, and/or workmanship developing under normal wear and tear for a period of five (5) years from the date of final acceptance of all work under this contract. The contractor shall be notified by the MAA representative of any defective work, and shall correct water leaks into the building within forty-eight (48) hours after notification and within ten (10) days for all other defects. Failure of the contractor to correct any defects in the time allowed shall allow the MAA to contract for repairs and charge the contractor for all costs incurred. All repairs/replacement shall be at no cost to the MAA.

11.5.1 Satellite Dish Locations

Satellite receiving dish antenna located on the roof of Pier B can cause operational problems with the airport surveillance radar (ASR-9). A software program can be used to alleviate the problem but no additional dish antennas shall be installed at Pier B or in the vicinity of Pier B. All proposed satellite dish antenna locations should be reviewed and coordinated with MAA Operations and FAA-BWI.

11.6 FLOOR AND WALL COVERINGS

11.6.1 Restrooms

Refer to Restroom Design Standards in Appendix G for Restroom floor and wall coverings.

11.6.2 Tile

1. Red Ceramic Tile Column Finish: Summitville Tile, Inc., Summitville, Ohio 43962, manufacturers the red tile which clads the columns in front of the Passenger Terminal. The custom color number is 4865-1.

2. No asbestos containing materials are to be used, including mastic.

11.6.3 Carpet Tile

1. Terminal E Carpet Tile: Carpet tile used in Pier E Holdrooms is manufacturered by Shaw Industries, Inc. The product is Networx Hemisphere No. SC-32, color 4295B-11. The field is 3 ply Dupont Antron Lumina, 2 end No. C145A and 1 end No. C151A. The border is 2 ply Dupont Antron Lumina, 1 end No. C127A and 1 end No. C247A.

2. Domestic Terminal Carpet Tile: The A/E shall coordinate selection of carpet with the MAA Resident Architect.

11.6.4 Painting

Architects shall specify "white" paint colors that are standard with the MAA Division of Maintenance in order to minimize the paint colors they have to keep on hand.

11.6.5 Wall Covering

The wall covering used in the public areas of the Domestic Terminal shall be the MAA standard.

11.6.6 Solid Surfacing Material

1. Domestic Terminal's Public Area: The solid surfacing material for the Domestic Terminal's public area wainscot shall be coordinated with the MAA Resident Engineer.

2. Terminal E Casework: The solid surfacing material for Terminal E casework is Wilsonart SSV D315-TM Platinum Tempest.

Wilsonart no longer manufactures the SSV (Solid Surface Veneer) line of products, which was a panel consisting of 1/8-inch solid surface material laminated (in most cases) to gypsum board. The actual solid surface material color may still be available, but minimum thickness may be 1/4- to 1/2-inch

11.6.7 Plastic Laminate

1. Terminal E Casework: The Plastic Laminate used for Terminal E casework shall be Nevamar "Phantom Grey Matrix Crystal" MR-6-7CR, and "Storm Grey Matrix Crystal" MR-6-4CR.

11.6.8 Waterproofing

Effective immediately, these standards refer to:

1. Waterproofing of suspended composite and reinforced concrete floors in janitors' closets, toilet rooms, kitchens, food preparation areas and any other spaces where the use of the space, potentially or consequently, results in the wetting of the floor. These spaces are referred to as "wet areas" in this Design Standard.

2. Prevention of water damage from hot water heaters and sprinkler drains.

SPECIAL NOTE:
In spaces located above electrical substations, communications rooms and other spaces where water damage would have significant impact on life safety or the

airport's operations or that of its tenants', applicants for building permits shall be required to review their proposed plans with the MAA. This may result in additional provisions being required beyond those contained in this Design Standard.

11.6.8.1 Waterproofing of Floors

1. Waterproofing of floors in wet areas is intended to prevent water damage to spaces below or adjacent to the wet area.

2. Waterproofing of floors in wet areas shall be continuous. The waterproofing may be a membrane material or a liquid-applied material, and must have acceptable waterproofing and crack-suppression qualities. The material must be laid in full compliance with the manufacturer's instructions.

3. Acceptable membrane materials are "Schluter-Ditra" membrane and underlayment as manufactured by Schluter Systems, or equal materials approved by MAA.

4. Acceptable liquid-applied materials are "Redgard" waterproofing and crack prevention membrane, as manufactured by Custom Building Products, or equal materials as approved by MAA.

5. At perimeter walls of wet areas and at pipe and other projections above the floor slab, turn up floor waterproofing minimum 2" onto the vertical surface, so that the wet area is surrounded by a continuous waterproof barrier to prevent water penetration into surrounding spaces. Refer to Standard detail for Floor Penetration on the following pages.

11.6.8.2 Floor Drains, Floor Sinks and Floor Cleanouts

1. Refer to the standard details for floor drains and floor sinks on the following pages.

2. Floor drains, floor sinks and floor cleanouts in food preparation spaces must comply with the requirements of Anne Arundel County Health Department.

3. Floor sinks, floor drains and floor cleanouts in wet areas generally must comply with the following requirements:

   - Floor sinks, drains and cleanouts must be provided with flanges to allow the floor waterproofing to be flashed around the flange and secured with continuous flashing clamps. Where necessary to allow for smooth transition of floor waterproofing onto flange, cut back the topping of the slab as illustrated.

   - Floor sinks and drain must have seepage openings to allow moisture penetrating the floor covering to discharge into the body of the sink/drain. Provide loose gravel at seepage openings.

4. Size of floor drains and sinks.

   - Grids of drains and sinks shall be not less than 8 inches in diameter, or 8" X 8" square. Rectangular grids shall not be less than 50 square inches in area.

   - Floor drains and sinks must have outlets not less than 4 inches diameter to discharge into drain piping not less than 4 inches in diameter.

5. Cleanouts

   - Cleanouts below the slab shall only be located above service areas or other unoccupied spaces, where access to them will not inconvenience other Tenants or the Public.

   - Where cleanouts below slab level are not permissible, provide side-accessible cleanouts in walls above the slab, such as walls of mechanical chases or other walls in Tenant's premises.

   - Cleanouts shall not be permitted in electrical substations, communications rooms and other similar spaces.

11.6.8.3 Penetrations Through Floors of Wet Areas

1. Refer to the standard details on the following pages.

2. Penetrations through slabs for new sinks, drains and pipes must not impair the structural stability of the slabs. Existing suspended slabs at the Airport are generally of the following types (Users of this Design Standard must verify this information in the field):

   - Composite concrete, generally 4-1/2 inches thick, with 2-1/2 inch concrete topping on 2 inch metal deck.

   - Reinforced concrete. Thickness varies, from approximately 6 inches to 8 inches.

3. General Requirements for Floor Penetrations

   - Submit drawings and documents signed and sealed by a structural engineer registered in the State of Maryland.

   - Locate penetrations through slabs so that they are clear of below-slab beams.

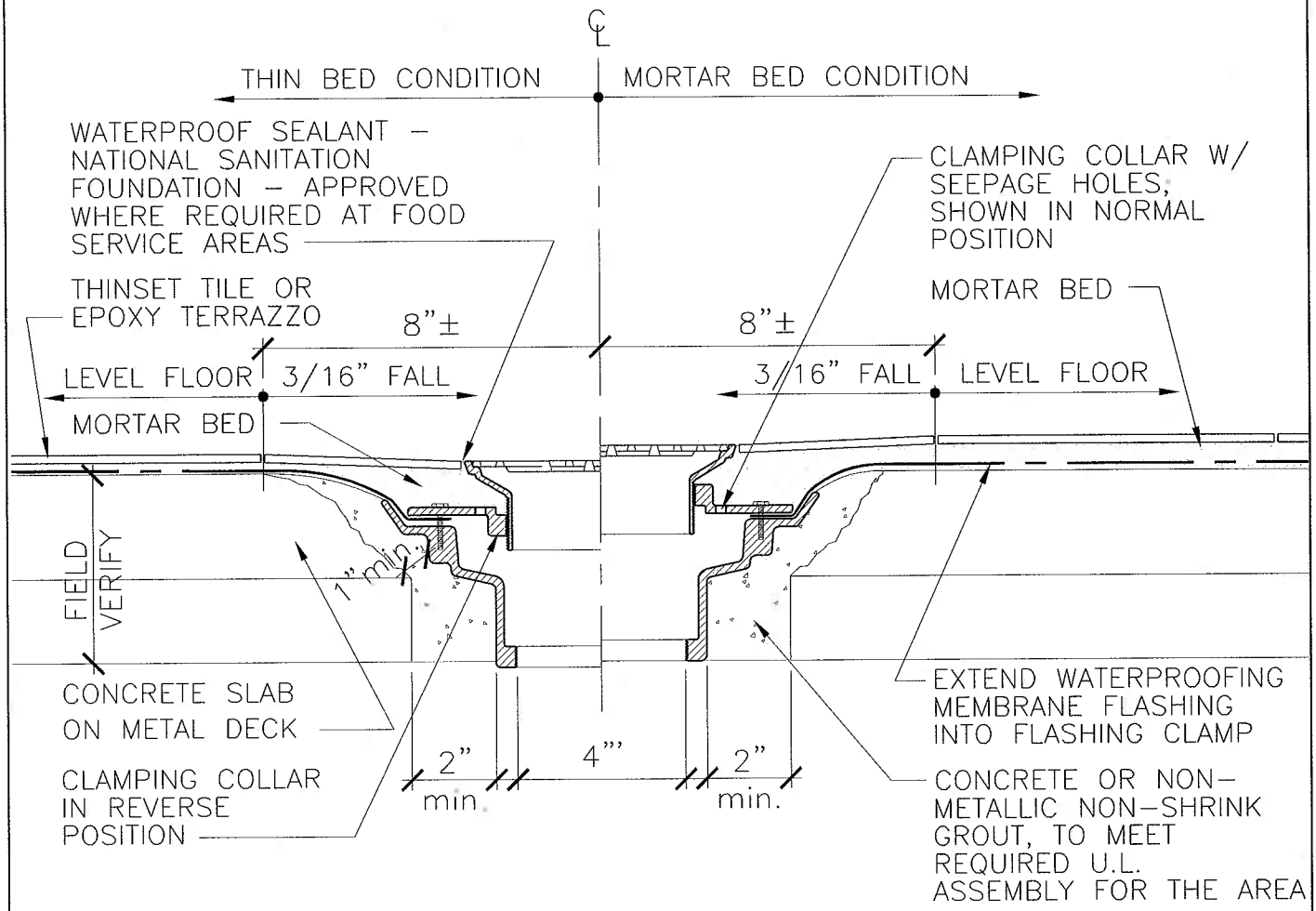
   - For reinforced concrete slabs, locate penetrations so as to avoid the slab reinforcement. Slab reinforcement is likely to be heavy in the areas surrounding columns. Where penetrations through reinforced concrete slabs are so located or of such a size that cutting of slab reinforcement bars is unavoidable, provide specific details signed and sealed by a structural engineer.

   - For composite slabs, for any penetrations larger than 10" X 10" through the slab, provide specific details signed and sealed by a structural engineer.

11.6.8.4 Floor Coverings.

1. Impervious tile or epoxy terrazzo is required in wet areas. Portland-cement based terrazzo is not permitted. An epoxy-type grout is recommended for tiled floors. At junction of floor finish and floor sinks/drains/cleanouts, provide flexible sealant. (National Sanitation Foundation approved where required at food service areas.)

2. At perimeter walls, etc., turn floor covering up as a wall base and to protect turned-up vertical waterproofing.



NOTE:
CORE DRILL OR SAW CUT AS NECESSARY TO REMOVE SLAB.
OPENINGS LARGER THAN 10"x10" REQUIRE STRUCTURAL ENGINEERS APPROVAL.

FLOOR DRAIN — COMPOSITE SLAB CONDITION

SCALE: 3" = 1'–0"

DRAIN AS SHOWN – J.R. SMITH FLOOR DRAIN # 2005–A
EQUIVALENT DRAINS ACCEPTABLE FROM JOSAM OR ZURN

BALTIMORE/WASHINGTON INTERNATIONAL Thurgood Marshall AIRPORT

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

URS CONSULTING ENGINEERING AND PLANNING
849 International Drive
Suite 320
Linthicum, MD 21090
Phone: 410-855-6160
Fax: 410-855-6163

PROJECT TITLE	DESIGN STANDARD FOR FLOORING IN WET AREAS
SHEET TITLE	FLOOR DRAIN IN COMPOSITE SLAB LOCATION
SCALE: AS NOTED	PROJECT NO.: 20831385
DATE: 09/19/06	SHEET REFERENCE
	EXHIBIT NO.

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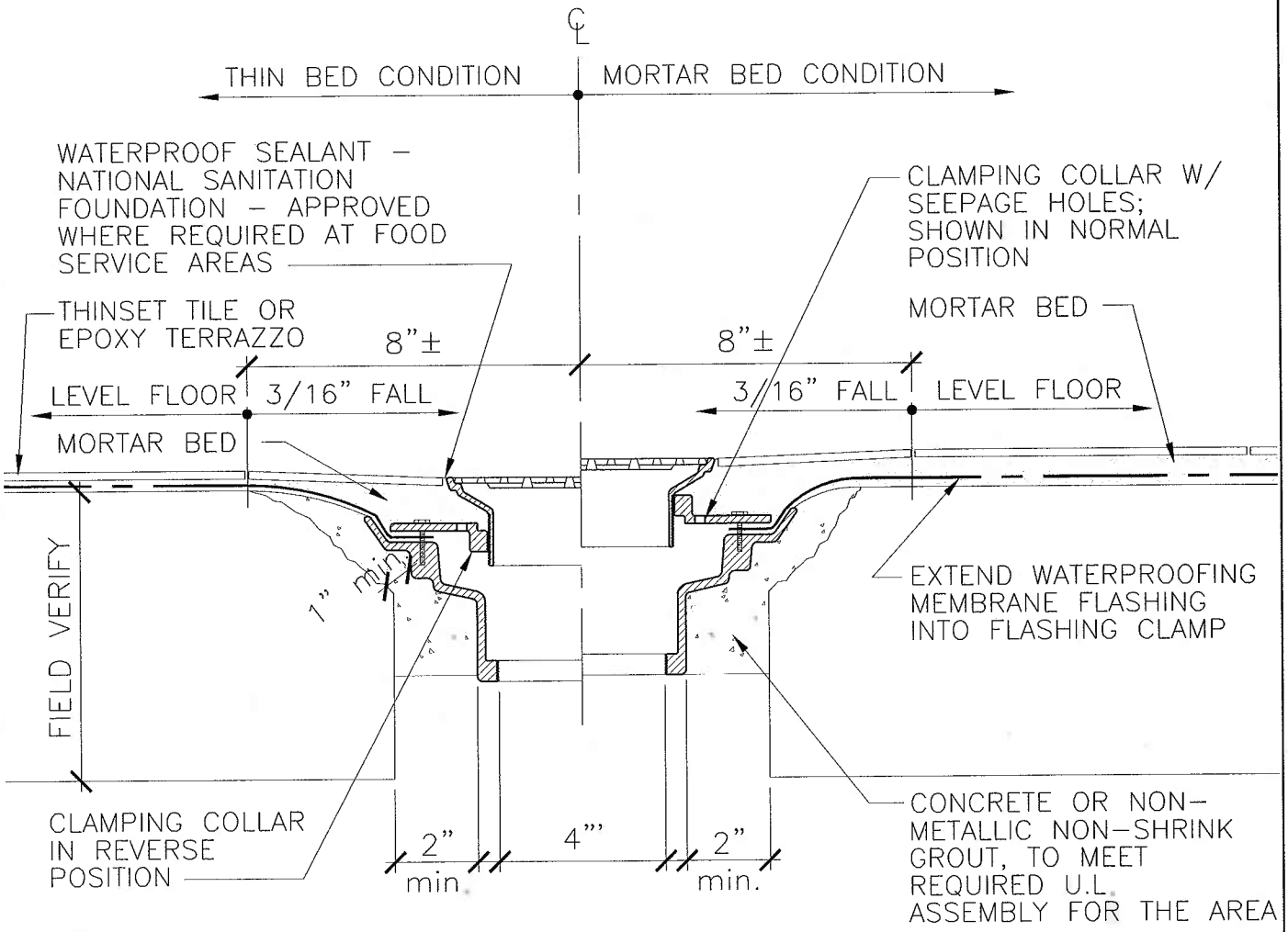

NOTE:
CORE DRILL OR SAW CUT AS NECESSARY TO REMOVE SLAB.
SLAB REINFORCEMENT CAN ONLY BE CUT WITH STRUCTURAL ENGINEER'S APPROVAL.

FLOOR DRAIN — SUSPENDED REINFORCED CONCRETE SLAB CONDITION

SCALE: 3" = 1'-0"

DRAIN AS SHOWN – J.R. SMITH FLOOR DRAIN # 2005-A
EQUIVALENT DRAINS ACCEPTABLE FROM JOSAM OR ZURN

BALTIMORE/WASHINGTON INTERNATIONAL Thurgood Marshall AIRPORT

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PROJECT TITLE: DESIGN STANDARD FOR FLOORING IN WET AREAS

SHEET TITLE: FLOOR DRAIN IN SUSPENDED REINFORCED CONC. SLAB LOCATION

SCALE	PROJECT NO.	EXHIBIT NO.
AS NOTED	20831385	
DATE	SHEET REFERENCE	
09/19/06		

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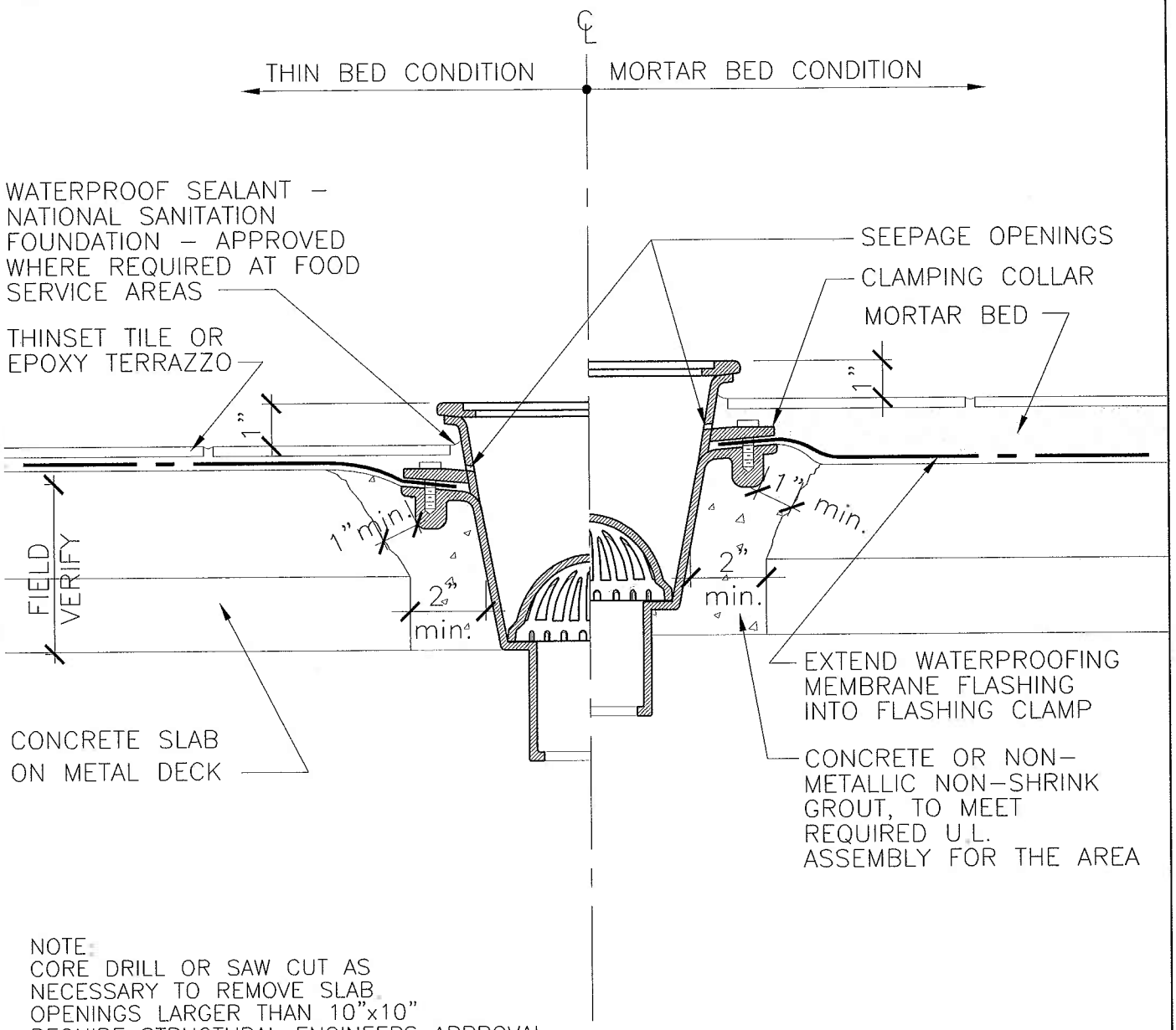

NOTE:
CORE DRILL OR SAW CUT AS NECESSARY TO REMOVE SLAB. OPENINGS LARGER THAN 10"x10" REQUIRE STRUCTURAL ENGINEERS APPROVAL.

LOCATE FLOOR SINK UNDER EQUIPMENT/ ETC. TO AVOID TRIPPING HAZARD.

FLOOR SINK – COMPOSITE SLAB CONDITION

SCALE: 3" = 1'-0"

SINK AS SHOWN – J.R. SMITH SANI-CEPTOR # 3100
EQUIVALENT SINKS ACCEPTABLE FROM JOSAM OR ZURN

BALTIMORE/WASHINGTON INTERNATIONAL Thurgood Marshall AIRPORT

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PROJECT TITLE	DESIGN STANDARD FOR FLOORING IN WET AREAS
SHEET TITLE	FLOOR SINK IN COMPOSITE SLAB LOCATION
SCALE: AS NOTED	PROJECT NO.: 20831385
DATE: 09/19/06	SHEET REFERENCE:
	EXHIBIT NO.:

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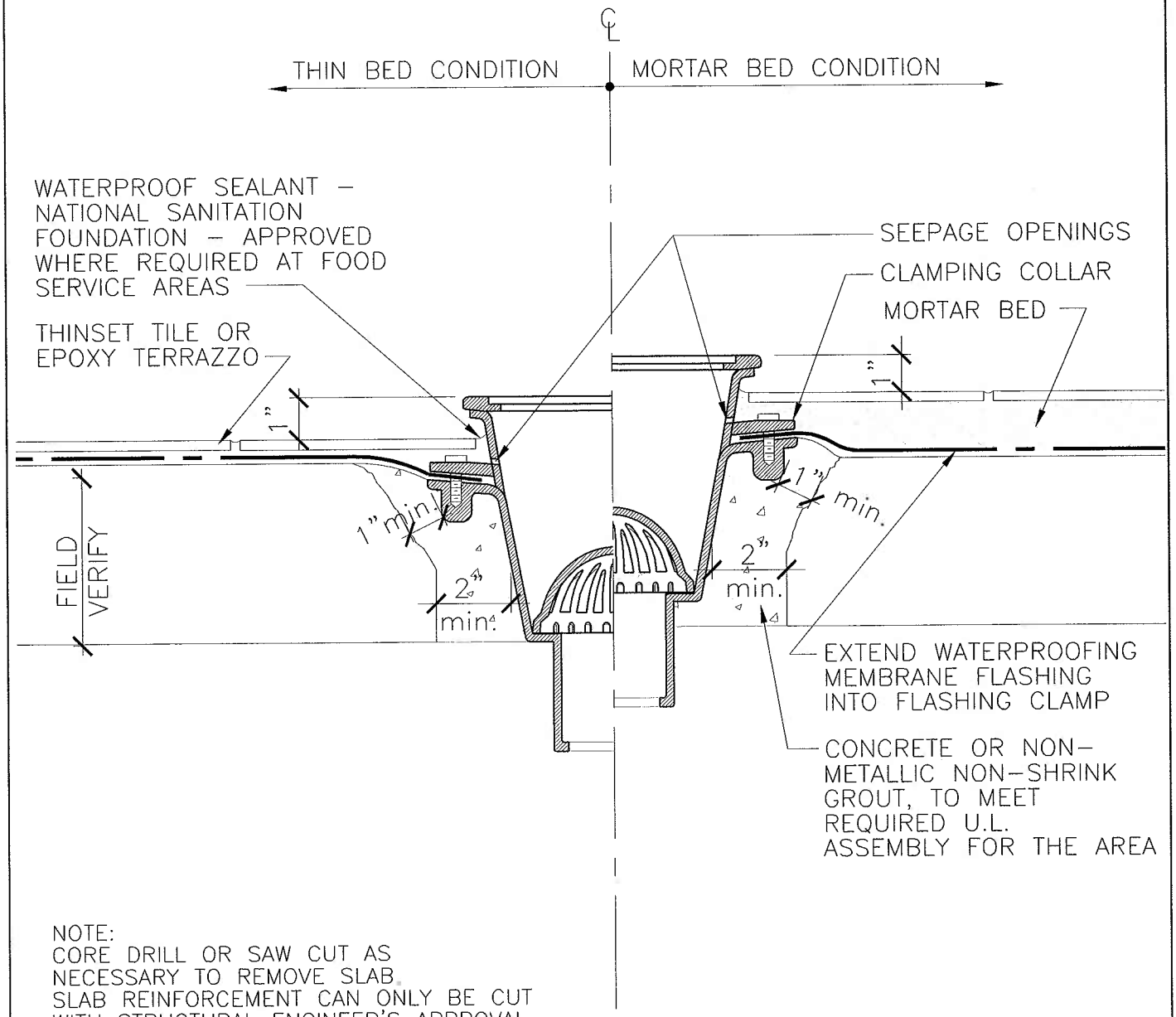

NOTE:
CORE DRILL OR SAW CUT AS NECESSARY TO REMOVE SLAB.
SLAB REINFORCEMENT CAN ONLY BE CUT WITH STRUCTURAL ENGINEER'S APPROVAL.

LOCATE FLOOR SINK UNDER EQUIPMENT/ ETC TO AVOID TRIPPING HAZARD.

FLOOR SINK – SUSPENDED REINFORCED CONCRETE SLAB CONDITION

SCALE: 3" = 1'-0"

SINK AS SHOWN – J.R. SMITH SANI-CEPTOR # 3100
EQUIVALENT SINKS ACCEPTABLE FROM JOSAM OR ZURN

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PROJECT TITLE: DESIGN STANDARD FOR FLOORING IN WET AREAS			
SHEET TITLE: FLOOR SINK IN SUSPENDED REINFORCED CONCRETE SLAB LOCATION			
	SCALE: AS NOTED	PROJECT NO.: 20831385	EXHIBIT NO.
	DATE: 09/19/06	SHEET REFERENCE	

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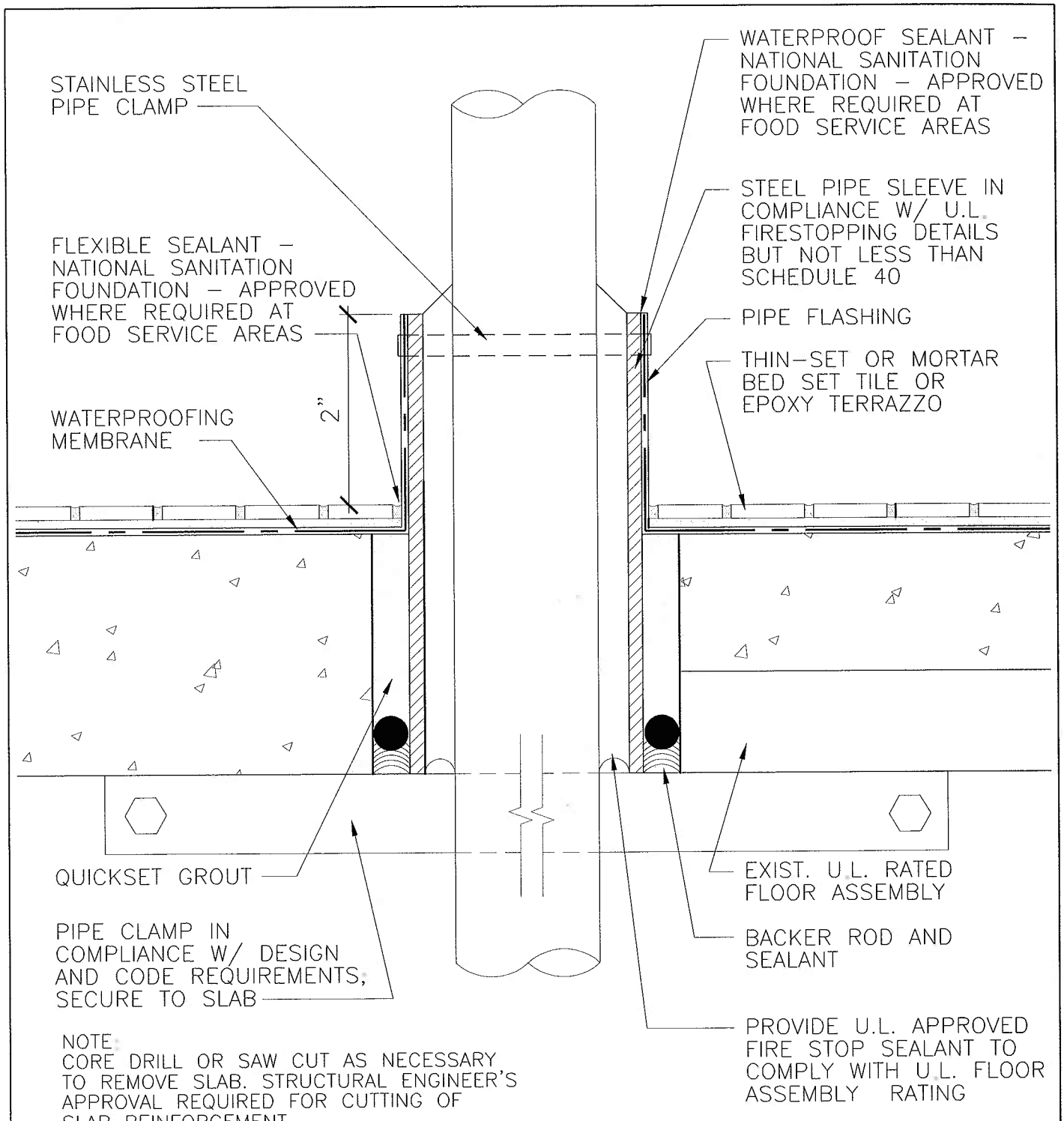

NOTE:
CORE DRILL OR SAW CUT AS NECESSARY TO REMOVE SLAB. STRUCTURAL ENGINEER'S APPROVAL REQUIRED FOR CUTTING OF SLAB REINFORCEMENT.

FLOOR PENETRATION

SCALE: N.T.S.

BWI BALTIMORE/WASHINGTON INTERNATIONAL Thurgood Marshall AIRPORT

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PROJECT TITLE	DESIGN STANDARD FOR FLOORING IN WET AREAS
SHEET TITLE	PIPE FLOOR PENETRATION DETAIL

SCALE	PROJECT NO.	EXHIBIT NO.
AS NOTED	20831385	
DATE	SHEET REFERENCE	
09/19/06		

FILE NAME: P:\20830082-AD5\CAD\orch\DRAIN DETAILS 2.dwg PLOTTED: Thursday, September 21, 2006 – 10:10am

11.6.8.5 Preventative measures to avoid water damage to floors from water heaters, etc.

1. Install hot water heaters (high level) over a curbed galvanized metal or other catchment tray, with a discharge pipe to discharge at a floor sink, mop sink or floor drain with a funnel.

2. Install hot water heaters (floor mounted) on a curbed waterproof tray raised sufficiently above the floor so that the tray discharge pipe can fall to discharge at a floor sink or floor drain.

3. Sprinkler drains must discharge over an adequately sized floor drain or floor sink.

11.7 LOCK SYSTEM

11.7.1 Finish Hardware

All projects shall specify MAA standard hardware and locksets. A list of the MAA Division of Maintenance (DOM) approved hardware and lockset is available from the Division of Facilities Design. The DOM must approve all hardware that deviates from the list.

12.8.2 Cipher Locks

Installation of all cipher locks shall comply with the requirements of the Life Safety Code, National Fire Protection Association (NFPA) 101, 2000 Edition or later, as new editions are published and accepted and COMAR Title 5 – Department of Housing and Community Development, Subtitle 02 – Building and Material Codes. Per paragraph 7.2.1.5.1 of NFPA 101, no cipher locks shall be installed along required paths of egress travel. This requirement includes, but is not limited to, exterior doors, doors of egress from aircraft boarding bridges, and doors leading to stairways, corridors, etc. The Maryland Aviation Administration Fire Marshall is the governing authority in determining whether a door is part of a required path of egress.

The Fire Marshall shall be notified of the installation of any cipher lock. To allow emergency access, all cipher locks must have a key override. Three sets of keys shall be submitted to the Fire Marshall for each cipher lock installed.

The key override system shall have a Best core. Cipher locks to be installed on the exterior side of doors must be rated for exterior usage.

11.8 RESTROOM STANDARDS

The Restroom Design Standards are contained in Appendix G.

11.9 DOORS/WINDOWS

11.9.1 Roll-up Doors

1. High Hazard Applications
   Fabric roll-up doors at "high hazard" locations are not permitted. Fabric roll-up doors do not provide a fire rating, and therefore provide a hazard when used at improper locations. "High hazard" applications included, but are not limited to, mechanical, switch gear, and electrical substation rooms. When fire rated doors are required, metal roll-up doors shall be specified.

11.9.2 Door Numbers

All BWI projects which involve the allocation or change of door numbers shall be coordinated with the Division Chief, Fire Prevention Division. The Fire Prevention Division has been assigned the responsibility of door management and shall provide guidance when new or replacement numbers are needed.

11.10 FURNISHINGS

11.10.1 Holdroom Tandem Seating

1. Domestic Terminal: Seating in most holdrooms is provided and installed by the designated airlines. Seating in MAA holdrooms is provided and installed by the MAA.
2. International Terminal: Seating is provided by the MAA. It is the "Eames Tandem Sling Seating" manufactured by Herman Miller, Inc., Zeeland, Michigan.

11.10.2 Exterior Benches and Bike Racks

1. Exterior Benches: Benches are manufactured by Landscape Forms, Inc. of Kalamazoo, MI. They are "Petroskey Group" with metal rod seat inserts. The color and finish is "Hollyberry" powdercoat.

2. Bike Racks: Bike racks are manufactured by Landscape Forms, Inc. of Kalamazoo, MI. They are "Pi Rack". The color and finish is "Grotto" powdercoat.

11.10.3 Trash Receptacles

Division of Maintenance must approve trash receptacles.

11.10.4 Master Clock System

All electronic clocks shall operate on the Simplex Master Clock System. Cut sheets for electronic clocks with analog faces are available by contacting the MAA Resident Architect. Digital clocks shall be designed with red characters.

CHAPTER 12: STRUCTURAL AND STRUCTURAL SYSTEMS

12.1 MATERIALS

12.1.1 Reinforced Concrete (With Subcategories)

All projects shall be designed based on cast-in place concrete principles. However, the contract specifications should allow for the submission of pre-cast concrete alternatives. The specifications should require the Contractor to submit the required design documentation and calculations to support the substitution of pre-cast concrete. MAA approval is required prior to proceeding with pre-cast applications.

12.2 BOMB MITIGATION DESIGN

Criteria exists for the design of terminal and building facilities to mitigate a potential vehicle bomb attack at the terminal curbside. This criteria can be obtained by contacting the MAA Manager of Facilities Design.

CHAPTER 13: HEATING, VENTILATION, AND AIR CONDITIONING (HVAC)

The Chief, HVAC Systems and the DOM must approve the design of proposed mechanical systems. The HVAC system shall be designed in accordance with the Maryland Department of General Services (DGS). The HVAC systems shall be tied to the Facility Management System (FMS) (BWI Airport only). Refer to Chapter 17.

13.1 DUCTWORK

13.1.1 Duct Liner

Unless otherwise approved by MAA, duct liners on supply ducts shall not be used. Where sound acoustics are a concern in public spaces, all insulation shall be installed on the exterior of the ductwork.

For critical non-public spaces where noise control is required, duct silencers shall be utilized, where space allows. If space for duct silencers is not available, then only the low velocity ducts shall be lined. No duct liner shall be provided in high velocity ducts, especially in ductwork on the supply to variable air volume terminals.

Return ducts to air handling units from return ceiling plenum spaces may have duct liners if the designer feels they are necessary.

When utilized duct liner shall be installed with anti-microbial products. In addition, reinforcing shall be provided for the liner material to guarantee that the liner will not peel away from the duct wall.

13.2 HVAC PIPE FLUSHING

All newly installed HVAC piping systems shall be cleaned and flushed prior to placing the pipe into operation. These HVAC piping systems include chilled water piping, condenser water piping, high temperature hot water (HTHW) piping, and primary / secondary heating water piping. This design standard is intended to cover HVAC piping installed at Baltimore/Washington International Thurgood Marshall and Martin State Airports as part of the Maryland Aviation Administration capital projects, as well as tenant improvements, and other equipment procurements.

13.2.1 Background

Due to the increase in occurrences of contaminated HVAC piping systems during construction at the Airport, the following standard has been created. It is the intention of this standard to provide the Contractor's with methods to clean and flush all new HVAC piping prior to placing the piping into operation. This will reduce the chances of damage to the chilled water, HTHW, and heating water systems within the Main Terminal and Central Utility Plant.

13.2.2 Design Specification Requirements:

Add the following in PART 3 of applicable hydronic piping specification sections.

"3.XX CLEANING AND FLUSHING OF PIPING SYSTEMS

A. The following applies to all temporary and permanent HVAC piping installations, both aboveground and underground. All of the following items must be completed prior to placing new connected HVAC pipes into operation with existing and/or new piping systems. The following items apply to condenser water piping, chilled water piping, high temperature hot water (HTHW) piping, and heating water piping systems.

1. Use clean potable water source. If not available from the Airport's water supply, then the Contractor must provide his own source of clean potable water. If high volumes of water are to be drawn from the Airport's water supply system, then the Contractor will provide a strainer to remove sand and grit which may be drawn from this water supply system.

2. The Contractor shall provide temporary pumps and strainers with fine mesh screens to obtain minimum eight (8) feet per second flushing velocity within the HVAC piping systems.

3. ***(This should be deleted if not desired for a particular project. This option may be considered if pre-approved by MAA Maintenance and Engineering, and if the logistics and costs for temporary pumps cannot be easily provided by the Contractor.)*** It may be possible to use existing pumps in the HVAC system, or pumps which are new as part of this project to obtain the minimum eight feet per second flushing velocity. If the Contractor wishes to utilize any new pumps or existing pumps within the HVAC piping system to obtain the minimum flushing velocity, this must be approved by the Engineer and MAA Maintenance. In addition, the Contractor shall provide additional strainers with fine mesh screens to insert into the existing strainers during flushing operations. Once the flushing is completed, the temporary strainers will be replaced with new strainer inserts matching existing and/or new pumps as utilized. In addition, if the new or existing pumps are used, the Contractor shall replace all pump seals after flushing operations, and then provide an additional set of pumps seals for Maintenance's use.

4. During the flushing operation, the Contractor shall add chemicals (cleaning agent) as necessary to clean all piping process oils and dirt/debris from within the piping systems. These chemicals shall not harm the new piping systems and any connected piping systems, including all valves, pumps, equipment, seals, gaskets, and other items

associated with the piping systems. All cleaning agents subject to approval by the Engineer and MAA Maintenance.

5. The cleaning operation for each section of piping installed shall be for a minimum of three (3) hours, or as necessary to completely clean all pipes. This water shall then be drained. Once drained, the piping shall be flushed with clean potable water.

6. ***(Delete this item if #3 is selected, or if not necessary due to the size of the piping additions.)*** After the cleaning and flushing operations are completed, the Contractor shall provide an additional set of pump seals and strainer inserts for each existing pump in each respective HVAC piping system which has been effected by this project. The pump seals and strainer inserts shall match existing.

7. ***(Consider the following for applicable projects with underground piping installations.)*** For underground pipes installed, prior to flushing the piping systems as described above, the Contractor shall provide television inspection of the entire pipe installation. This can be accomplished as the pipes are installed in several hundred foot sections (or the limit of the camera equipment used by the Contractor). The Contractor shall provide video tapes of the pipe interiors to show that no (or very minimal) excavation and backfill dirt has entered the piping systems. Two copies of these video pipe inspections shall be provided to the Engineer. The tapes should clearly indicate the date, time, and section of piping being videoed. If these tapes indicate that there are large amounts of debris within the piping system, the Engineer may either direct the Contractor to open the pipes in the areas of question and clean them out, or have the Contractor re-video tape the pipe sections after the pipes are flushed. This will be at no additional cost to the MAA.

B. The above noted items are minimum requirements for the Contractor to complete to clean and flush the HVAC piping systems. The Contractor is fully responsible for a satisfactory flushing operation. Any damage to existing pumps, boilers, chillers, cooling towers, control valves, and other associated items within the piping systems due to poor flushing and cleaning of the piping systems will be the responsibility of the Contractor. The Contractor shall make all necessary repairs at no additional cost to the Owner.

C. After flushing and refilling each HVAC piping system, provide chemicals (match existing chemicals used by MAA Maintenance) to bring new piping additions and existing piping system which are effected back to existing Central Plant or Terminal Piping system chemical level conditions. Coordinate introduction and verification of chemical concentrations with MAA Maintenance through the Engineer."

CHAPTER 14: PLUMBING

14.1 NATURAL GAS PIPING

All gas piping shall be installed underground or inside the building. Installation of gas piping on any building roof or exterior wall is not permitted.

CHAPTER 15: FIRE SUPRESSION SYSTEMS

Fire protection equipment shall be reviewed and approved by the MAA's Division Chief, Fire Prevention Division.

15.1 SPRINKLER SYSTEMS

15.1.1 Dry Pipe Sprinkler Systems

Dry pipe sprinkler systems are for areas subject to freezing, such as Parking Garages, Baggage Make-up areas, and unheated building spaces such as intake plenums, hangars, storage spaces, etc. This design standard is intended to cover dry sprinkler systems installed at BWI Thurgood Marshall and Martin State Airports as part of the MAA capital projects, as well as tenant improvements, and other equipment procurements.

1. All dry sprinkler piping NPS 2-inch and smaller: Galvanized, standard weight (Schedule 4) steel pipe with threaded ends; cast- or malleable-iron (galvanized) threaded fittings; and threaded joints.

2. All dry sprinkler piping NPS 2-1/2 inches to NPS 8-inches: Galvanized, standard weight (Schedule 4) steel pipe with grooved ends; steel, grooved-end (galvanized) fittings; steel, keyed couplings; and grooved joints. Gasket seals for grooved end couplings shall be approved by the pipe manufacturer for dry pipe applications.

3. All dry sprinkler piping NPS 10 inches or larger: Galvanized, (Schedule 30) steel pipe with grooved ends; steel, grooved-end (galvanized) fittings; steel, keyed couplings; and grooved joints. Gasket seals for grooved end couplings shall be approved by the pipe manufacturer for dry-pipe service applications.

15.2 FIRE HYDRANTS

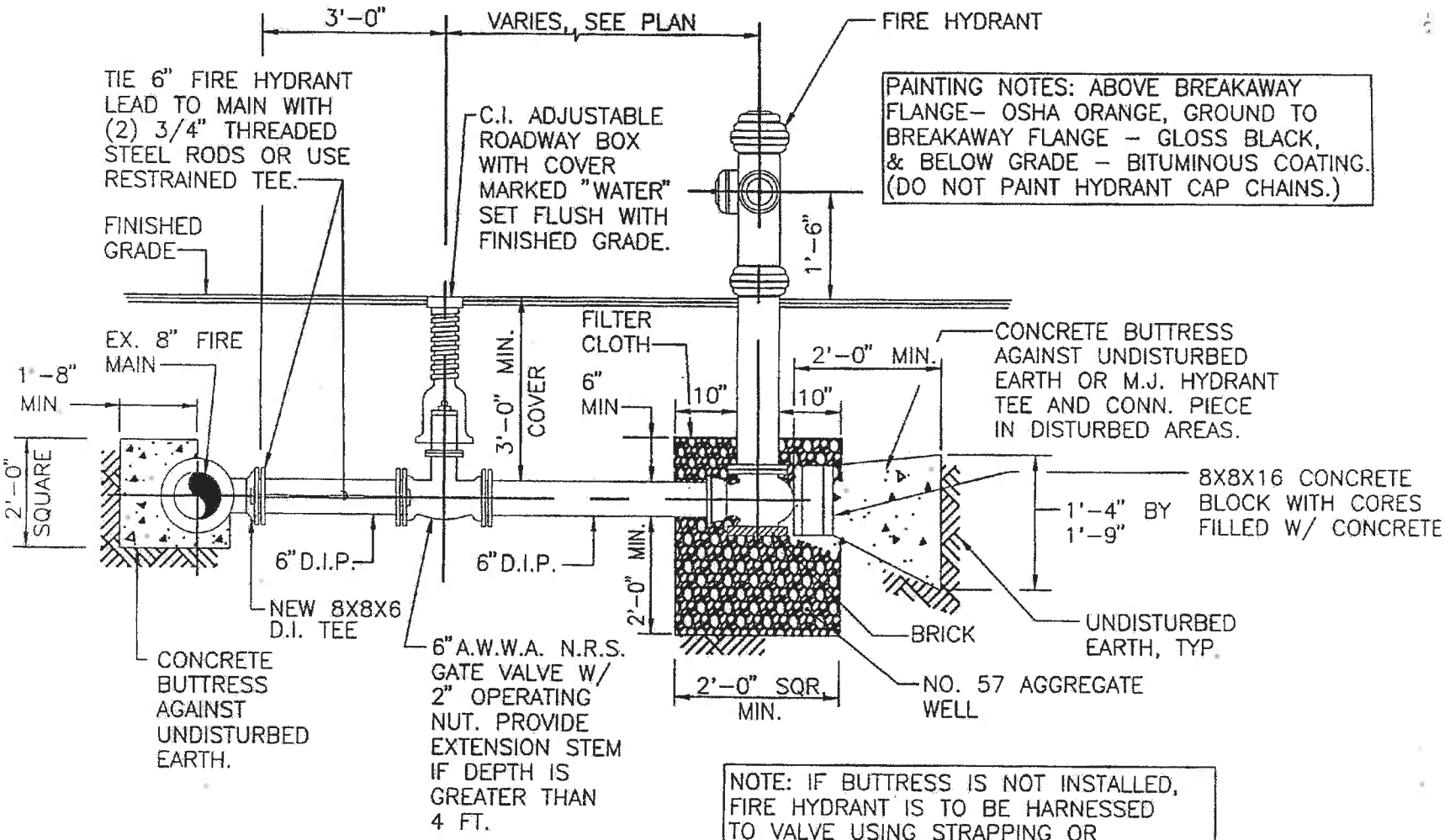
Fire hydrants shall be designed and installed in accordance with the requirements of NFPA 1141 and shall be located so that fire hoses connected to the hydrant shall not impede streets, roadways, etc. General design guidelines are provided below but refer to Appendix D for the Standard Specification U-15/02505 – FIRE HYDRANT.

15.2.1 Aboveground Fire Hydrants

Fire hydrants shall be American Darling, Type B-62-B; Kennedy Valve, Model K-81-A; or Mueller, Model Super Centurion 250 with breakaway bolts, with a 5 sided 5/16" operating nut, two 2½" diameter hose nozzles (with National Standard threads) and a 4½" diameter steamer or pumper connection (with Baltimore City threads). Fire Hydrants shall be painted OSHA Orange.

SHEET TITLE: FIRE HYDRANT SETTING DETAIL

DATE: APRIL 2005

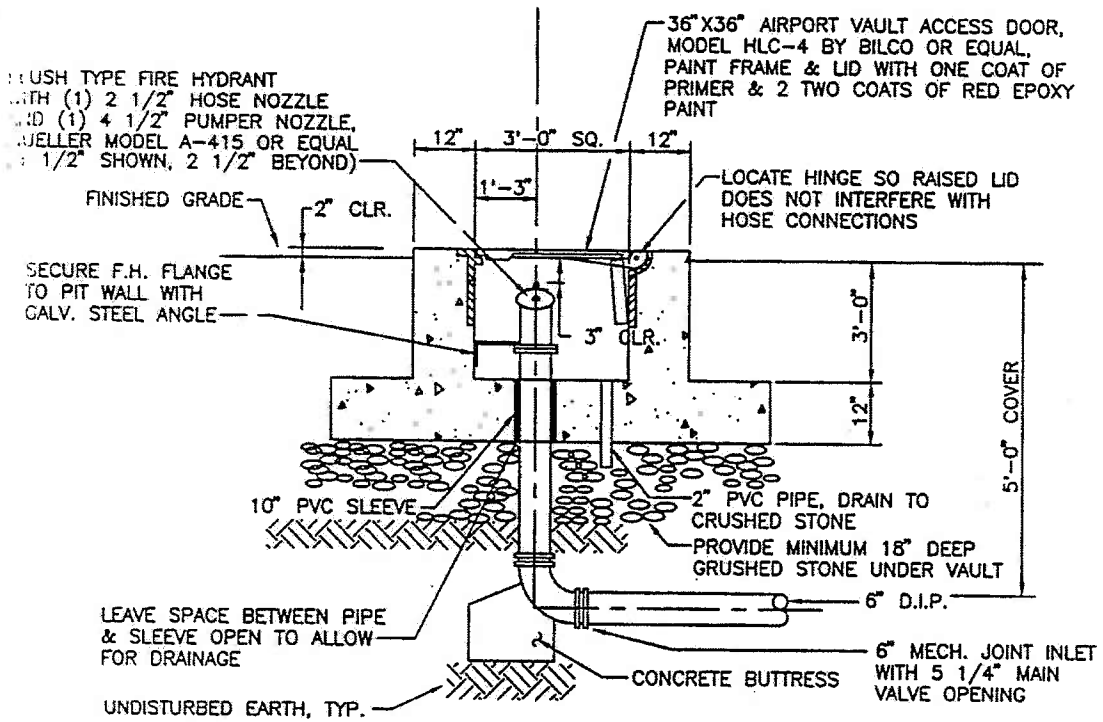


FIRE HYDRANT SETTING DETAIL

NOT TO SCALE

SHEET TITLE: FLUSH TYPE FIRE HYDRANT AND VAULT DETAIL (FOR AIRCRAFT MOVEMENT AREAS ONLY)

DATE: APRIL 2005



SIDE VIEW

NOTES:

1. FLUSH TYPE FIRE HYDRANTS SHALL BE FURNISHED WITHOUT THE ENCLOSURE BOX. PROVIDE TWO WRENCHES PER FIRE HYDRANT. WRENCHES SHALL BE SUPPLIED BY THE HYDRANT MANUFACTURER. PRIOR TO INSTALLATION, THE CONTRACTROR SHALL VERFIY THAT THE APPROVED HYDRANT AND WRENCHES WILL FUNCTION PROPERLY INSIDE THE PROPOSED VAULT. ADJUST VAULT DIMENSIONS AS REQUIRED SO OPERATION OF WRENCHES WILL NOT INTERFERE WITH THE SIDES OF THE VAULT AND THE HINGES/ LIFTING MECHANISM OF THE COVER HATCH.

2. THE 36"X36" COVER SHALL BE SUITABLE FOR AIRCRAFT LOADING TO WITHSTAND A LIVE LOAD OF 200 POUNDS PER SQUARE INCH PLUS 30% IMPACT. COVER SHALL BE MADE OF STEEL PLATE, WITH STEEL CHANNEL FRAME AND ANCHOR FLANGES. PROVIDE DOOR WITH FLUSH MOUNTED HINGES & STAINLESS STEEL HARDWARE, SPRING CUSHION OPERATORS, & HOLD OPEN ARM.

3. PROVIDE NATIONAL STANDARD THREADS ON THE 2-1/2" HOSE CONNECTION, AND BALTIMORE CITY STANDARD THREADS ON THE 4-1/2" HOSE CONNECTION.

4. ON THE ACCESS DOOR, OVER THE RED PAINT, PROVIDE A WHITE FIRE HYDRANT SYMBOL WHICH IS A MINIMUM OF 2 FEET LONG, PAINTED TO MATCH THE NFPA 170 FIGURE 4-2.5.

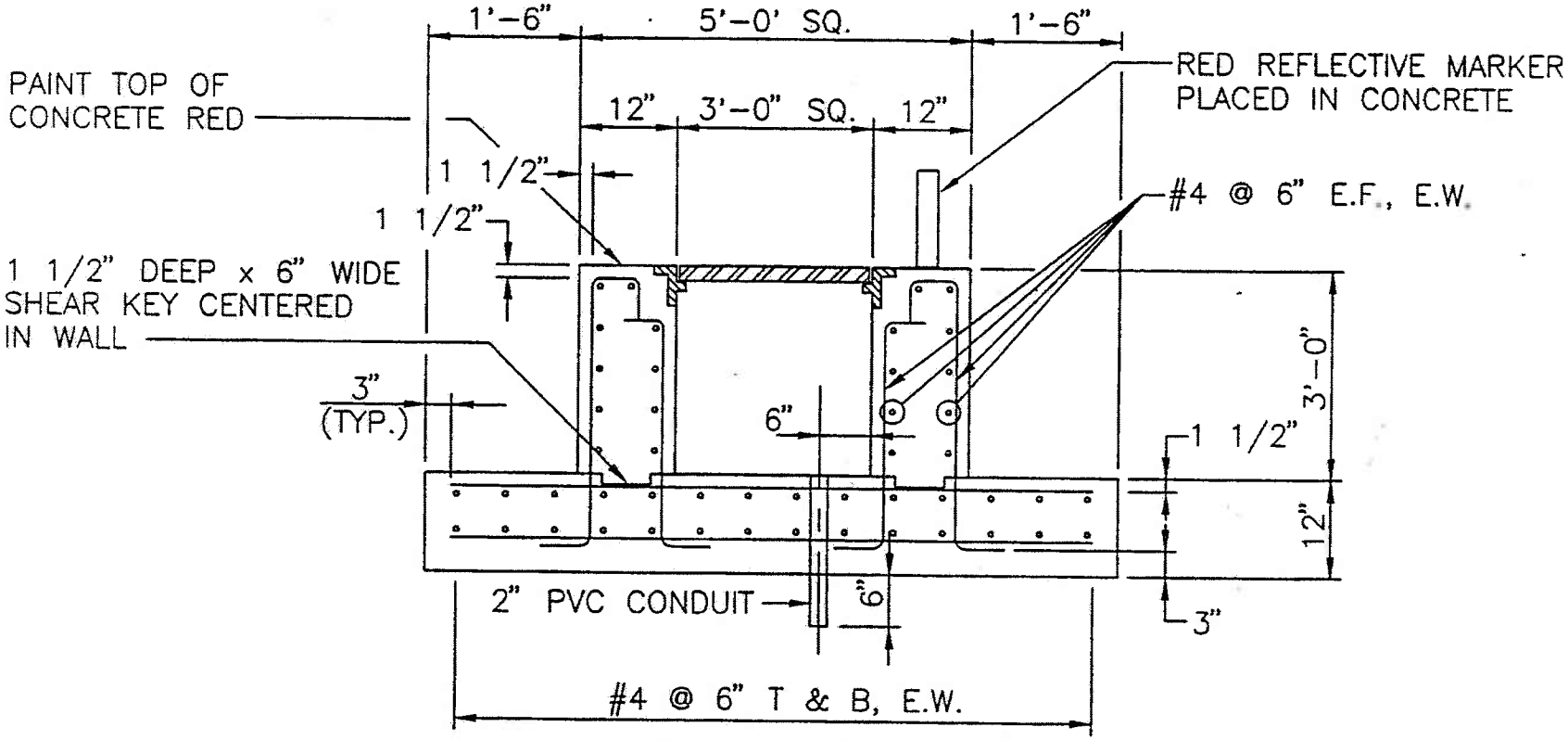
FLUSH TYPE FIRE HYDRANT AND VAULT DETAIL (FOR AIRCRAFT MOVEMENT AREAS ONLY)

NOT TO SCALE

SHEET TITLE: FLUSH TYPE FIRE HYDRANT AND VAULT DETAIL (FOR AIRCRAFT MOVEMENT AREAS ONLY)

DATE: APRIL 2005

NOTES: 1. RED REFLECTIVE MARKER SHALL COMPLY WITH FAA AC 150/5345-39: L-853, MODEL TRM (TAXIWAY REFLECTIVE MARKER) 853-CO-24-R-3W BY CROUSE-HINDS OR EQUAL.



STRUCTURAL SECTION

FLUSH TYPE FIRE HYDRANT AND VAULT DETAIL

(FOR AIRCRAFT MOVEMENT AREAS ONLY)

NOT TO SCALE

15.2.2 Underground Fire Hydrants (Non-Aircraft Loading Areas)

Flush type fire hydrants shall be Mueller or approved equal with a 5 sided 5/16" operating nut, two 2½" diameter hose connection (with National Standard threads) and a 4½" diameter steamer or pumper connection (with Baltimore City threads).

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

15.2.2 Underground Fire Hydrants (Aircraft Loading Areas)

Flush type fire hydrants shall be Mueller or approved equal with a 5 sided 5/16" operating nut, two 2½" diameter hose connection (with National Standard threads) and a 4½" diameter steamer or pumper connection (with Baltimore City threads).

Designer shall provide details for a reinforced concrete structure around the underground fire hydrant. The cover shall be 36" x 36" Model HLC-4 by Bilco or equal, suitable for aircraft loading. The cover shall be capable to withstand a live load of 200 psi plus 30% impact. Structure shall have a door with flush mounted hinges and stainless steel hardware, spring cushion operators, and hold open arm. Cover shall be painted red.

15.2.3 Construction Phasing for Fire Hydrants and Water Mains

In accordance with the Fire Laws of the State of Maryland, which has adopted NFPA-1 Fire Prevention Code, the following applies to new construction: Section 41-2, Fire Safety During Construction, subsection 41-2.3.2, Water Supply – "Where underground water mains and hydrants are to be provided, they shall be installed, completed, and in service prior to construction work." MAA FRD will allow the pad to be installed and the steel to be erected prior to the underground water mains and hydrants being in service.

15.3 CERTIFICATION OF FIRE PROTECTION AND DETECTION SYSTEM DESIGN

The following requirements shall be incorporated into the design and specifications of all projects at BWI and MTN Airports:

Certification:

1. A qualified fire protection engineer shall be an integral part of the design team, and shall be involved in every aspect of the design as it relates to fire protection and detection systems.

2. For the purpose of meeting this requirement, a qualified fire protection engineer is defined as an individual meeting one of the following conditions:

- An engineer having a Bachelor of Science or Master of Science degree in Fire Protection Engineering from an accredited university engineering program, plus a minimum of three (3) years work experience in fire protection engineering.
- A registered professional engineer (PE) who has passed the National Council of Examiners for Engineering and Surveys (NCEES) fire protection engineering written examination.
- A registered PE in related engineering discipline, with a minimum of five (5) years experience dedicated to fire protection engineering.

3. Sealing Requirements: Fire protection and detection system (s) plans, specifications, drawings, submittals, shop drawings, reports, or other documents shall be signed and sealed, as required, pursuant to the Business Occupations and Professions Article, Section 14-403, Annotated Code of Maryland.

Application:

1. The design of the fire protection systems shall meet the requirements of 1, 2, and 3 under "Certification" above. The construction contract documents shall require the construction contractor's Fire Protection Engineer certify the fire protection system(s) design and any revision, in accordance with '3' above. For projects which may not require the production of contract documents, i.e. building permits, applicants shall be required to meet the certification requirements under the building/installation permit.

   Fire protection system(s) include, but are not limited to: wet sprinkler systems, dry sprinkler systems, deluge systems, pre-action or fire cycle systems, dry chemical systems, wet chemical systems, carbon dioxide systems, clean agent systems, foam systems, smoke removal systems, and stair pressurization systems.

   A certification waiver may be requested for the design/renovation of wet sprinkler system(s) not exceeding 10 heads. This request shall be put in writing to the Division Chief, Fire Prevention Division.

2. The design of fire detection systems shall meet the requirements of 1, 2, and 3 under "Certification" above. Fire detection system(s) shall be designed and certified by the Consultant/Engineering firm preparing the construction contract documents prior to advertisement. The Consultant/Engineering firm, prior to issuance to the Contractor, shall certify any subsequent changes/revisions to the design.

   Fire detection system(s) shall be defined as a system that detects the presence of smoke, heat, and fire. This system shall send a signal to the main fire alarm panel and then activate occupant notification systems and alert the fire department. Fire detection system(s) include, but are not limited to: smoke detectors, heat detectors, pull stations, waterflow switches, infrared detectors, beam detectors, horns and strobes, control modules, and monitor modules.

A certification waiver may be requested for the design/renovation of small system(s). This request shall be put in writing to the Division Chief, Fire Prevention Division. If a waiver is granted, the minimum certification required shall be NICET (National Institute for Certification in Engineering Technologies) Level III.

If the fire detection system is integrated or connected to the special fire protection system, no certification waiver will be granted.

Special fire protection system(s) shall be defined as a system that is connected/controlled by the base fire detection system. Special fire protection system(s) include, but are not limited to: fire cycle or pre-action sprinkler systems, or smoke removal systems.

CHAPTER 16: FIRE ALARM, LIFE SAFETY, AND SECURITY SYSTEMS

Refer to Appendix H for The Airport Wide Standard for Interface of Fire Alarm, Life Safety, and Security Systems at Baltimore/Washington International Thurgood Marshall Airport.

16.1 SECURITY SYSTEM DRAWINGS

Security System design shall be produced as separate and unique sections in the contract plans and specifications. Security Systems shall be defined as the Controlled Access Security System (CASS), the Flex response system, the Closed Circuit Television (CCTV) systems, and the supporting communication and/or Fiber-optic backbone delivery systems. All information pertaining to these systems must be clearly tagged and separated in all submitted drawings and documents. These sheets must also carry the following statement:

"WARNING: This document contains Sensitive Security Information that is controlled under 49 CFR 1520. No part of this document may be released to persons without a need to know, as defined by 49 CFR 1520, except with the written permission of the TSA Administrator, Washington D.C. Unauthorized release may result in civil penalty or other action. For U.S. Government agencies, public release is governed by 5 U.S.C. 522."

16.2 BWI AIRPORT FIRE ALARM SYSTEM

The Maryland Aviation Administration (MAA) has adopted the Honeywell Fire Alarm system for BWI Airport. All applicable contracts should include the Honeywell Fire Alarm system as a sole source specification. The specified Honeywell Fire Alarm System should function, operate and be compatible with the existing BWI Fire Alarm system.

The specification should require the Contractor to submit a copy of the as-built fire alarm and sprinkler systems drawings to the Engineer for the BWI Fire Rescue Department (FRD).

The specifications should require the Contractor to design and submit to the Engineer a copy of the sprinkler layout on AutoCADD file on CD for the BWI Fire Rescue Department. The Contractor should also design and submit a copy of the fire alarm system floor plans on AutoCADD file on CD to the Engineer for Honeywell to update the Fire Alarm Central Graphic Computer.

16.2.1 Smoke Detectors

All smoke detectors must be UL or FM listed.

16.3 BUILDING SECURITY ALARM SYSTEM

16.3.1 Knox Box System

All building contract documents should include the installation of the Knox Box System. The Knox Box System is a high security key box designed to give firefighters and emergency services immediate access to locked buildings, elevators, and other secured areas. The Knox Box System has been approved by the MAA as a sole source procurement.

During the design process, you will need to coordinate the number, size, and location of Knox Boxes with the MAA Fire Marshall. The specifications should require the contractor to complete the Authorization/Order form, and obtain the MAA's authorized signature. The Knox Box shall be Key Vaults Series 3200 Surface Mount.

Refer to the standard Authorization/Order form in Appendix B.

CHAPTER 17: ELECTRICAL

The electrical systems for all facilities shall be based on proven design principles. The final configuration, selection and sizing of the electrical system shall be determined by the designer during detailed design phase. The design shall utilize state of the art technology in available equipment and components. The electrical system shall be flexible to accommodate changes, additions and modifications as necessary. Straight forward designs shall be safe, reliable and cost effective.

Accessibility, ease of erection and dismantling of all the components of the system shall be a priority.

17.1 GENERAL ELECTRICAL REQUIREMENTS

17.1.1 UPS Protection

All contract documents for retrofitting, modifying, or new building construction, which involve data jacks, cabling, etc. shall be designed to include, at a minimum, one duplex outlet on a UPS circuit adjacent to each data jack location. This requirement is in addition to any convenience outlet requirements, and is to provide UPS protection for each PC-CPU and future telephone system which is deployed.

17.1.2 Total Harmonic Distortion

1. In order to minimize potential effects of harmonics from: Frequency Converters (including 400 hertz ground power units for aircraft), and Uninterruptible Power Supplies (UPS) of 30,000 volt-ampere capacity or greater, the technical specifications for each piece of such equipment must include the following requirements:

    a. Harmonics Content: total harmonic distortion (THD) of the input current waveform, as measured at the input terminals where the equipment is connected to the premises electrical system, shall be 30% or lower whenever the load on the equipment is 50% of its rated output or higher, independent of external filters.
    b. Power Factor: the input power factor measured at the input terminals, where the equipment is connected to the premises electrical system, shall be 90% or higher whenever the load on the equipment is 50% of its rated output or higher.

2. For Adjustable Frequency Drives (AFDs) for motors 25 horsepower or larger, the technical specifications for each piece of such equipment must include the following requirements:

a. Harmonics Content: total harmonic distortion (THD) of the input current waveform, as measured at the input terminals where the equipment is connected to the premises electrical system, shall be 15% or lower, and the THD of the voltage waveform shall be 3% lower whenever the load on the equipment is 50% of its rated output or higher, independent of external filters.
b. Power Factor: the input power factor measured at the input terminals where the equipment is connected to the premises electrical system, shall be 90% or higher whenever the load on the equipment is 50% of its rated output or higher.

In addition, for Adjustable Frequency Drivers of 300 horsepower or more or a group of Drives with horsepower adding to the 500 horsepower or more, a system study shall be performed by the designer to demonstrate compliance with IEEE Std 519-1992 Tables 10.2 and 10.3. The point of common coupling for the study shall be the immediately upstream medium voltage to low voltage substation in the Airport distribution system. If the study indicates that the IEEE standard cannot be met with above THD limits, then the designer shall specify lower limits so that the IEEE Standard requirements are met.

17.1.3 Approved Testing Laboratories

All equipment and materials shall be tested and labeled by a nationally recognized testing laboratory. A current list of recognized laboratories should always be available on the following website, and should be regularly referred to for updates:

www.firemarshal.state.md.us/Testinglabs.htm

Background:
Electrical Testing Laboratories are qualified private organizations that meet the requirements in 29 CFR 1910.7 to perform independent (i.e., third-party) safety testing and product certification, and thereby receive OSHA recognition. To be recognized by OSHA, an organization must: (1) Have the appropriate capability to test and evaluate products for workplace safety purposes; (2) be completely independent of the manufacturers, vendors, and users of the products for which OSHA requires certification; (3) have internal programs that ensure proper control of the testing and certification process; and (4) establish effective reporting and complaint handling procedures (29 CFR 1910.7(b)).

Any testing laboratory that is listed or otherwise recognized by the U.S. Department of Labor, Occupational Safety and Health Administration, National Voluntary Laboratories Accreditation Program (NVLAP), International Accreditation Service, Inc., or the International Code Council, is automatically accepted by the Office of the Maryland State Fire Marshall and Maryland Aviation Administration.

17.2 GROUNDING AND LIGHTNING PROTECTION

17.2.1 Grounding

Whenever grounding electrode conductors are bonded to ground rods or other grounding electrodes, bonds shall be exothermic welds. Exothermic welds shall be coated against corrosion where direct buried.

1. Ground Rods: Ground Rods shall be ¾" in diameter, 10' long as a minimum. Materials of construction shall be copper-coated steel as a minimum. Ground rods shall be designed and installed per the National Electric Code.

17.2.2 Surge Suppression, Bonding and Grounding for Outdoor Systems

Surge Suppression, Bonding and Grounding, shall be included in the specifications and plans for the following outdoor installations:

- Parking and Revenue Control Systems
- Closed Circuit Television System (CCTV) Installations
- Access Control
- Any unprotected system that may be struck by lightning that would conduct the lightning energy to the inside of the facilities.

Note: Equipment product catalog numbers included in this design standard are for equipment manufactured and provided by Emerson Network Power, EDCO, Transient Voltage Surge Suppression, or by General Electric but these are not meant to be sole source or proprietary specifications. Products by other manufacturers, which meet or exceed the specifications of the named products and include salient features matching those named may be specified, and used.

17.2.2.1 Protection for Parking and Revenue Control Systems

Surge suppression devices shall be installed on all electrical conductors connected to lane toll equipment (revenue plaza equipment, ticket dispensers (spitters) and gates). Typical installations include data cabling (RS-422 for example) and electrical power circuits that feed the lane equipment, and booths.

Protection for Data Cabling

The RS 485/RS-422 circuits shall be protected with an EDCO PC-642-008LC signal line protection device. This device provides two stages of protection with an 8-volt clamp which coordinates well with the 6-volt normal operating voltages on RS-422/485 circuits. The LC suffix indicates low capacitance which allows the suppressor to operate at higher data rates. The EDCO PC series suppressor modules shall be ordered with a model PC-BIB base assembly. The first stage (odd numbered) terminals shall be connected to the field-side wiring

and that the second stage (even numbered) terminals shall be connected to the equipment-side cabling to the protected equipment.

Many locations run RS-422 cables from lane-to-lane in a daisy-chain fashion (parallel connections). In these locations the inter-lane cabling shall be bridged in and then out to the next lane on the field-side wiring of the suppressor. This requires separate inbound and outbound inter-lane cables connected to the field-side of the suppressor with a short pigtail data cable between the suppressor equipment-side and the lane equipment. A suppressor shall be installed on the end of the inter-lane cabling where it attaches to an isolator or protocol converter. **Figure 1** below shows the inter-lane cabling configuration graphically.

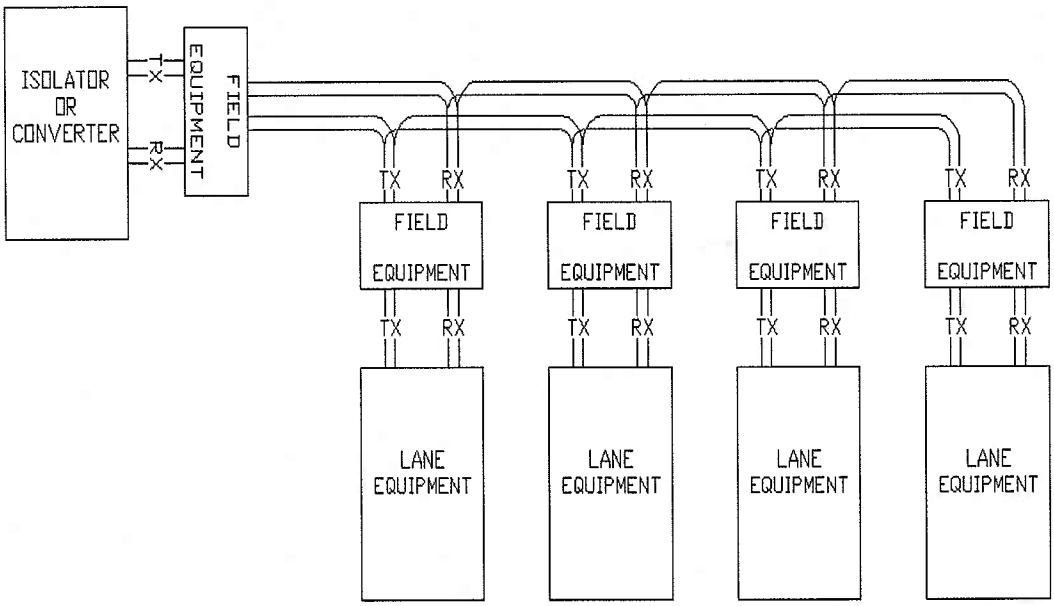


Figure 1 – Inter-Lane Cabling Configuration

Power ground wires and signal suppressor ground wires shall be as short as possible and be bonded to the equipment chassis as physically close to the suppressor as possible. This will minimize the effects of inductive voltage drop across these conductors and help control the voltage excursions that occur during a surge between the protected conductors and the equipment chassis. **Figure 2** below from the EDCO suppressor's application notes depicts these details.

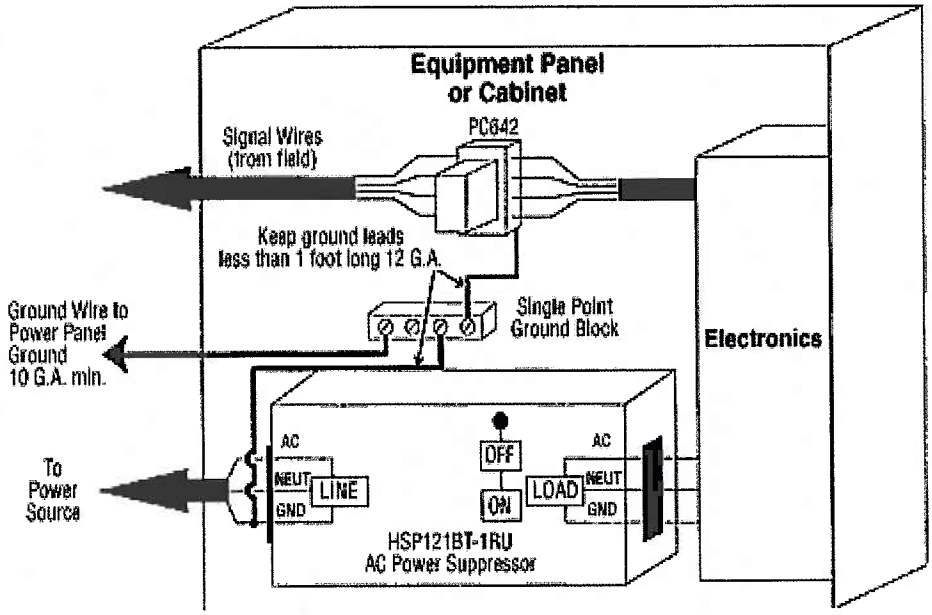


Figure 2 – Chassis Bonds for Suppressor Grounds

Protection for 120 Volt AC Powered Equipment

The 120 Vac powered cashier interface terminals, ticket spitters and gates shall be protected with either an EDCO model HSP121BT or a model HSP121A surge suppressor.

The EDCO HSP121BT has an external barrier strip which is suitable for installation inside ticket spitters, and gate operator housings that are not normally accessible to the cashier or others.

The EDCO HSP121A is mounted in a NEMA enclosure and has an internal terminal strip and knockouts that will accept conduit fittings or cord strain relief fittings. The EDCO HSP121A shall be used inside the cashier booths for protection of the cashiers' interface terminals. Using a cord strain relief fitting, the device shall be hard wired in series with the power input to the UPS at the booths. This will help ensure that the cashiers do not plug heaters into an unused receptacle protected by the surge suppression device as these devices are only rated for 15 amperes.

At the gates, these units shall be used to protect the 120 Vac feed to the controllers with the 120 Vac for the motors taken off upstream of the device. Motor loads shall not be fed through the surge suppressors.

The central equipment is typically located at the equipment cabinet in the Toll Plaza Administration building. The power equipment in the closet cabinet is usually supported by one or two plug-strips. An EDCO TS-1200G suppressor which will plug into one of the receptacles located in the cabinet shall be used.

The plug-strip(s) can then be plugged directly into the EDCO TS-1200G. The "G" in the part number is an external binding post ground terminal. It connects to the internal grounds in the suppressor and provides a good point to attach the ground leads from the data line suppressors.

17.2.2.2 Protection for Closed Circuit Television Systems

Remote Closed Circuit Television (CCTV) cameras located at gates and parking areas are particularly susceptible to damage from lightning, largely due to the high level of exposure to direct lightning strikes or strikes in near proximity.

Protection for CCTV Cameras

The CCTV cameras typically include pan tilt assemblies, and are integrated units requiring 24 Vac power, RS-485 4-wire pan-tilt-zoom control and a coaxial video connection. A NEMA 4X rated equipment enclosure is typically installed at the base of each tower. This enclosure contains a quad electrical receptacle, a fiber-optic transceiver for video and control, a power transformer for camera power and a separate power transformer for the fiber-optic transceiver. Adequate space must be provided in the enclosure for the required surge suppression devices.

Figure 3 below depicts several measures that shall be taken at typical tower locations. An air terminal, fashioned from a galvanized ground rod shall be installed to protect the camera housing from direct lightning strike currents. A ground rod and bonding conductor to the tower shall be added to improve the ground resistance of the tower foundation. Continuous steel conduit shall be installed from the camera housing to the equipment enclosure to help shield the camera cabling from induced voltage if the tower is struck by lightning.

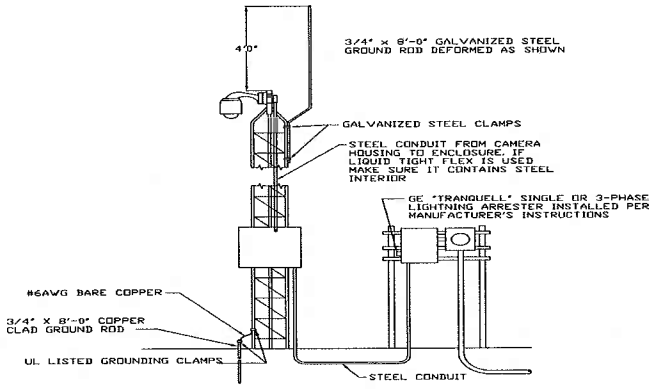


Figure 3 – CCTV Camera Tower Recommendations

Because of the relatively high exposure of these sites a high energy Metal Oxide Varistor (MOV) arrester shall be installed at the electrical panel serving each camera tower. The product recommended is a General Electric Tranquell device in either a 120/240 Vac single phase or 120/208 Vac three phase configuration. These units install in a knockout in the panel and either is directly connected to the buses or connected through a 30-ampere breaker. These units are rated for 10,000 ampere Category C exposure conditions and they will provide a first stage clamp down to a level between 2 kV and 3 kV. This provides an additional level of protection that will help extend the lifespan of suppressors installed inside the camera cabinet.

Figure 4 below shows the recommended configuration for the CCTV power, video and RS-422 pan-tilt-zoom control circuits at the base of the tower. These enclosures are typically equipped with quad 120 Vac receptacles to plug-in the camera power transformer and the plug-in DC supply for the fiber transceiver. Protect these receptacles with an EDCO HSP-121A, NEMA 4X, 120 Vac, suppressor. This suppressor (shown as A on Figure 4) is shown interconnecting these receptacles with the incoming power conductors. This suppressor will control voltage excursions from line-to-neutral and from line-to-ground to about 300-400 volts during 10 kiloampere Category C surge conditions. These suppressors are required in these locations due to the high exposure levels to direct lightning.

NOTES

A EDCO HSP-121A 120VAC NEMA 4X
B EDCO FAS-1-043HC 24VAC
C EDCO CX-06-BNC-Y-I GND ISOLATED VIDEO
D EDCO PC-642-008LC/PCB1B RS-485
E #12AWG COPPER & RING LUGS - KEEP SHORT
F NEW 4"SQ BOX WITH RECEPTS & COVER
G 1" X 1/8" COPPER BUS BONDED TO SIDE OF CABINET
H BOND HSP INPUT GROUND TERMINAL TO INCOMING GROUND CONDUCTOR. EXTEND BONDING JUMPER FROM INPUT GROUND THROUGH DRILLED HOLE TO BAR

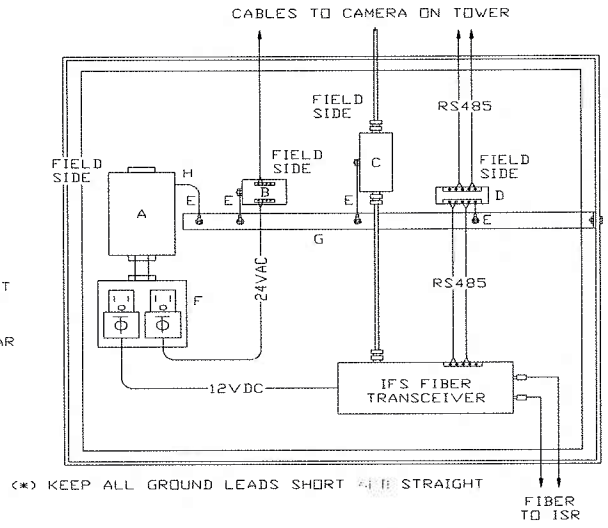


Figure 4 – CCTV Equipment Enclosure Recommended Configuration

An EDCO FAS-1-043HC, two-stage, suppression shall be installed to protect the 24 Vac power conductors to the camera assembly. This suppressor uses series inductors between the first and second stage rather than resistors, allowing it to pass several amperes of current.

An EDCO CX-06-BNC-Y-I, coaxial suppressor (shown as B on Figure 4) shall be installed to protect the camera video cable. This suppressor uses a female BNC connector on both the field-side and equipment-side. A clamp voltage of 6-volts is recommended as the peak-to-peak video levels should be around one volt.

An EDCO PC-642-008LC/PCB1B, two-pair low capacitance suppressor (shown as D on Figure 4) shall be installed to protect the RS-485 circuits with a clamping voltage of eight volts. This is consistent with the 6-volt operating range for the suppressor. This suppressor is polarity insensitive. The part number for this unit also includes a plug-in screw terminal base.
A copper ground bus (shown as G on Figure 4) shall be installed to terminate the ground leads for the suppressors. A flat conductor provides a significantly lower inductance than a round conductor, which is a major factor in having the suppressors track each other during high levels of lightning current. The bus bar is shown bonding to the side of the cabinet with stainless steel hardware and star washers to ensure that potentials inside the enclosure remain consistent with each other.

The power suppressor has a terminal strip for line, neutral and ground on both the unprotected and protected side. Line, neutral and ground conductors shall terminate on these strips. In addition, a #12 AWG copper conductor is shown between the unprotected ground terminal and the copper bus for the cabinet. This will help to ensure that the ground reference for the power suppressor and ground leads for the other suppressors track each other during surge handling.

Properly connect the suppressors with their unprotected or field-side wiring terminals to the cabling leaving the enclosure. If connected backwards, the more sensitive (but faster acting) second stage will be exposed to excessive current and the suppressors may be damaged by the first lightning event.

Separation of cabling is required to minimize coupling between protected and unprotected cabling. If it is necessary to cross these cables over each other, make the crossover using right angles. This will help to minimize the inductive and capacitive coupling of energy between protected and unprotected circuits.

Protection is not provided for the 12 Vdc power supply to the IFS transceiver as this power circuit does not leave the enclosure.

17.2.2.3 Protection for Access Control System Gates

Due to the exposed location of access control components located at vehicular gates, there is likely to be damage by direct or nearby lightning strikes and the metallic fencing's ability to conduct nearby strikes to the gate locations.

Figure 5 shows the recommended method for protecting the access control equipment at the gates. Install an EDCO HSP-121A, two-stage hybrid, NEMA 4X, suppressor (See A on Figure 5) on the exterior of the access control enclosure to protect the power conductors. This approach is recommended as access control enclosures typically have insufficient space to place the suppressor in the housing. The incoming 120 Vac power entering the enclosure is looped out, through the suppressor and back into the enclosure where it is hard-wired to the 27 Vdc regulated switching power supply.

NOTES

A EDCO HSP-121A 120VAC NEMA 4X

B EDCO FAS-1-043HC 24VAC

C EDCO PC-642-008LC/PCB1B RS-485

D #12AWG COPPER & RING LUGS - KEEP SHORT

E 1" X 1/8" COPPER BUS BONDED TO SIDE OF CABINET

F EDCO FAS-1-043HC 24VAC OR DC

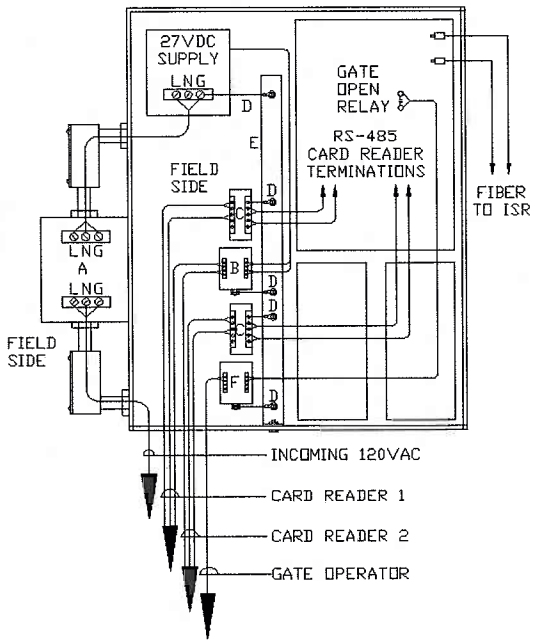


Figure 5 – Gate Access Control Recommended Configuration

An EDCO FAS-1-043HC, two-circuit, 24 Vac, suppressor shall be installed at each gate to protect the wiring to the two card readers. This EDCO AC suppressor was chosen for this application as the 27 Vdc used to power the remote readers is on the upper limit of what a 24 Vdc suppressor will tolerate. Since peak voltage on an AC circuit is 1.41 times the RMS value, the clamping threshold for the AC suppressor is actually set at 43-Volts. The suppressors for card reader power utilize a series inter-stage inductor rather than resistors making them suitable for this type of powering application.

Use EDCO PC-642-008LC/PCB1B, low capacitance, 8-volt, RS-485, suppressors for protection of the card reader data circuits. These suppressors shall include a plug-in screw terminal base that can be secured to the back or side panels in an enclosure.

In the event that Wiegand readers are ever required, the same manufacturer makes a 5-conductor Wiegand protector in the same package.

In lower exposure areas, there would not be concern about circuits that leave the enclosure isolated by a dry relay contact. Cases of welded relay contacts, contacts burned open and even miniature relays which were completely disintegrated have occurred in high exposure level situations. When this occurs there is often collateral damage to other components on the circuit board.
A 24 Vac suppressor shall be specified for in high exposure level situations. This is usable with AC or DC control voltages of up to about 30 volts as the clamping threshold is set at 43 volts. If higher voltages are required, a different suppressor may be utilized with a clamp setting that is workable with the voltage being switched.

All of the rules and guidelines recommended for the CCTV enclosure apply to the card access installation. This includes separation of protected and unprotected conductors and keeping ground leads short.

No detail was produced for the remote card readers themselves. These readers shall be equipped with one of the reader power suppressors (also available in a single pair configuration) and an RS-485 suppressor installed in the junction box behind the reader. Bond suppressor grounds to the metallic housing for the reader and reader pedestal.

17.3 POWER DISTRIBUTION SYSTEM AND EQUIPMENT

17.3.1 Substations

Below outlines the requirements for 13,800-480 volt electrical substations.

1. All equipment and installations shall be in accordance with the National Electrical Code (NEC) per edition approved and specified in the Maryland Model Performance Code.

2. All equipment locations shall be coordinated with the MAA Office of Engineering and Construction Management.

3. Substations shall be 13,800-480 volt, secondary selective configuration consisting of two primary (13,800 volt) feeders, two primary fused load interrupter switches, two power transformers, two secondary (480 volt) main circuit breakers, one tie breaker, and feeder breakers. All current carrying parts of the substation and related components shall be copper. Each substation shall be supplied by one North feeder and one South feeder originating from switchgear supplied from the BWI North and South substation respectively. Refer to Substation one-line diagram and the substation sequence of operation details for additional information. The current BWI medium voltage one-line diagram is available from MAA upon request.

The secondary main and tie circuit breakers shall be electrically operated draw-out type low voltage power circuit breakers or insulated case circuit breakers.
The feeder circuit breakers shall be manually operated draw-out type low voltage power circuit breakers, insulated case circuit breakers or molded case circuit breakers mounted in continuous metal enclosed switchgear or switchboard enclosure(s).

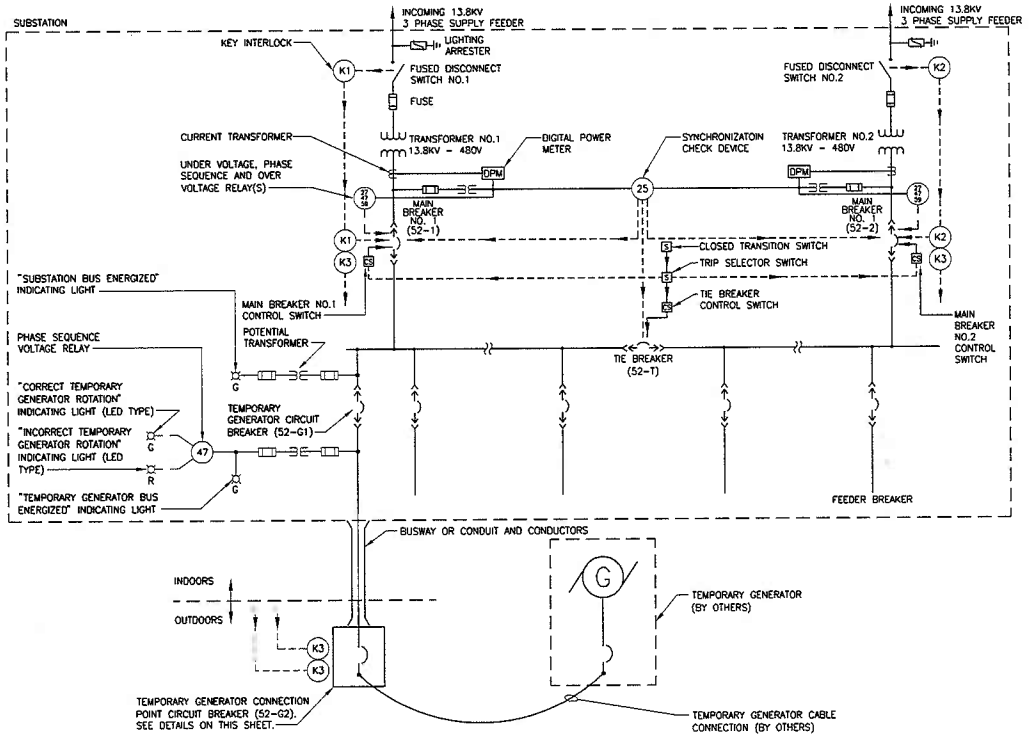
4. All substation short-circuit ratings shall be adequate for the combined available fault current contribution due to secondary closed transition switching. The available fault current shall be calculated for the moment that both secondary main breakers and the tie breaker are simultaneously closed and both transformers are energized from their primary source.

5. Ground fault protection shall be provided for all substation 480 volt circuit breakers including secondary main circuit breakers, tie breaker and all feeder breakers. Ground fault protection for 3 phase, 4 wire, solidly ground systems shall utilize current transformer (CT) sending for all phase and neutral conductors. Three (3) phase underground systems shall include a ground fault sensing and indication system.

6. Substations shall include a semi-automatic secondary closed transition switching scheme that allows for momentary simultaneous closing of both secondary main circuit breakers and tie circuit breaker for maintenance switching purposes. The closed transition scheme and associated components shall be designed and manufactured by the substation equipment manufacturer and designed specifically for this application. All components shall be integral to the substation. Refer to Substation one-line diagram and the substation sequence of operation details for additional information.

   The designer shall contact MAA maintenance personnel to see if any operating problems have occurred recently with closed transition operation at existing substations. If so, the designer shall request that BGE perform a circulating study. The designer shall make recommendations based on the results of the study.

   The designer shall contact BGE to see if any changes have been made that could affect the synchronization of incoming feeders and closed transition operation. If so, the designer shall request that BGE perform a circulating study. The designer shall make recommendations based on the results of the study.



SUBSTATION ONE-LINE DIAGRAM

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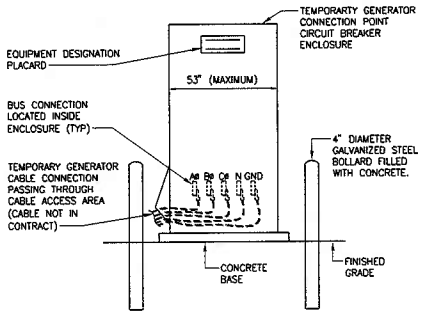

TEMPORARY GENERATOR CONNECTION POINT CIRCUIT BREAKER (52-G2) - FRONT VIEW

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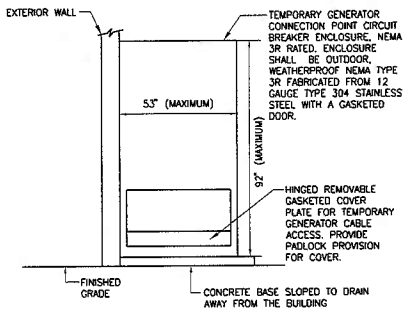

TEMPORARY GENERATOR CONNECTION POINT CIRCUIT BREAKER (52-G2) - SIDE VIEW

NOT TO SCALE

URS CONSULTING ENGINEERING AND PLANNING 1099 Winterson Road Linthicum, MD 21090 Phone: 410-855-6160 Fax: 410-855-6163	DESIGNED D.M.W.	REVISION NO.	REVISION DATE	DESCRIPTION	MARYLAND DEPARTMENT OF TRANSPORTATION MARYLAND AVIATION ADMINISTRATION DIVISION OF ENGINEERING BALTIMORE/WASHINGTON INTERNATIONAL AIRPORT	PROJECT TITLE	
	DRAWN M.R.F.					SHEET TITLE SUBSTATION ONE-LINE DIAGRAM	SHEET NO.
	CHECKED D.L.B.					SCALE NONE	DATE AUGUST, 2003
	APPROVED D.L.B.						

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SUBSTATION OPERATING DESCRIPTION

1. KEY INTERLOCKS K1 AND K2 INTERLOCK PRIMARY FUSED DISCONNECT SWITCH AND SECONDARY MAIN BREAKER. SECONDARY MAIN BREAKER CAN BE CLOSED ONLY AFTER PRIMARY SWITCH IS CLOSED. PRIMARY SWITCH CAN BE OPENED ONLY AFTER SECONDARY MAIN BREAKER IS OPENED. KEY IS CAPTIVE IN PRIMARY SWITCH WITH SWITCH IN OPEN POSITION. KEY IS CAPTIVE IN SECONDARY MAIN BREAKER WITH BREAKER IN CLOSED POSITION.

2. BREAKER CONTROL SWITCH ELECTRICALLY OPEN AND CLOSE BREAKER UNLESS OVERRIDDEN BY INTERLOCK FUNCTIONS.

3. CLOSED TRANSITION SWITCH ACTIVATES SUBSTATION SECONDARY CLOSED TRANSITION SWITCHING SCHEME ALLOWING FOR MOMENTARY SIMULTANEOUS CLOSING OF BOTH SECONDARY MAIN CIRCUIT BREAKERS AND TIE CIRCUIT BREAKER.

   - CLOSED TRANSITION SWITCH TO "OFF" POSITION PERFORMS THE FOLLOWING FUNCTIONS:

     (1) PREVENTS SIMULTANEOUS CLOSING OF MAIN BREAKER NO. 1, MAIN BREAKER NO. 2, AND TIE BREAKER WITH ELECTRICAL INTERLOCK.

     (2) DISABLES TRIP SELECTOR SWITCH FUNCTIONS.

   - CLOSED TRANSITION SWITCH TO "ON" POSITION PERMITS SECONDARY CLOSED TRANSITION SWITCHING WITH SELECTIVE TIME-OUT FUNCTION.

4. TRIP SELECTOR SWITCH SELECTS SECONDARY BREAKER (MAIN BREAKER NO.1, MAIN BREAKER NO.2, OR TIE BREAKER) THAT WILL AUTOMATICALLY OPEN AFTER SECONDARY CLOSED TRANSITION SWITCH OPERATION HAS BEEN INITIATED. SELECTED BREAKER WILL OPEN AFTER TIME-OUT PERIOD WHICH STARTS AT THE INSTANT WHEN ALL SECONDARY BREAKERS ARE SIMULTANEOUSLY CLOSED (MAIN BREAKER NO. 1, MAIN BREAKER NO. 2, AND TIE BREAKER). FEEDER CIRCUIT BREAKERS WILL NOT EXPERIENCE ANY TYPE OF OUTAGE DUE TO THIS SWITCHING OPERATION.

5. SYNCHRONISM CHECK DEVICE PREVENTS SECONDARY CLOSED TRANSITION SWITCHING OPERATION IF VOLTAGE PHASE SHIFT OR MAGNITUDE ACROSS OPEN SECONDARY BREAKER (MAIN BREAKER NO. 1, MAIN BREAKER NO. 2 OR TIE BREAKER) EXCEEDS A PRESET VALUE. THE SYNCHRONISM CHECK DEVICE SETTINGS SHALL BE PROVIDED BY THE SWITCHGEAR EQUIPMENT MANUFACTURER.

6. SECONDARY BREAKER TRIP DEVICE BELL ALARM INTERLOCK (NOT SHOWN ON ONE – LINE DIAGRAM) PREVENTS SECONDARY CLOSED TRANSITION SWITCHING OPERATION IF BELL ALARM ACTIVATED ON ANY SECONDARY BREAKER (MAIN BREAKER NO. 1, BREAKER NO. 2 OR TIE). BELL ALARM IS INDICATION OF BREAKER TRIP DUE TO FAULT AND REQUIRES MANUAL RESET AT BREAKER.

7. KEY INTERLOCK K3 INTERLOCKS THE TEMPORARY GENERATOR CONNECTION POINT CIRCUIT BREAKER (52-G2) WITH BOTH SECONDARY MAIN BREAKERS. THE TEMPORARY GENERATOR CONNECTION POINT CIRCUIT BREAKER (52-G2) CAN ONLY BE CLOSED AFTER BOTH SECONDARY MAIN BREAKERS ARE OPENED. KEY K3 IS CAPTIVE IN SECONDARY MAIN BREAKER WHEN BREAKER IS IN CLOSED POSITION. BOTH K3 KEYS ARE CAPTIVE IN THE TEMPORARY GENERATOR CONNECTION POINT CIRCUIT BREAKER (52-G2) WHEN BREAKER IS IN CLOSED POSITION.

8. TEMPORARY GENERATOR CIRCUIT BREAKER (52-G1) IS NOT KEY INTERLOCKED.

9. TEMPORARY GENERATOR CIRCUIT BREAKER (52-G1) INDICATING DEVICE FUNCTIONS ARE AS FOLLOWS:

   - "SUBSTATION BUS ENERGIZED" INDICATING LIGHT:

     (1) ON WHEN TEMPORARY GENERATOR CIRCUIT BREAKER (52-G1) LINE SIDE BUS IS ENERGIZED.

     (2) OFF WHEN TEMPORARY GENERATOR CIRCUIT BREAKER (52-G1) LINE SIDE BUS IS DE-ENERGIZED.

   - "CORRECT TEMPORARY GENERATOR ROTATION" GREEN INDICATING LIGHT:

     (1) ON WHEN TEMPORARY GENERATOR CIRCUIT BREAKER (52-G1) LOAD SIDE BUS IS ENERGIZED AND VOLTAGE ROTATION IS CORRECT

     (2) OFF WHEN TEMPORARY GENERATOR CIRCUIT BREAKER (52-G1) LOAD SIDE BUS IS DE-ENERGIZED. OFF WHEN TEMPORARY GENERATOR CIRCUIT BREAKER (52-G1) LOAD SIDE BUS IS ENERGIZED AND VOLTAGE ROTATION IS INCORRECT.

   - "INCORRECT TEMPORARY GENERATOR ROTATION" RED INDICATING LIGHT:

     (1) ON WHEN TEMPORARY GENERATOR CIRCUIT BREAKER (52-G1) LOAD SIDE BUS IS ENERGIZED AND VOLTAGE ROTATION IS INCORRECT.

     (2) OFF WHEN TEMPORARY GENERATOR CIRCUIT BREAKER (52-G1) LOAD SIDE BUS IS DE-ENERGIZED. OFF WHEN TEMPORARY GENERATOR CIRCUIT BREAKER (52-G1) LOAD SIDE BUS IS ENERGIZED AND VOLTAGE ROTATION IS CORRECT.

   - "TEMPORARY GENERATOR BUS ENERGIZED" INDICATING LIGHT:

     (1) ON WHEN TEMPORARY GENERATOR CIRCUIT BREAKER (52-G1) LOAD SIDE BUS IS ENERGIZED.

     (2) OFF WHEN TEMPORARY GENERATOR CIRCUIT BREAKER (52-G1) LOAD SIDE BUS IS DE-ENERGIZED.

   - PHASE SEQUENCE VOLTAGE RELAY:

     MONITORS TEMPORARY TEMPORARY GENERATOR CIRCUIT BREAKER (52-G1) LOAD SIDE VOLTAGE AND PROVIDES ELECTRICAL CONTACTS REQUIRED TO CONTROL ROTATION INDICATING LIGHT FUNCTIONS.

SUBSTATION SECONDARY CLOSED TRANSITION SWITCH SCHEME SEQUENCE OF OPERATION

OPERATION 1: PERFORM CLOSED TRANSITION SECONDARY SWITCHING FROM NORMAL TO ALTERNATE CONFIGURATION.

CIRCUIT BREAKER	INITIAL STATUS	STATUS AFTER SWITCHING
MAIN NO. 1 (52-1)	CLOSED	CLOSED
TIE (52-T)	OPEN	CLOSED
MAIN NO. 2 (52-2)	CLOSED	OPEN

1. CLOSED TRANSITION SWITCH TO "ON" POSITION.
2. TRIP SELECTOR SWITCH TO "MAIN 2" POSITION.
3. CLOSE TIE BREAKER VIA CONTROL SWITCH.
4. AFTER TIME-OUT PERIOD MAIN BREAKER NO. 2 AUTOMATICALLY OPENS.

OPERATION 2: PERFORM CLOSED TRANSITION SECONDARY SWITCHING FROM OPERATION 1 ALTERNATE BACK TO NORMAL CONFIGURATION.

CIRCUIT BREAKER	INITIAL STATUS	STATUS AFTER SWITCHING
MAIN NO. 1 (52-1)	CLOSED	CLOSED
TIE (52-T)	CLOSED	OPEN
MAIN NO. 2 (52-2)	OPEN	CLOSED

1. CLOSED TRANSITION SWITCH TO "ON" POSITION.
2. TRIP SELECTOR SWITCH TO "TIE" POSITION.
3. CLOSE MAIN NO. 2 BREAKER VIA CONTROL SWITCH.
4. AFTER TIME-OUT PERIOD TIE BREAKER AUTOMATICALLY OPENS.

OPERATION 3: PERFORM CLOSED TRANSITION SECONDARY SWITCHING FROM NORMAL TO ALTERNATE CONFIGURATION.

CIRCUIT BREAKER	INITIAL STATUS	STATUS AFTER SWITCHING
MAIN NO. 1 (52-1)	CLOSED	OPEN
TIE (52-T)	OPEN	CLOSED
MAIN NO. 2 (52-2)	CLOSED	CLOSED

1. CLOSED TRANSITION SWITCH TO "ON" POSITION.
2. TRIP SELECTOR SWITCH TO "MAIN NO. 1" POSITION.
3. CLOSE TIE BREAKER VIA CONTROL SWITCH.
4. AFTER TIME-OUT PERIOD MAIN BREAKER NO. 1 AUTOMATICALLY OPENS.

OPERATION 4: PERFORM CLOSED TRANSITION SECONDARY SWITCHING FROM OPERATION 3 ALTERNATE BACK TO NORMAL CONFIGURATION.

CIRCUIT BREAKER	INITIAL STATUS	STATUS AFTER SWITCHING
MAIN NO. 1 (52-1)	OPEN	CLOSED
TIE (52-T)	CLOSED	OPEN
MAIN NO. 2 (52-2)	CLOSED	CLOSED

1. CLOSED TRANSITION SWITCH TO "ON" POSITION.
2. TRIP SELECTOR SWITCH TO "TIE" POSITION.
3. CLOSE MAIN NO. 1 BREAKER VIA CONTROL SWITCH.
4. AFTER TIME-OUT PERIOD TIE BREAKER AUTOMATICALLY OPENS.

OPEN TRANSITION: OPEN TRANSITION SECONDARY SWITCHING CAN BE PERFORMED WHEN CLOSED TRANSITION SWITCH IS IN "OFF" POSITION.

SUBSTATION AUTOMATIC TRANSFER SCHEME SEQUENCE OF OPERATION

PROVIDE AN OPEN TRANSITION AUTOMATIC TRANSFER SCHEME WITH THE FOLLOWING FUNCTIONS:

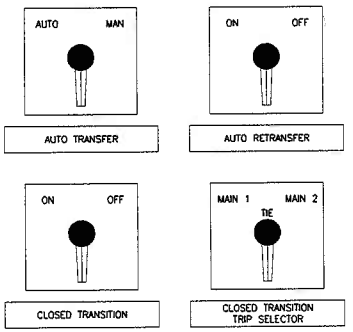
1. AUTOMATIC/MANUAL CONTROL SWITCH – ENABLES/DISABLES AUTOMATIC TRANSFER SCHEME.
2. RETRANSFER CONTROL SWITCH – ENABLE/DISABLE AUTOMATIC TRANSFER SCHEME AUTOMATIC RETRANSFER OPERATION.
3. NORMAL CONDITION – SECONDARY MAIN CIRCUIT BREAKERS (52-1 AND 52-2) ARE CLOSED, AND THE TIE BREAKER (52-T) IS OPEN.
4. LOSS OF EITHER ONE OF THE INCOMING UTILITY SOURCES RESULTS IN AUTOMATIC OPENING OF AFFECTED SECONDARY MAIN CIRCUIT BREAKER (52-1) OR (52-2) AND CLOSING OF SECONDARY TIE BREAKER (52-T) IN ORDER TO AUTOMATICALLY SUPPLY ENTIRE SUBSTATION LOAD.
5. WHEN INCOMING UTILITY SOURCE IS RE-ENERGIZED, 52-1, 52-2, AND 52-T RETRANSFER TO NORMAL CONDITION IF RETRANSFER CONTROL SWITCH IS IN "ON" POSITION. SUBSTATION SECONDARY BREAKERS WILL NOT RETRANSFER IF RETRANSFER SWITCH IS IN "OFF" POSITION.
6. ATS SCHEME SHALL BE COORDINATED WITH OTHER SUBSTATION FUNCTIONS.

SUBSTATION GENERATOR QUICK CONNECT SEQUENCE OF OPERATION

SUBSTATION DEVICE	SUBSTATION DEVICE STATUS (NORMAL SYSTEM OPERATION)	SUBSTATION DEVICE STATUS (TEMPORARY GENERATOR OPERATION)
FUSED DISCONNECT SWITCH NO. 1	CLOSED	OPEN
FUSED DISCONNECT SWITCH NO. 2	CLOSED	OPEN
SECONDARY MAIN BREAKER NO. 1 (52-1)	CLOSED	OPEN
SECONDARY MAIN BREAKER NO. 2 (52-2)	CLOSED	OPEN
TIE BREAKER (52-T)	OPEN	CLOSED
TEMPORARY GENERATOR CIRCUIT BREAKER (52-G1)	CLOSED	CLOSED
TEMPORARY GENERATOR CONNECTION POINT CIRCUIT BREAKER (52-G2)	OPEN	CLOSED

SWITCHING OPERATION: FROM NORMAL SYSTEM OPERATION TO TEMPORARY GENERATOR OPERATION SHALL BE AS FOLLOWS:

1. OPEN 480V FEEDER CIRCUIT BREAKERS.
2. OPEN TEMPORARY GENERATOR CIRCUIT BREAKER (52-G1).
3. OPEN SECONDARY MAIN CIRCUIT BREAKER NO. 1 (52-1) AND NO. 2. (52-2)
4. REMOVE KEYS K1 AND K2 FROM SECONDARY MAIN CIRCUIT BREAKERS. INSERT KEYS K1 AND K2 INTO FUSED DISCONNECT SWITCH NO. 1 AND NO. 2.
5. OPEN FUSED DISCONNECT SWITCH NO. 1 AND NO. 2.
6. CLOSE TIE CIRCUIT BREAKER (52-T).
7. REMOVE KEY K3 FROM BOTH SECONDARY MAIN CIRCUIT BREAKERS. INSERT BOTH K3 KEYS INTO TEMPORARY GENERATOR CONNECTION POINT CIRCUIT BREAKER (52-G2).
8. CONNECT TEMPORARY GENERATOR CABLE CONNECTION FROM GENERATOR TO TEMPARARY CONNECTION POINT CIRCUIT BREAKER (52-G2).
9. START GENERATOR.
10. CLOSE TEMPORARY GENERATOR CONNECTION POINT CIRCUIT BREAKER (52-G2).
11. CHECK TEMPORARY GENERATOR ROTATION INDICATING LIGHTS AT TEMPORARY GENERATOR CIRCUIT BREAKER (52-G1). IF GENERATOR ROTATION IS CORRECT, CLOSE THE TEMPORARY GENERATOR CIRCUIT BREAKER (52-G1). THE SUBSTATION MAIN 480V BUS IS ENERGIZED AT THIS TIME.
12. CLOSE 480V FEEDER BREAKERS AS NEEDED.



SUBSTATION AUTOMATIC TRANSFER AND CLOSED TRANSITION SCHEME – CONTROL SWITCH LAYOUT

NOT TO SCALE

NOTE:

1 PROVIDE CONTROL SWITCH LAYOUT AT SWITCHGEAR TRANSFER CONTROLS SECTION.

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DRAWN	M.R.F.
CHECKED	D.L.B.
APPROVED	D.L.B.

REVISION NO.	REVISION DATE	DESCRIPTION

MARYLAND DEPARTMENT OF TRANSPORTATION
MARYLAND AVIATION ADMINISTRATION
DIVISION OF ENGINEERING
BALTIMORE/WASHINGTON INTERNATIONAL AIRPORT
BWI

PROJECT TITLE

SHEET TITLE: SUBSTATION SEQUENCE OF OPERATION

SCALE: NONE | DATE: AUGUST, 2003

SHEET NO.

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7. Substations shall include a secondary automatic transfer scheme that will automatically open one secondary main breaker and close the tie breaker in order to transfer all load to one primary feeder if abnormal voltage is detected on one of the two incoming substation primary feeders. Since there is an automatic transfer on the primary feeders to the substations, the automatic secondary transfer should incorporate time delays of sufficient length to allow the primary transfer to occur prior the secondary transfer. Refer to Substation one-line diagram and the substation sequence of operation details for additional information.

8. Substations shall include an emergency power quick connect system which includes a permanent connection point for a temporary electric generator in order to supply temporary power to the entire substation in the event of a complete substation power outage. The quick connect system shall include a temporary generator circuit breaker (52-G1) (located within the substation), temporary generator connection point circuit breaker (52-G2) (located outdoors, remote from the substation at an area easily accessible to the temporary generator), feeder from 52-G1 to 52-G2, and control system. The location of the temporary generator connection point enclosure shall be approved by the BWI Office of Airfield Operations and Security, as well as the Office of Maintenance and Utilities. Refer to Substation one-line diagram and the substation sequence of operation details for additional information.

   Circuit breaker 52-G1 and 52-G2 shall be manually operated. Circuit breaker 52-G1 and 52-G2 and the feeder shall have a rated ampacity equal to the substation main circuit breakers.

   The temporary generator connection point circuit (52-G2) shall be installed in a pad-mounted enclosure of sufficient size and configuration to allow for temporary generator cable connections. The enclosure shall have the following options: NEMA 3R 12-gauge type 304 stainless steel construction, gasketed door, front accessible only, padlock provision, key interlock, internal heater (with thermostat and internal control power transformer), internal hinged dead front door (that allows breaker to be operated with no possible access to energized parts), temporary generator cable access area, and number of cables. The entire enclosure shall be rated NEMA 3R while-in-use when temporary generator cables are connected and operational. All components of the temporary generator connection point circuit breaker shall be specifically designed for this purpose and manufactured by the circuit breaker manufacturer or by the circuit breaker manufacturer factory authorized field service organization. An 8-1/2" x 11" aluminum sign attached to outside of the enclosure shall be installed with

the following wording: "Substation _____ Generator Connection." The name of the substation shall be filled in the blank space.

9. Contract documents shall require performance of a short-circuit and coordination study during construction to establish settings for all new adjustable system protection devices. All new devices shall be selectively coordinated with existing devices and operating schemes including but not limited to, overload/short-circuit protection and automatic transfer schemes.

10. Contract documents shall require furnishing and installation of permanently attached engraved instruction placards including substation one-line diagram and all substation sequence of operations. Locate on placard at substation interior wall with an emergency lighting fixture with integral battery back-up in close proximity. Locate one placard on the inside of the temporary generator connection point circuit breaker enclosure.

11. Contract documents shall require furnishing and installation of a framed wall-mounted one-line diagram for the substation and the entire downstream distribution system. Locate with substation room.

17.3.2 Medium Voltage Electrical Phasing and Rotation (BWI Thurgood Marshall Airport only)

This design standard details the electrical phasing and rotation conditions for the BWI medium voltage electrical distribution system. This standard was requested to document field conditions found during recent modifications to the BWI North and South substations.

The term phasing refers to the fact that the BWI medium voltage distribution system is a three-phase system. The phases are labeled A, B and C in accordance with industry standard practices. If system phasing is correct, rotation is also correct. System phasing must be consistent throughout the medium voltage distribution system for the following reasons: (1) for system identification and safety purposes, (2) to provide correct system rotation, and (3) to allow for the use of alternate distribution system configurations made possible by using Airport tie circuit breakers.

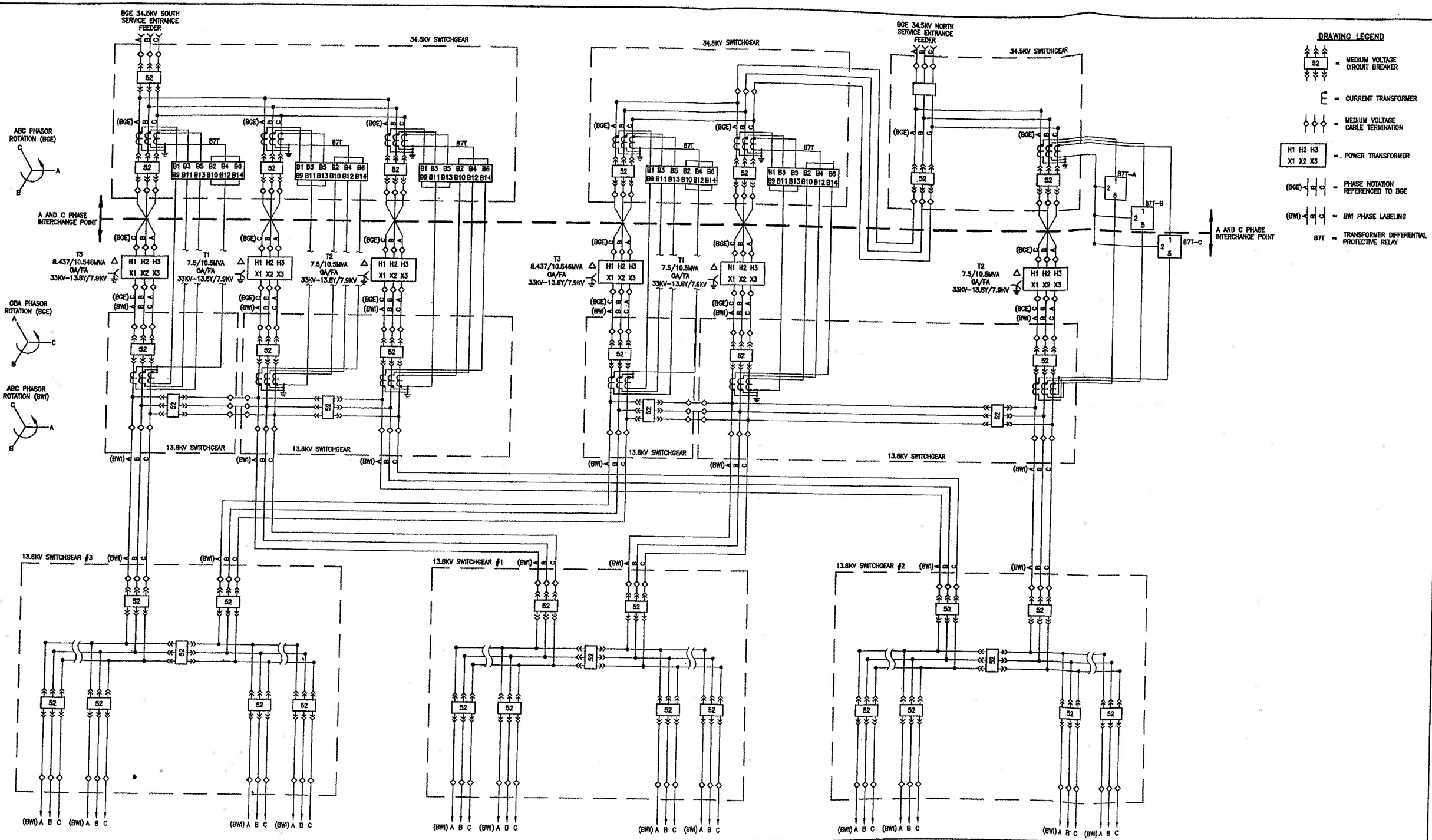
The term rotation refers to the order that the phases reach their maximum instantaneous line-to-neutral voltage value. There are two possible system rotations, ABC (positive sequence) or CBA (negative sequence). The rotation of the system determines the direction that a three-phase motor will spin when connected to the system. A three-phase motor connected to an ABC system will rotate in the opposite direction as compared to a CBA system. System rotation must be consistent throughout the distribution system.

The existing phasing and rotation conditions for the medium voltage distribution system down to Switchgear #1, #2 and #3 are shown in the following three-line

diagram, Exhibit titled "BWI Medium Voltage Distribution System Three-Line Diagram". The three-line diagram shows that A and C phases are interchanged at the primary of each power transformer located in the BWI North and South substation. This phase orientation was present when the Airport was supplied from the original North substation (now the Air Cargo substation) and the South substation. When the new BWI North substation was first installed as part of the Terminal Roadways and Utilities project (MAA-CO-94-017), A and C phases were interchanged to match the existing phasing conditions at the South substation. When the North and South substations were modified during the Substation Upgrades At BWI project (MAA-CO-01-010), A and C phases were interchanged on all new and resupplied power transformers at the North and South substations to match the existing BWI phasing conditions. Also shown on the exhibit are the associated transformer differential protection relay control wire modifications to compensation for the A and C phase interchange.

The phasing conditions shown on the exhibit are marked (BGE) when referenced to the incoming BGE phasing and are marked (BWI) to indicate BWI system labeling. The incoming BGE feeders are ABC rotation. The BWI system is ABC rotation (when referenced to BGE) down to the point that A and C phases are interchanged. This point is labeled on the exhibit. Beyond this point, the BWI system is CBA (when referenced to BGE); however, the BWI system is labeled and operated as an ABC rotation system or downstream Airport distribution equipment. As long as the existing BWI system labeling remains consistent from this point down into the distribution system, there should be no phasing or rotation discrepancies. For future projects at the Airport, the existing phase labeling should remain in use unless work is being performed at the North or South substations, in which case the phase A and C interchange should be accounted for. The designer shall contact Mr. Michael Karlinchak at BGE at 410-291-3156 to coordinate all work at the North and South substations.

When three-phase temporary generators are used on the Airport distribution system, it may be required to interchange the Generator A and C phase connection (i.e., connect Generator A phase to BWI C phase, B phase to B phase and C phase to A phase) to match the BWI system rotation. Temporary generator rotation shall be electrically tested by the Contractor prior to connecting to the BWI system. Generators connected to BWI 13.8 kV – 480 V unit substation emergency power quick connect systems shall be tested for proper rotation using the voltage phase sequence relay and associated generator rotation indicating light that is permanently installed on most substations. A substation quick connect sequence of operation placard is required by the MAA Substation Design Standard to be located at the substation and on the temporary generator connection point circuit breaker. This placard explains the use of the quick connect scheme including the generator rotation indicating light.



BWI BALTIMORE/WASHINGTON INTERNATIONAL AIRPORT

MARYLAND DEPARTMENT OF TRANSPORTATION
MARYLAND AVIATION ADMINISTRATION

OFFICE OF ENGINEERING AND CONSTRUCTION MANAGEMENT

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PROJECT TITLE: BWI DESIGN STANDARD DST 2005 – 01

SHEET TITLE: BWI MEDIUM VOLTAGE DISTRIBUTION SYSTEM THREE – LINE DIAGRAM

SCALE	PROJECT NO.	EXHIBIT NO.
NONE	--	
DATE: FEBRUARY 2005	SHEET REFERENCE: --	

FILE NAME: P:\20827879\CAD\3-LINE-DIAG.dgn PLOTTED: Friday, February 11, 2005 – 9:04am

17.4 EQUIPMENT

17.4.1 Panelboards (Power and Lighting)

BWI and MTN Airport projects shall only specify Square-D 120/208 circuit breaker panelboards. Accordingly, "No substitutions will be accepted" shall be used when specifying Square-D circuit breaker panelboards.

17.4.2 Raceways

17.4.2.1 Raceways – Within Buildings

Indoor wiring methods:

1. Exposed where subject to physical damage: Rigid galvanized steel (RGS) conduit from slab up to 10 feet above finished floor. Electrical metallic tubing (EMT) above 10 feet above finished floor.

2. Exposed where not subject to physical damage: EMT.

3. Concealed: EMT

4. Concealed where installing/fishing new wiring in existing wall or partition: Flexible metal conduit (FMC) or metal clad cable (MC). FMC and MC shall be directly connected to junction box located directly above existing wall or partion.

5. Connection to vibrating equipment (Including transformers and hydraulic, pneumatic, electric solenoid, or motor-driven equipment): Liquid tight flexible metal conduit (LFMC) or FMC. Use maximum of 6 foot length. Connections in wet or damp environments shall use LFMC.

6. Final connection to recessed and semirecessed lighting fixtures: FMC or MC. Use maximum of 6 foot length from fixture to junction box only.

7. Minimum raceway size: ¾ inch.

8. The use of any type flexible raceway or flexible cable other than those specifically mentioned above will not be accepted unless approved in advance.

~~All Fire Alarm related wiring and cable shall be installed in a raceway system as detailed in indoor wiring methods 1 through 3 shown above.~~

~~The use of flexible metal conduit shall be permitted only for final connections for hard to reach fire alarm devices as approved by the Fire Marshall. See BWI Airport Wide Standard for Interface of Fire Alarm, Life Safety and Security Systems in Appendix H.~~

Cable tray shall be permitted for low voltage communication wiring/cable only. All fire alarm and security related wiring/cable shall be installed in a raceway system as detailed in indoor wiring methods 1 through 8 shown above. Public Address System wiring if used to convey voice messages for public space evacuation, as required by the MAA Fire Marshal, shall be considered fire alarm wiring and shall be installed in a raceway system.

All raceways and cables shall be properly installed and supported in accordance with the National Electrical Code (NEC) and the Code of Maryland Regulations (COMAR). All new construction materials shall be fire retardant. All new wiring/cable shall be plenum-rated. Cable and raceways shall be permanently labeled at a minimum of every 50 feet, at all junction boxes and at all terminations. Label information shall include equipment type/usage, supply panelboard/equipment and circuit number. Wherever old raceways, wiring and/or cables are to be abandoned, they shall be removed.

Metal Conduit Fittings: All fittings, coupling, etc. for metal conduit shall be steel, set screw or compression type. No malleable fittings will be considered.

Grounding: A ground wire properly sized to the largest phased conductor shall supplement all metallic conduits. Ground wire shall be identified by either green insulation coating or by the use of green tape.

17.4.2.2 Raceways – Underground

Marking tape indicating "Electrical Cable Buried Below" shall be installed. The tape should be 3" wide and positioned 8"-12" deep below top of ground, or 4" wide and positioned at a maximum 3"-6" deep below the bottom of pavements.

17.4.3 Boxes and Wiring Devices

17.4.3.1 Electrical Receptacles

Duplex receptacles shall be rated at 20 amperes, 125 volts, and be polarized, parallel blade type with ground and National Electrical Manufacturer's Association (NEMA) 5-20R configuration. Regular power receptacles for corridors, hallways, and other areas subject to heavy use by housekeeping and cleaning machinery should be equivalent in quality to Pass & Seymour (P&S)

5362A. In other regular or normal power use areas, receptacles equivalent in quality to P&S Type 5362 should be specified. The receptacles shall be side wired.

Cover plates for receptacles shall be brushed stainless steel.

Receptacles shall be identified by color-coding the body according to type of circuit connected to per the following:

Regular Power	Brown or Ivory
Uninterruptible Power Source (UPS)	Red
Isolated Ground	Orange/or Ivory with Orange Triangle

17.5 EMERGENCY AND STANDBY POWER SYSTEMS

17.5.1 Diesel Powered Engine – Generator Load Bank

Permanent diesel powered engine-generator sets provided to power: emergency (Level 1 per National Fire Protection Association (NFPA) Standard 110, "Emergency and Standby Power Systems"): legally required standby (Level 2 per NFPA 110): or optional standby circuits shall be designed to include a permanent load bank to provide electrical loading for testing and exercising the generator-set. Load banks shall be sized to provide at least 50 percent of the engine-generator set nameplate kilowatt rating. Load banks shall, if practical, be mounted next to the engine radiator and be connected to outside air duct for the radiator.

Include in requirements for the Automatic Transfer Switch associated with each engine-generator set an engine exerciser and requirements for setting it for at least 30 minutes exercise loading at least once a month.

Load banks shall be equipped with automatic controls so that the test or exercise load is automatically replaced with the emergency loads in the event of failure of the normal power source during the test.

17.6 METERING OF POWER

Each substation shall be provided with secondary watt-hour demand meters. All watt-hour demand meters shall have digital readout and pulse output for future remote monitoring.

Watt-hour meters shall be provided for tenant spaces by the tenant. Each food and beverage tenant shall provide watt-hour demand meter in the MAA electrical closet. All other tenants shall include provisions for future metering. These meters shall be "E-Mon" brand and shall be located in the MAA electrical closet. A spare 2" conduit shall be installed from each metering location to the nearest telephone closet. Provisions shall consist of routing the tenant feeder through a current transformer cabinet located adjacent to the MAA electrical panelboard. Watt-hour meters shall be socket type with a by-pass type meter base and they shall be ANSI approved.

Metering at substation shall be Square-D Powerlogic system.

For double ended substations, a meter shall be provided in each side of the double ended switchgear. Meter shall measure all of the following: voltage, current, power, power factor, frequency, kilowatt-hours, and demand. Unit shall have the following additional features: 4 optically isolated status inputs, 2 optically isolated RS485 communications ports, Modbus and DNP communications protocol. In addition, one meter in any group shall have an internal modem. An auxiliary contact on each main and tie circuit breaker shall be wired to the status inputs on one power meter. The transformer over-temperature alarm on each transformer shall be wired to a status input on the associated power meter. The RS485 ports on all meters shall be daisy-chained together. A category 5 telecom cable shall be extended from the meter with the internal modem to the nearest telecom closet.

17.7 TEMPORARY ELECTRIC POWER SERVICE

For temporary electric power service during construction, designers shall include the following requirements in the specifications. These requirements are usually found in:

Technical Specifications
Temporary Facilities and Control
Section 01500

Part 2 – Products
2.2 Equipment

H. Power Distribution System: Service entrance drop cable to the first disconnect may be aluminum, subject to conditions specified in Part 3 of this specification. Circuit wiring conductors, inward from the first disconnect, shall be copper.

I. Power Distribution System Circuits: Circuits for temporary power distribution and lighting, not exceeding 125 volts AC, 20 ampere rating, may be permitted to use nonmetallic sheathed cable, provided that:

a. The installation meets requirements of the NEC, and
b. The cables are installed overhead and left exposed for surveillance.

Add the following new language to:

"Part 3 – Execution", under Section "3.2 Temporary Utility Installation"

If, as allowed under Part 2 – Products above, aluminum conductors are used for service drops, they shall be inspected monthly for the duration of their use. A written report on the cable condition shall be submitted to the MAA's authorized inspection firm.

17.8 AIRFIELD ELECTRICAL

On airfield work which requires temporary wiring of lights, signs, etc. – the temporary wiring shall be buried. All areas disturbed by temporary wiring shall be returned to its original condition following removal of the temporary wiring.

CHAPTER 18: LIGHTING

18.1 INTERIOR LIGHTING

All projects shall be designed to specify light fixtures that require lamps that the DOM currently keeps in stock. A list of those lamps is available from the Division of Facilities Design. Approval must be obtained from DOM to specify light fixtures that require lamps that are not listed. Neon lighting is not acceptable.

The use of dimming systems shall be limited. When applicable, the design shall be kept simple and shall be reviewed and approved by the DOM.

18.2 EXTERIOR LIGHTING

18.2.1 Apron Lighting

All light poles and fixtures shall be specified based on aesthetics, design parameters, and replacement/maintenance considerations. Consultants shall match existing products when modifying and/or expanding existing facilities. A list of lamps that are kept in stock is available to Consultants in the Office of Engineering and Construction Management. In addition, all designs shall be coordinated with the MAA Resident Architect for aesthetics.

Consultants shall provide MAA's Project Manager and the Division of Maintenance (DOM) with cut-sheets on every light fixture and lamp proposed for MAA projects.

Exterior lighting on the airfield ramp shall meet the performance of Crouse-Hinds, GAL series with energy efficient high-pressure sodium lamps and ballast.

Each pole shall bear an identification tag (engraved on aluminum plate) which shall list the manufacturer, model number, and date of manufacture and installation.

Heights of the poles should match existing. Designers shall coordinate each light pole installation(s) with and submit an Airport Zoning Application to MAA's Office of Planning and comply with all state and federal regulations. Light pole design should make every attempt to avoid penetrating any navigational surfaces, i.e. FAR Part 77. If penetration is unavoidable, Federal Aviation Administration approval must be acquired (Refer to Design Procedures, Section 4.2)

Color shall be black and smooth, unless otherwise approved by MAA's Resident Architect. Arms, luminaries, and all other attachments shall be provided in matching color.

18.2.2 Airfield Lighting

18.2.2.1 Lighting and Visual Aid Systems and Fixtures

Lockout / Tag-out for Airfield Lighting for S-1 Series Plug Cutouts

All S-1 series plug cutouts shall be the lockable type. The following is the specification for the S-1 series plug cutout:

"SERIES PLUG CUTOUT TYPE S-1. S-1 series plug cutouts shall be lockable, individually keyed with two keys, capable of carrying 20 Amperes, and shall have four contacts that close the circuit between the regulator and series lighting loop. The body shall be constructed of high strength plastic. Porcelain bodies may not be used. The series plug cutout shall be protected against arcing."

L852T, Style 3 Inpavement Lights

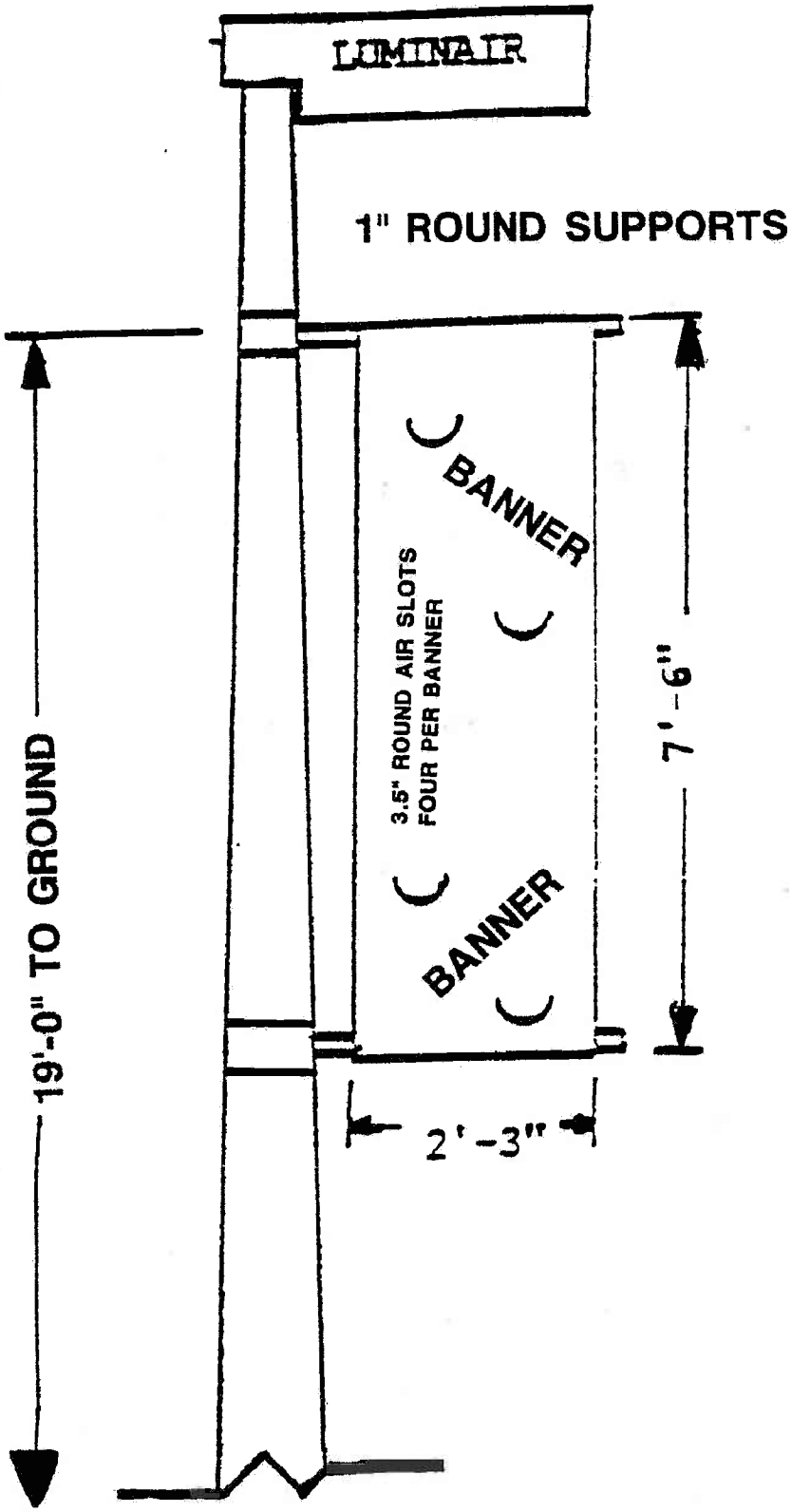
Reference is made to the advisory circular AC 150/5345-46B, Specification on Runway and Taxiway Light Fixtures. Effective immediately, in areas where L-852T lights are required, only Style 3 shall be specified. Any style 3 fixture that is installed at the airport must also be Federal Aviation Administration (FAA) certified prior to installation. The style designation must be reflected on the drawings, as well as noted in the technical specifications. Style designation applies to the fixture's total height above finished grade where Style 3 is less than ¼-inch to flush. This standard is intended to prevent damage to inpavement light fixtures during snowplow operations. In cases where this standard is in conflict with the requirements of the FAA, the FAA requirements shall prevail. Any deviation from this standard shall be brought immediately to the attention of the Maryland Aviation Administrations' Project Manager in writing.

18.2.2.2 Cable and Conduit

L-824 Cables for Airfield Lighting Circuits

The L-824, Type B cables shall be the standard cable used for all underground medium voltage (5,000V) cable for airport lighting circuits.

The following is the specification for this cable.



SHEET TITLE: LIGHT POLE	DATE: APRIL 2005

Airfield Lighting Circuit Cable. Underground cable shall conform to the requirements of AC 150/5345-7E, Specification for L-824 Underground Electrical Cable for Airport Lighting Circuit.

All medium voltage power cable (5,000V or more) that will be used on airfield lighting shall be L-824, Type B, jacket 7-strand (19 strand is acceptable).

18.2.3 Landside Lighting (Parking and Roadways)

All light poles and fixtures shall be specified based on aesthetics, design parameters, and replacement/maintenance considerations. Consultants shall match existing products when modifying and/or expanding existing facilities. A list of lamps that are kept in stock is available to Consultants in the Office of Engineering and Construction Management. In addition, all designs shall be coordinated with the MAA Resident Architect for aesthetics.

Consultants shall provide MAA's Project Manager and the Division of Maintenance (DOM) with cut-sheets on every light fixture and lamp proposed for MAA projects.

Light poles shall be round tapered, fiberglass, breakaway poles with anchor base shrouds, transformer base and a smooth black finish. Poles shall meet the performance of Shakespeare #AHW30-0251BB01.

Luminaries shall meet the performance of Holophane (Somerset) contemporary low profile, rectangular luminaries with 5-3/4" arms and smooth black finish. Existing luminaries that are to be matched are 250W, 400W, or 1000W, HPS at 277V with a separate grounding wire.

Each pole shall bear an identification tag (engraved on aluminum plate) which shall list the manufacturer, model number, and date of manufacture and installation.

The need to install banners on light poles shall be coordinated with MAA's Project Manager and DOM. Light poles, banner supports, and foundations shall be designed for banners, when required by MAA. The detail shows BWI's standard banner configuration. The banner supports and hardware shall be coordinated with and approved by DOM.

Heights of the poles should match existing. Designers shall coordinate each light pole installation(s) with and submit an Airport Zoning Application to MAA's Office of Planning and comply with all state and federal regulations. Light pole design should make every attempt to avoid penetrating any navigational surfaces, i.e. FAR Part 77. If penetration is unavoidable, Federal Aviation Administration approval must be acquired (Refer to Design Procedures, Section 2.9.1)

Parking lot foundation heights shall be a minimum of 2-1/2 feet above finished grade to resist vehicle impact.

Color shall be black and smooth, unless otherwise approved by MAA's Resident Architect. Arms, luminaries, and all other attachments shall be provided in matching color.

CHAPTER 19: SIGNAGE AND GRAPHICS

Refer to Appendix I for signage standards.

19.1 EXTERIOR SIGNAGE

19.1.1 Landside/Roadway Signage

19.1.2 Apron/Airfield Signage

19.1.2.1 Electrical Characteristics of Airfield Signs

Each circuit shall be designed to handle all combinations of VA loading and power factor or the Designer shall ensure that sign electrical characteristics, not covered by FAA Specifications, are included in the contract specifications, as appropriate. This is to help alleviate the substantial variances in volt-amp loading and power factor, from manufacturer to manufacturer as well as manufacturers who produce both high and low VA loading versions of the same sign.

19.2 INTERIOR SIGNAGE

The graphic style for BWI signage is Helvetica Regular. All sign boxes shall be internally lighted. Sign boxes in the Domestic Terminal shall be black and those in the International Terminal shall match Benjamin Moore 1608 Grey. New signs shall match the Airport's Standard.

LED Signs shall match the existing signs manufactured by Winona Lighting, Cole Lighting, or Bergen Art Metal. LED message center shall be manufactured by Salescaster Displays or approved equal.

19.3 DIRECTIONAL SIGNAGE

19.3.1 Door Identification Signs

Door identification signs will be provided as outlined below. Designer is responsible for developing a suitable sign attachment method for approval by the MAA Project Manager and the Division Chief, Fire Prevention.

1. "SPRINKLER CONTROL VALVES" and "SPRINKLER/STANDPIPE CONTROL VALVES": Metal type sign with red background and reflective white letters. These signs will be placed both indoors and outdoors. Sign size shall be 10" x 6". The sign shall be placed on the door closest to the valves.

2. Manual Fire Pull Sign (MFP 1111): The sign shall be used to identify the location of "Manual Fire Pull" stations at exit doors leading to the aircraft

apron. The MFP shall be constant for all signs but the 4-digit number will change. The last four digits of the 12-digit fire alarm number shall be used. The sign shall be placed on the exterior doors as high as possible. Metal type sign with red background and white reflective letters and numbers. Sign size shall be 2" x 6".

3. Electrical Substations ("WARNING ELECTRIC SUBSTATION PROTECTED BY WET SPRINKLER SYSTEM"): This sign shall be used to identify the location of Electrical Substations. Metal type sign with red background and white reflective letters shall be placed on the outside of the door. Sign size shall be 6" x 12".

4. Standpipe Connection ("Fire Dept. Standpipe Connection"): This sign shall be made like a bumper sticker. It will be used indoors only and placed on smooth metal or glass. It will be placed over existing signage on glass that is stenciled on the interior of the glass. The sign contractor shall determine the sign size (minimum 10" x 3"), color and size of the lettering. The locations and placement shall be field determined.

5. Fire Command Room ("FIRE COMMAND ROOM FAP-HVAC-PA): Metal type sign with red background and white reflective letters. The sign will be placed on the outside of the door. Sign size 9" x 11".

SPRINKLER CONTROL VALVES

Sign type No. 1

SPRINKLER / STANDPIPE CONTROL VALVES

Sign type No. 2

Metal type sign with red background and reflective white letters. These signs will be placed indoors and outdoors.

Sign size: 10"x6"

The sign shall be placed on the door closest to the valves.

MFP 1111

This sign shall be used to identify the location of "Manual Fire Pull" stations at exit doors leading to the aircraft apron.

The MFP shall be constant for all signs; the 4-digit number will change. The last four digits of the 12-digit fire alarm number shall be used. The sign shall be placed on the exterior of doors as high as possible.

Metal type sign with red background and white reflective letter and numbers.

Sign size 2"x 6"

WARNING
ELECTRIC SUBSTATION
PROTECTED BY WET
SPRINKLER SYSTEM

This sign shall be used to identify the location of Electrical Substations.

Metal type sign with red background and white reflective letters shall be placed on the outside of the door.

Sign size 6"x 12"

FIRE
COMMAND
ROOM
FAP-HVAC-PA

Metal type sign with red background and white reflective letters. The sign will be placed on the outside of the door.

Sign size 9"x11"

Fire Dept. Standpipe Connection

This sign shall be made like a bumper sticker. It will be used indoors only and placed on smooth metal or glass. It will be placed over existing signage on glass that is stenciled on the interior of the glass.

The sign contractor shall determine the sign size (minimum 10"x3"), color and size of the lettering.

The locations and placement shall be field determined.

APPENDIX A

AIRPORT CONSTRUCTION PROJECT CHECKLIST

MARTIN STATE AIRPORT

BWI BALTIMORE/WASHINGTON INTERNATIONAL Thurgood Marshall AIRPORT

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

AIRPORT CONSTRUCTION PROJECT CHECKLIST
DIVISION OF FACILITIES DESIGN

MAA Project No.: _____

Project Title: _____

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

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

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

Any changes in project scope, design and/or construction costs, or schedule resulting from design reviews or other causes must be approved by the Manager, 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-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.:**
_____

Yes	No	Item
___	___	1. Do the plans and specifications cover all the work included in the tentative allocation? If not, please explain. _____ _____
___	___	2. Do the plans and specifications include any non-eligible development? 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?

Yes	No	Item
___	___	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

MARTIN STATE AIRPORT

BWI BALTIMORE/WASHINGTON INTERNATIONAL Thurgood Marshall AIRPORT

MEETING MINUTES

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

INVITED PARTICIPANTS	ATTENDEES	REPRESENTING	EMAIL ADDRESS	PHONE NUMBER

	INTRODUCTION AND PURPOSE OF THE MEETING

A	*NEW* ACTION/DISCUSSION ITEMS	ACTION REQUIRED BY:	DATE REQUESTED:

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

Distribution:

cc:

PROJECT COST ESTIMATE

TASK NUMBER & TITLE

CONTRACT NUMBER

Date: / /

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

DESCRIPTION		*UNIT*	*UNIT COST*	*QUANTITY*	*TOTAL*	*COMMENT*
1.						
2						
3.						
4.						
5.						
6.						
7.						
.						
SUBTOTAL A						
Special Systems	BAS (Metasys)					
	FAS (Honeywell)					
	CASS					
	CCTV					
	BGE					
	Verizon					
SUBTOTAL B						
Miscellaneous Construction Allowance (5% to 10% of B)		%?				
SUBTOTAL C						
Design Contingency (15% to 25% of C)		%?				
SUBTOTAL D						
General Conditions X% of D (If not included in Unit Costs)		%?				
Contractor O&P X% of D (If not included in Unit Costs)		%?				
SUBTOTAL E						
Construction Quality Control Plan (3% of E)		%?				
SUBTOTAL F (Construction Cost Estimate)						
Estimated Design Fee (8% to12% of E)		%?				
Estimated CMI Fee (8% to 12% of E)		%?				
SUBTOTAL G						
Escalation Factor (if applicable)		%?				
GRAND TOTAL **(Program Cost Estimate)**						

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

KNOX

2006 Fire/Law Enforcement Rapid Entry System AUTHORIZATION ORDER FORM

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

Effective January 1, 2006

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

COMPANY / NAME

DATE ORDERED

STREET (NO P.O. BOXES)

SUITE / BUILDING

CITY

STATE

ZIP CODE

CONTACT NAME

PHONE NUMBER

P.O. NUMBER (GOV. AGENCIES ONLY)

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

ORDER WILL NOT BE PROCESSED

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

FS-39-026-02-89

System Code

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

Section 3 ORDER PRODUCT HERE

Quantity	Part Number	Amount
		Total $
		Total $
		Total $

Shipping & Handling

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

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

If required, add $7.00 per submastered item $

Shipping and Handling $

Subtotal $

No St. Tax Sales Tax $

Read Pre-payment Total $

PRE-PAYMENT INFORMATION REQUIRED **USE PRICE LIST ON LAST PAGE**

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

☐ VISA ☐ AMEX ☐ MC ☐ DISC

CARD NUMBER

EXP. DATE (MM / YYYY)

Cardholder Signature

Section 4 INSTALLATION ADDRESS - REQUIRED BY FIRE DEPARTMENT

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

ADDRESS

CITY

STATE

ZIP CODE

Fire Department Approval Signature Required to Submaster Items

☐ Check here to Submaster

Authorized Fire Agency Signature

Submaster fee $7.00 per keyed item.

Section 5 SHIP TO ADDRESS IS REQUIRED

O/N

REC'D

SHIP TO CONTACT NAME

COMPANY NAME

STREET ADDRESS (NO P.O. BOXES)

CITY

STATE

ZIP CODE

E-MAIL ADDRESS

CT-KBAUTH-0053-A

Continued Page 1

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

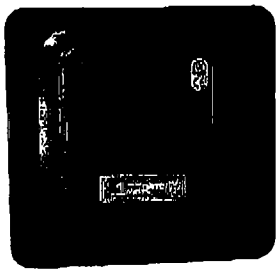
Knox Master Keys are provided to authorized fire departments or other registered entities on an as-needed basis solely for the use with Knox Rapid Entry System. No other use of the keys or their associated codes is authorized. Key codes associated with the Knox Master Keys and Keyways remain the property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

Authorized Dual Lock User Signature

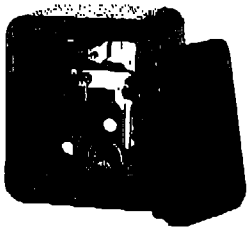
Date

Knox Rapid Entry System Product Catalog

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



#3227 Recessed



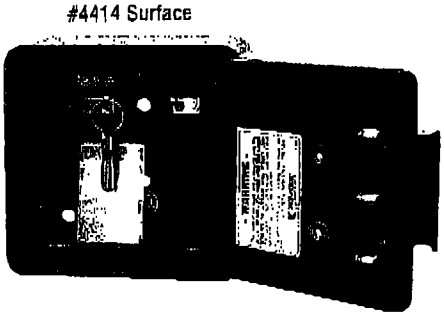
#3208 Surface

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

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

KNOX-VAULT™ 4400 Series - Heavy Duty

#4444 Recessed

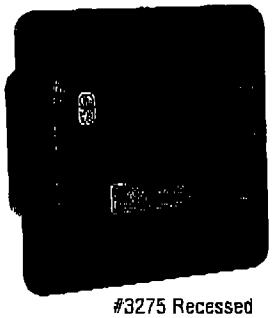


#4414 Surface

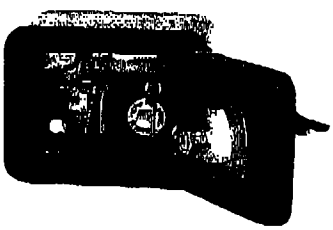
- Heavy-duty, high security construction
- 50 key capacity storage, for access cards, floor plan
- 5/8" solid steel door, re-locking mechanism with drill resistant hard-plate lock protector
- Dimensions: Surface 7" H x 7" W x 5" D
  Recessed 9-1/2" H x 9-1/2" W Flange
- **Ship weight: 29 lbs**
- Colors: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

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

KNOX-BOX® 3200 Series w/ Hinged Door



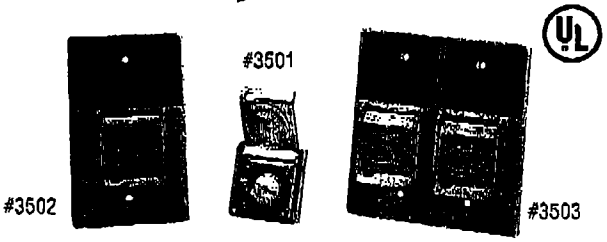
#3275 Recessed



#3266 Surface

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

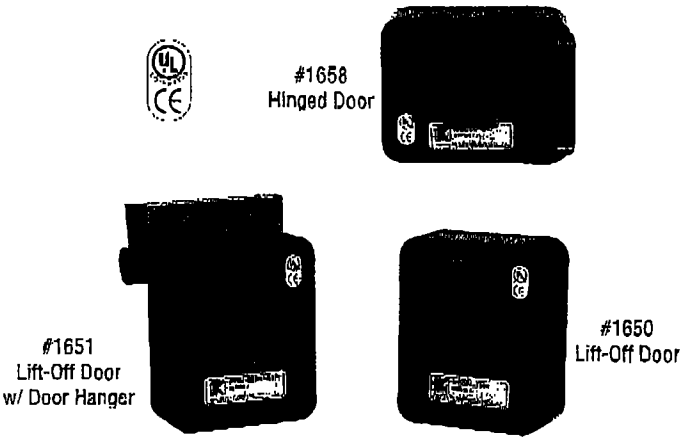
Knox® Key Switch 3500 Series



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

Knox® Residential 1650 Series

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

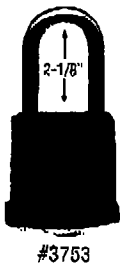


Knox® Padlock

Agency I.D. Label Included

(Lock Core)

Exterior - All Weather Conditions

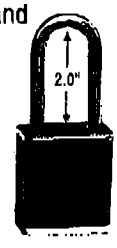


#3753

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

Interior - Light Duty

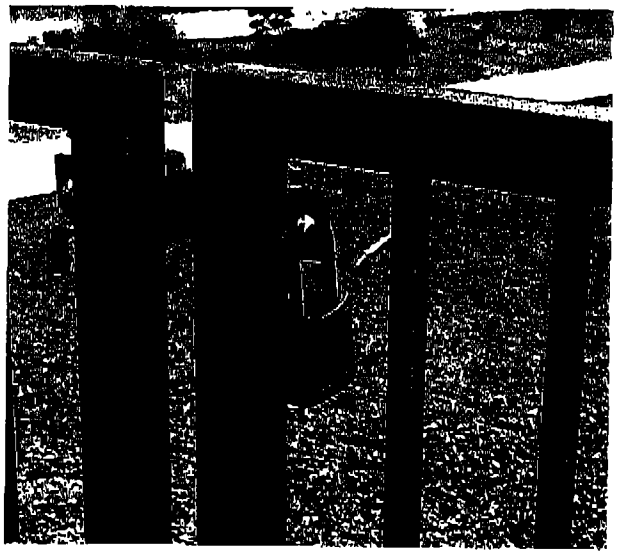
- Steel body and hardened steel 5/16" diameter shackle



#3754

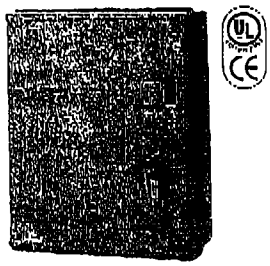
Ship Weight: 1.5 lbs

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

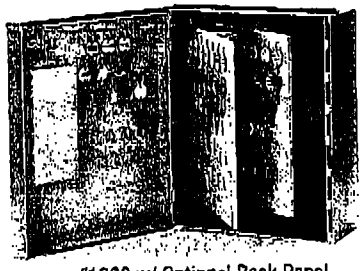


.nox® Master Keys are provided to authorized fire departments or other registered entities on an as-needed basis solely for use ith the Knox Rapid Entry System. No other use of the keys or their associated codes is authorized. Key codes associated with the .nox Master Keys and Keyways remain the property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

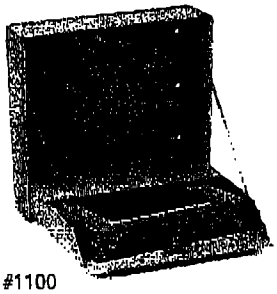
Knox Rapid Entry System Product Catalog



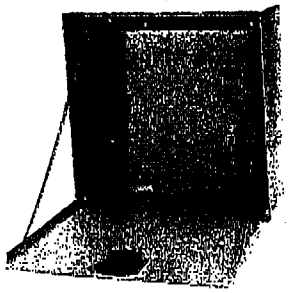
#1307 Dual Lock



#1308 w/ Optional Back Panel and Swing Panels.



#1100
Not suitable for key storage.



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

Knox® Cabinet

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

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

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

Knox® FDC Plug

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

#3011

#3010

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

Knox® FDC Storz Cap

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

#3080

#3090

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

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

Prices and availability subject to change.

● Included
– Not Included

KNOX-BOX®

3200 Series w/ Lift-Off Door Surface Mounted

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

Ship Wt: 10 lbs.

3200 Series w/ Lift-Off Door Recess Mounted

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

Ship Wt: 10 lbs.

3200 Series w/ Hinged Door Surface Mounted

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

Ship Wt: 10 lbs.

3200 Series w/ Hinged Door Recess Mounted

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

Ship Wt: 10 lbs.

KNOX-VAULT™

4400 Series Surface Mounted

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

Ship Wt: 29 lbs.

4400 Series Recess Mounted

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

Ship Wt: 29 lbs.

KNOX® KEY SWITCH

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

Continued on back page

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

Prices and availability subject to change.

● Included
– Not Included

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	–	Ship Wt: 65 lbs.	5"	$545.00
1302	Lt. Grey	Single	–		7"	$585.00
1303	Lt. Grey	Single	●		5"	$585.00
1304	Lt. Grey	Single	●		7"	$625.00
1305	Lt. Grey	Dual	–		5"	$605.00
1306	Lt. Grey	Dual	–		7"	$645.00
1307	Lt. Grey	Dual	●		5"	$645.00
1308	Lt. Grey	Dual	●		7"	$685.00

1300 Cabinet Options

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

1100 Series

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

ACCESSORIES

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

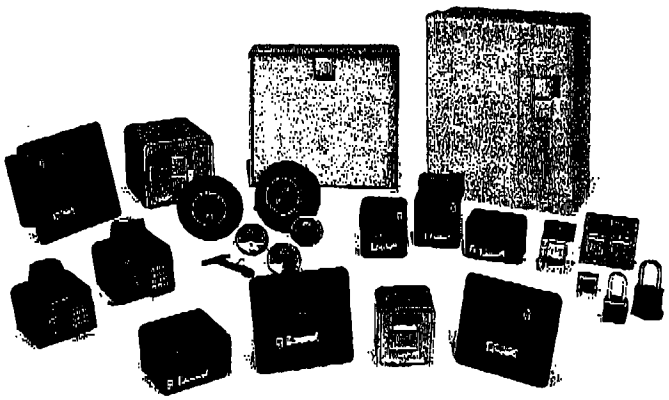
KNOX® LOCKING FDC PLUGS

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

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

KNOX® LOCKING FDC STORZ CAPS

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



KNOX®
Serving Fire Departments Since 1975

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

APPENDIX C

CADD STANDARDS MANUAL

MARTIN STATE AIRPORT

BWI BALTIMORE/WASHINGTON INTERNATIONAL Thurgood Marshall AIRPORT

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): _____

_____

_____

Manual Paragraph(s): _____

_____

_____

Manual Page(s): _____

_____

_____

Existing: _____

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Proposed: _____

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Background: _____

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1.0 SCOPE

This manual outlines the requirements for CADD file delivery to the Maryland Aviation Administration (MAA) by its consultants. This manual does not specify standards normally associated with basic engineering and drafting techniques, nor does it define design and drafting procedures for consultants to follow. 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 3.0 Drawing Requirements addresses MAA's requirements applicable to construction drawings, installation permits, building permits and space allocation drawings. The second part, 4.0 Special Drawing Requirements (SAD) addresses MAA's requirements specific to tenant use Space Allocation Drawings.

1.1 Standard Definition

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

MAA is currently in the process of implementing applications and procedures for an Architectural Engineering Information System (AEIS). The AEIS system will be comprised of the following components: Geographical Information System (GIS), Project Information Management System (PIMS) and Electronic Document Retrieval System (EDRS). These components will provide 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 2004	AutoCAD 2000i	AutoCAD Express Tools
AutoCAD 2002	AutoCAD 2000	AutoCAD 200x LT

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/AEIS Spatial Data Standards Manual.

2.2 Government Documents

Standards - Military

A/E/C CADD Standard Release 2.0 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/1EEE 2.16 Reference Designations for Electrical and Electronics Parts and Equipment
- ANSI/1EEE 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 Drawing Requirements

3.1 Drawing Production

MAA requires that all CADD files be in AutoCAD DWG format. 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.

3.1.1 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:

a) Drawing Exchange Format (DXF) - unless mandated by special requirement in this manual.
b) 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.

3.1.2 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 3-1, 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 3-1, Scale Factor and Text Height Conversion Chart

3.1.2.1 Drawing Sheet Format

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

3.1.2.2 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 3-2, 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 3-2, Standard Drawing Sizes

3.1.2.3 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 3-3 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
¼"=1'-0"	38' x 53'	76' x 106'	0.0208XP
3/8"= 1'-0"	25' x 35'	50.7' x 70.7'	0.0312XP
½"=1'-0"	19' x 26.5'	38' x 53'	0.0416XP
¾"=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 ½"=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

Architectural Units

Decimal Units

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

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

3.1.2.4 Appearance

Figure 3-1 shows the relationship of typical features as applicable to the composition of CADD-produced drawings. The figure shows the location of the following features in a construction drawing.

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

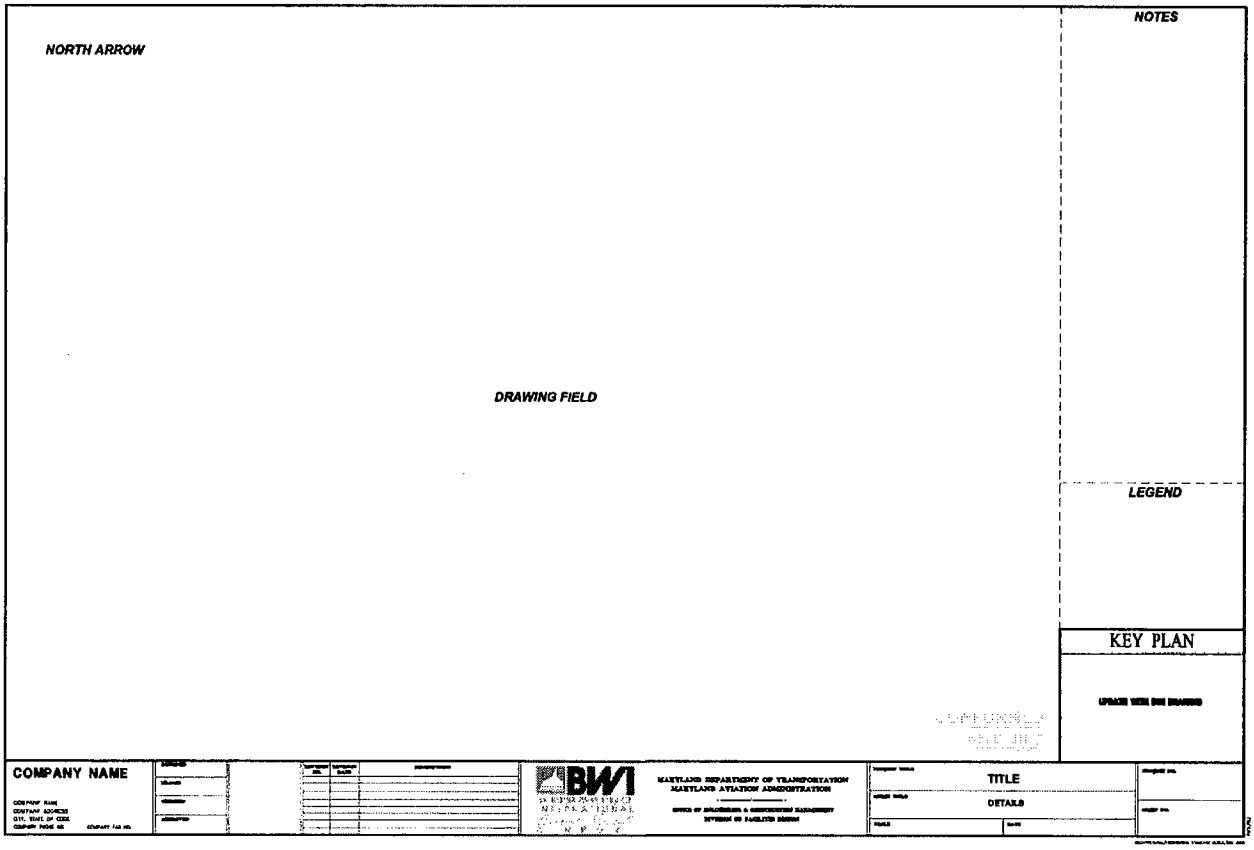


Figure 3-1, Drawing Appearance Example

3.1.3 Title Block

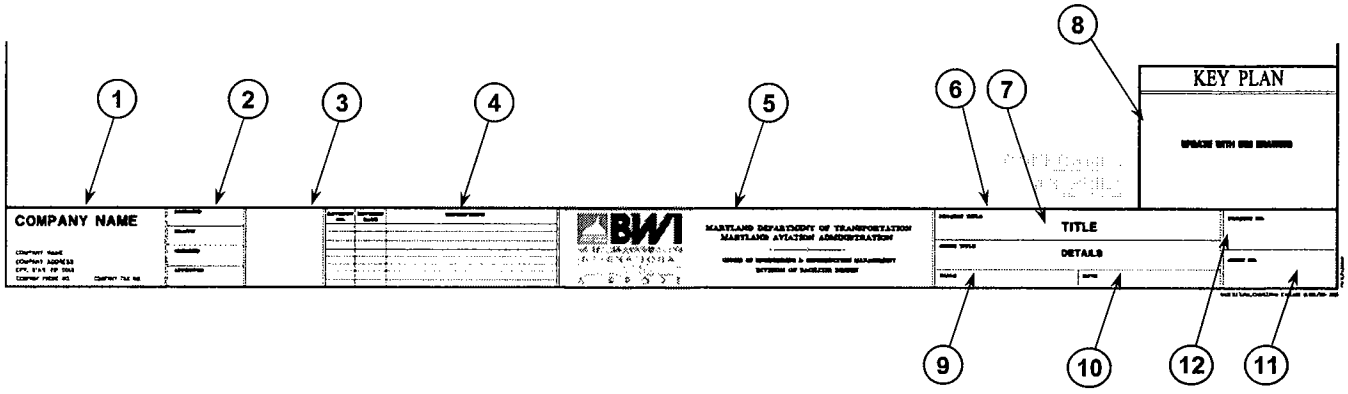


Figure 3-2, Drawing Appearance Example

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	0.125
3	Engineers Stamp Block		
4	Revision Date and Description Block	ROMANS	0.125
5	Airport Logo and Name Block	ROMAND	0.1535
6	Project Title	ROMAND	0.200
7	Sheet Title	ROMAND	0.1535
8	Key Plan		
9	Scale	ROMANS	0.125
10	Date	ROMANS	
11	Drawing Number	ROMAND	0.1535
12	Contract Number	ROMAND	0.1535

Table 3-4, Drawing Title Block Descriptions

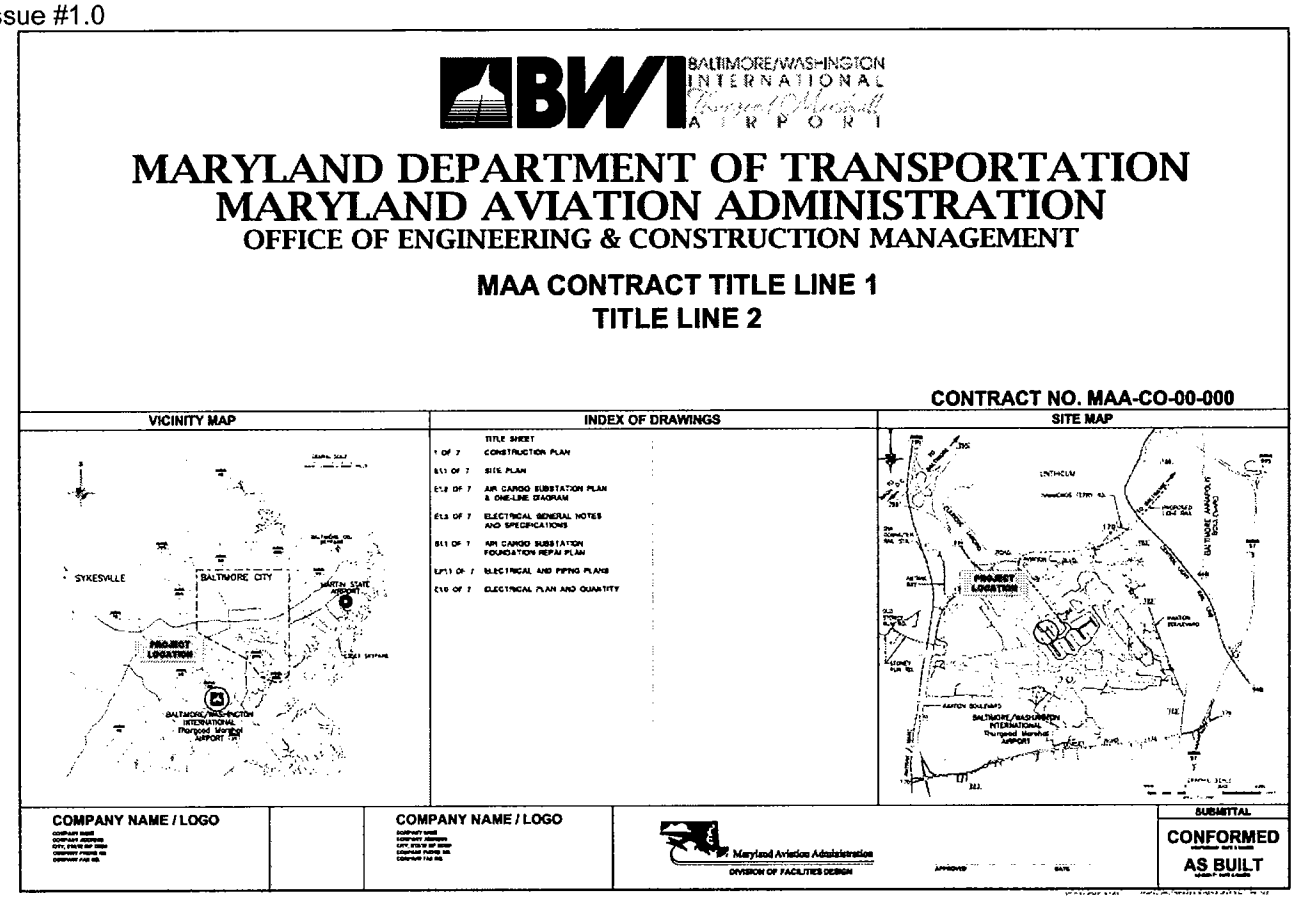
3.1.4 Title Sheets and Borders

An example of the standard *title sheet* and *border sheet* are available in AutoCAD format as part of 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.)
- Vicinity Map and Site Map
- Consultant Name Block and Stamp Block
- Airport Signature Block Including: Signature Line, Date Line
- Drawing Index
  (Should additional space be required provide separate index sheet immediately behind cover sheet)
- Vicinity Map
- *Reference Contracts*

(A complete list pertaining to the active task document is 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)



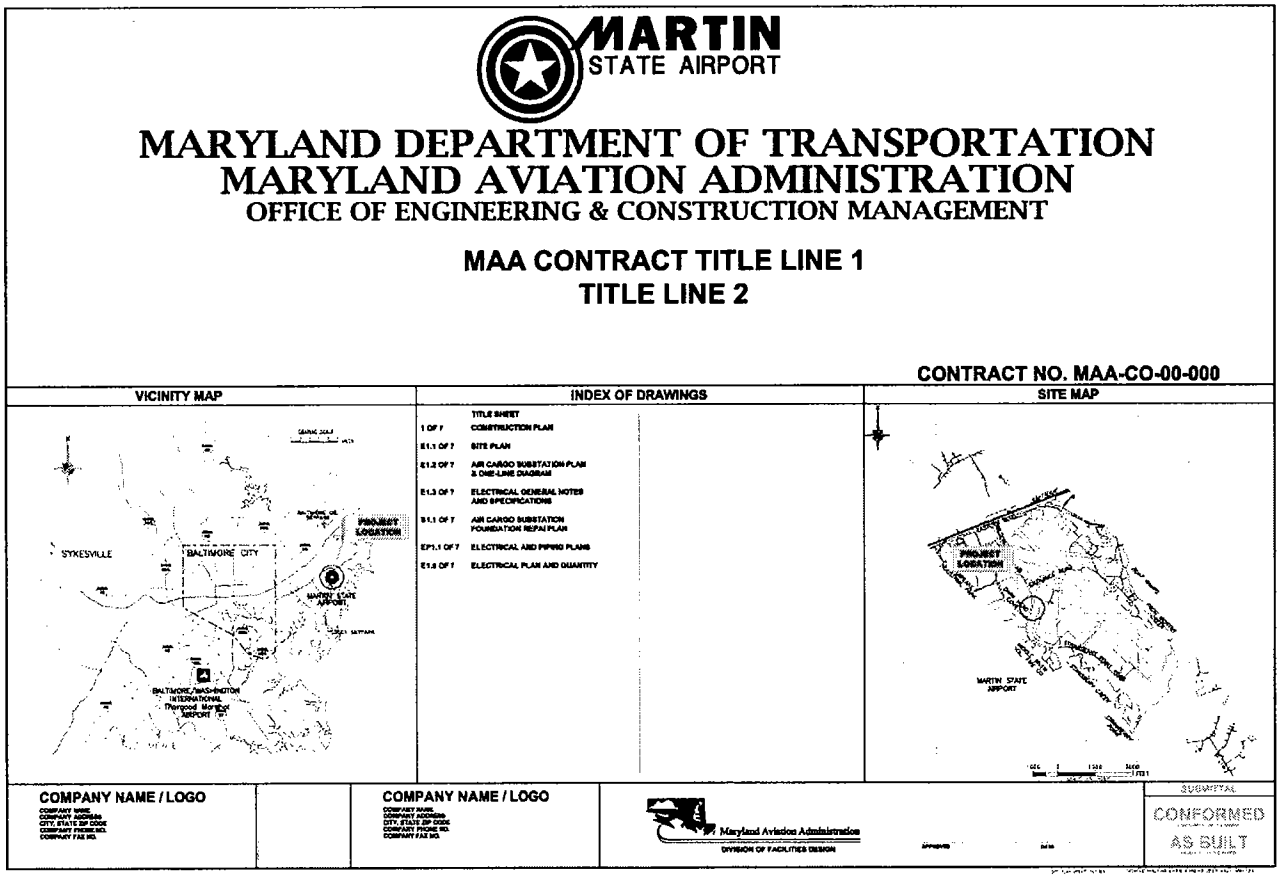


Figure 3-3, Title Cover Sheet Layout Examples

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

3.1.5 Drawing Numbering

As MAA moves forward towards an enterprise, AEIS (Architectural Engineering Information System) it will be essential that a drawing numbering schema be developed that:

- Facilitates electronic document archiving, retrieval and interoperability.
- Readily relates the drawing to the facility or object being represented.
- Facilitates a documents' unique identification.
- Promotes reuse of existing drawing information.

3.1.5.1 Drawing Number Structure

The drawing sequence number for construction drawing starts with an upper case letter specifying the discipline followed by a three digit sequential number. 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	R	Real estate/lease
D	Demolition	I	Interiors	S	Structural
E	Electrical	L	Landscaping	T	Telecommunication
F	Fire protection	M	Mechanical	Z	Contractor/shop drawing

Table 3-5, Drawing Number Discipline Codes

3.1.6 Arrangement of Drawings

The drawings in a construction drawing set are listed by discipline in Table 3-6, Construction Drawing Set.

3.1.6.1 Construction Drawing Sets

The drawings in Table 3-6 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 3- 6, Construction Drawing Set

3.1.7 Typical Sheets and Layouts for Construction Drawing Sets

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

3.1.7.1 Cover Sheet

See Figure 3-3, Title Cover Sheet Layout Example.

3.1.7.2 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.
An example is shown in Figure 3-4, Index Sheet Example, the columns shown are for illustration only and may be adjusted to accommodate more or less of one type of information.

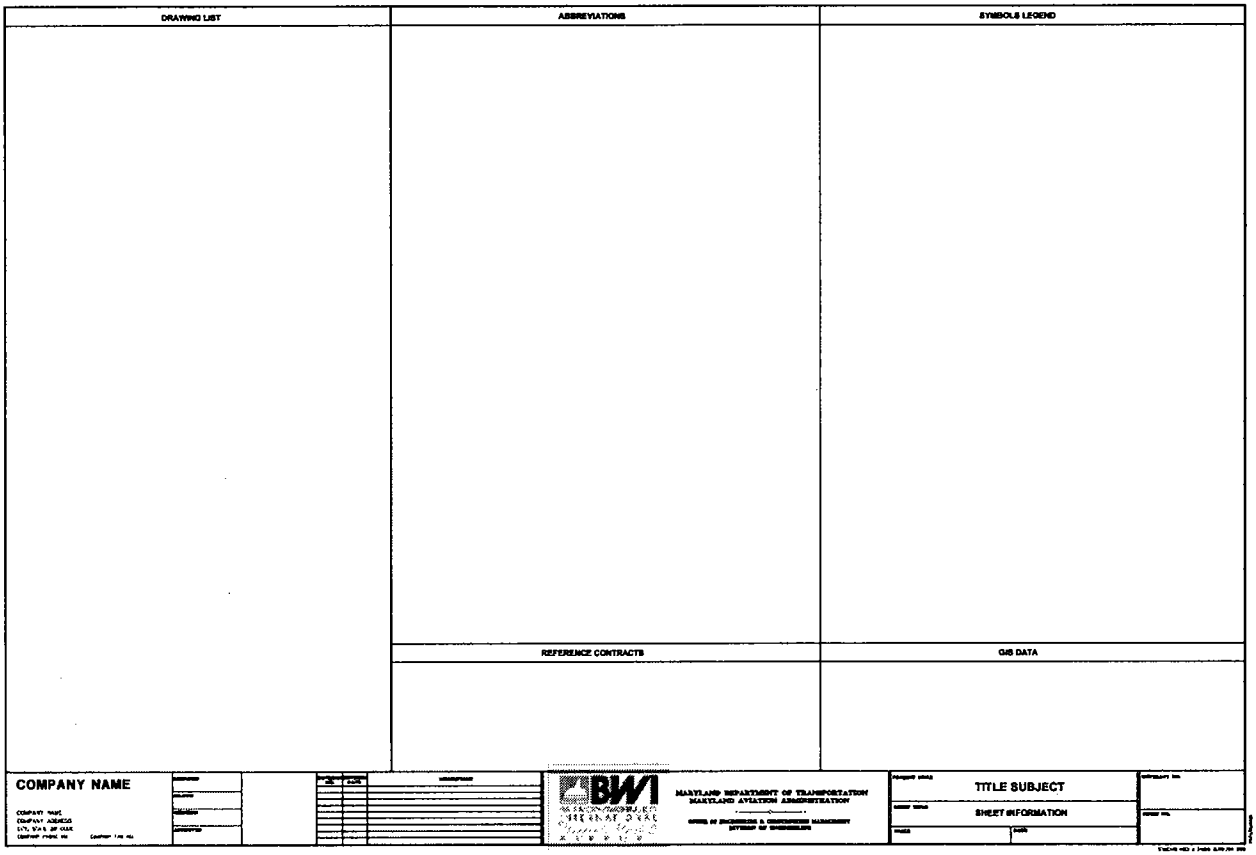


Figure 3-4, Index Sheet Example

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.

3.1.8 MDOT/MAA Logo Art

MAA provides the following logos in *electronic format* for use in CADD documents:

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

3.1.9 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 file and layer names that may be used.
To facilitate the set up of layers in conformance with AIA guidelines in 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 3-5, 3-6, 3-7 and 3-8).
Table 3-7, Common Layers outlines levels that will be common to all disciplines.

General Layer/Level Names	General Layer Descriptions	Color #
ANNO-TEXT	Miscellaneous text and callouts with associated leaders	7
ANNO-REDL	Redline Annotations	10
ANNO-SYMB	Miscellaneous Symbols	4
ANNO-LEGN	Legends and Schedules	4
ANNO-DIMS	Dimensions and Leaders	5
ANNO-TTLB	Border and title block	2
ANNO-NOTE	Notes	7
ANNO-NPLT	Construction Lines, non-plotting information	8
ANNO-KEYN	Key Notes	7
ANNO-REVS	Revisions	4
ANNO-PATT	Cross-hatching, poche'	5
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
ANNO-TITL	Drawing Component Titles, Detail Titles, Section Titles, Elevations	3

Table 3-7, Common Layers

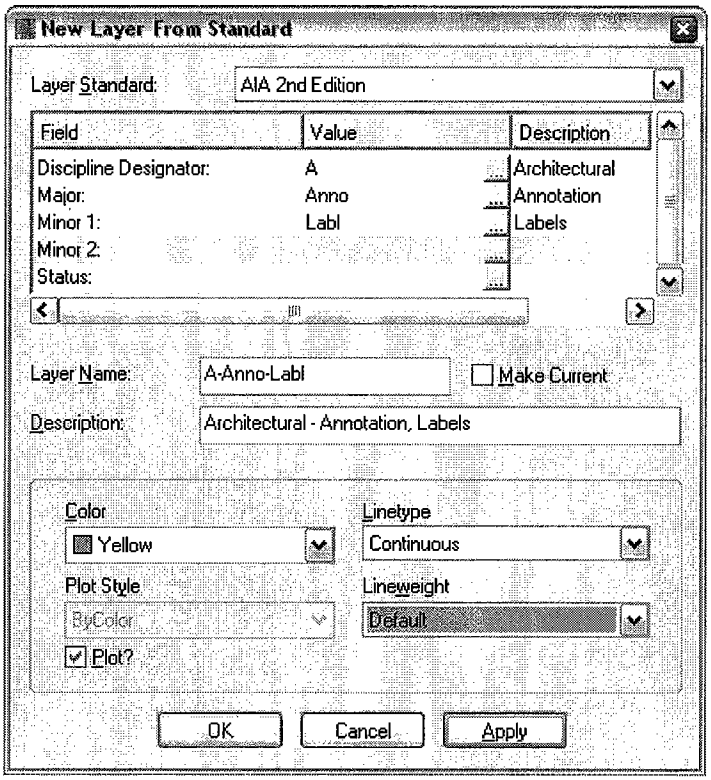


Figure 3-5, Layers - Layer Key Style Dialog Box

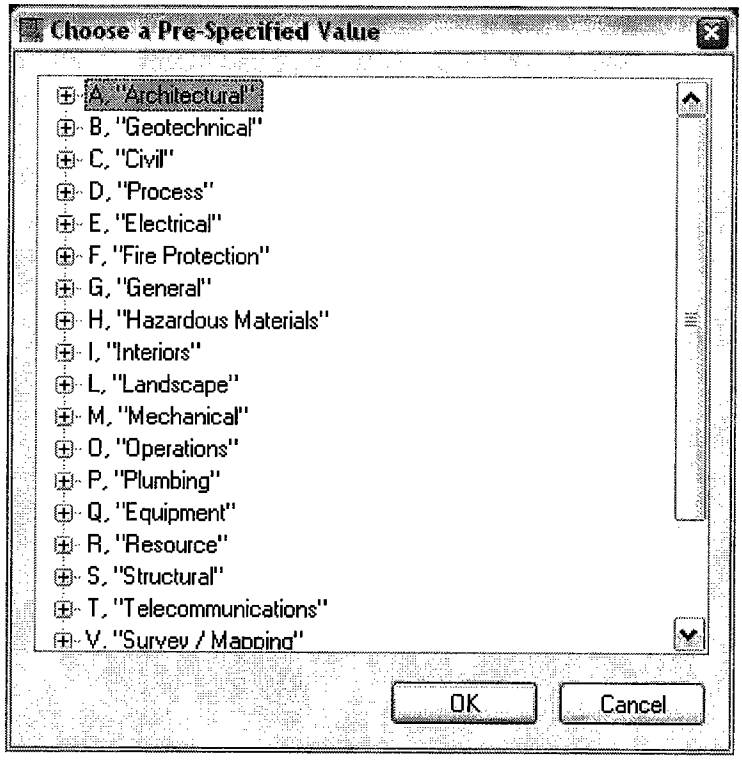


Figure 3-6, Layers - Discipline Designator Dialog Box

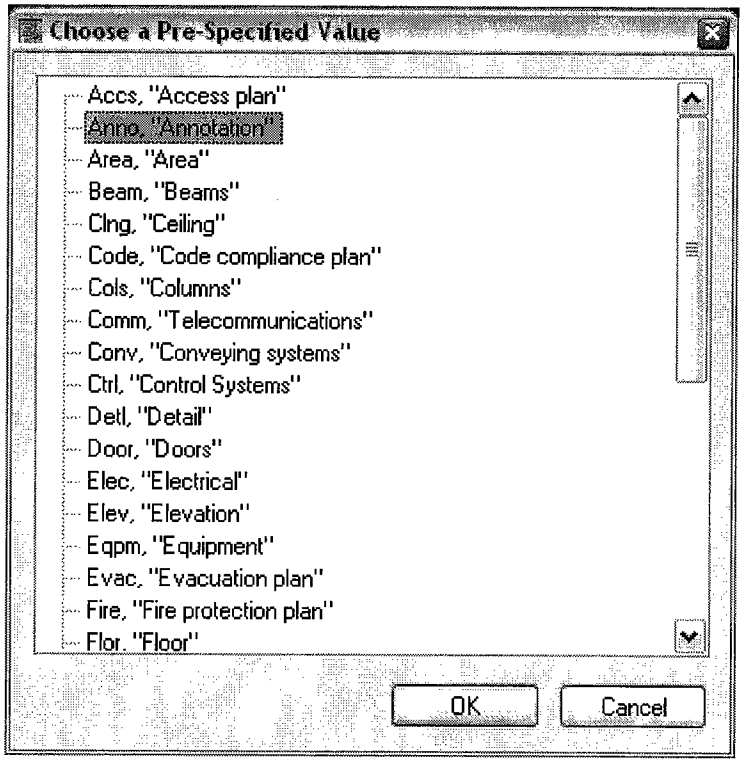


Figure 3-7, Layers - Major Category Dialog Box

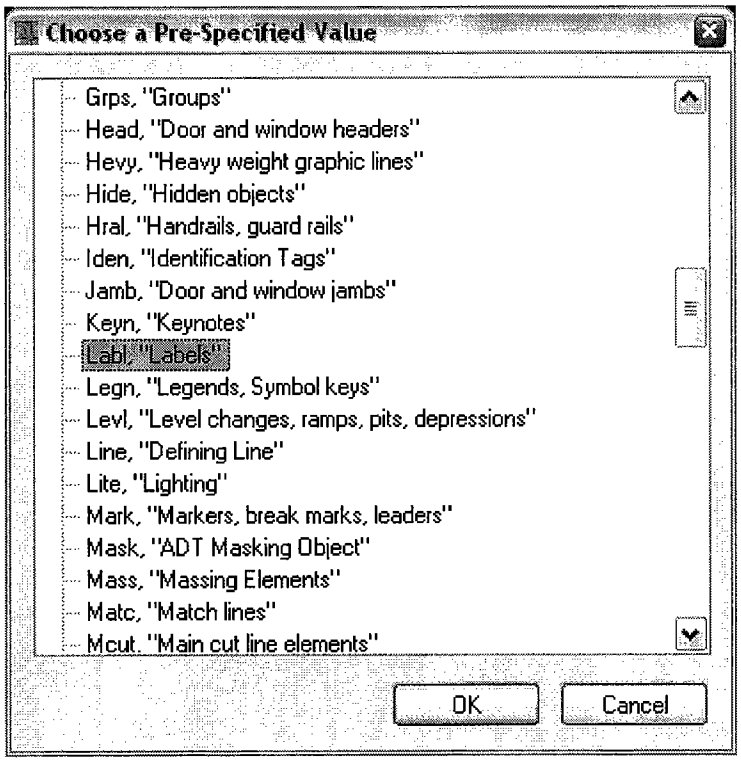


Figure 3-8, Layers - Minor Category Dialog Box

3.1.10 Text Styles/Fonts

All allowable ***Fonts*** used are provided in the MAA standard font library. The MAA standard font library includes 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*

3.1.11 Text Justification

All annotation text shall be left justified.

3.1.12 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 3-8, Text Heights and Colors

3.1.13 Line Widths and Colors

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 3-9, MAA Standard Pen Settings.

AutoCAD Color No.	Plotted Pen Width in Inches	Plotted Color	Plotted Line Width (plotted on HP1055)
1	.010	Black	
2	.012	Black	
3	.014	Black	
4	.020	Black	
5	.024	Black	
6	.031	Black	
7	.007	Black	
8	.005	Black	
9	.047	Black	
10	.01	Dark Grey	
11	.012	Medium Grey	
12	.012	Light Grey	

Table 3-9, 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.

3.1.14 Line Types

All ***Linetypes*** used must be available in the provided MAA standard *linetype* file. The MAA standard *linetype* file includes only "out of the box" *linetypes;* these are *linetypes* that ship with every installment of *AutoCAD*. 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.

3.1.15 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, metric units may be used as required by specific projects.

3.1.16 Drawing Origins and Working Units

Units should be selected according to the discipline of the drawing, architectural (feet and inches), engineering (feet and tenths), or decimal (metric). All topography and topography related design including structural and architectural building footprints shall remain or be placed in the Maryland State Plane NAD83 coordinate system for horizontal data and NGVD88 for vertical data (refer to MAA GIS standard for specific parameters).
The lower left corner of all other drawings should be positioned at the Cartesian coordinate point of 0, 0, 0.

3.1.17 Externally Referenced Files

Figure 3-9, Externally Referenced Files Example, illustrates the concept of how a drawing is composed using model or design and informational xref files.

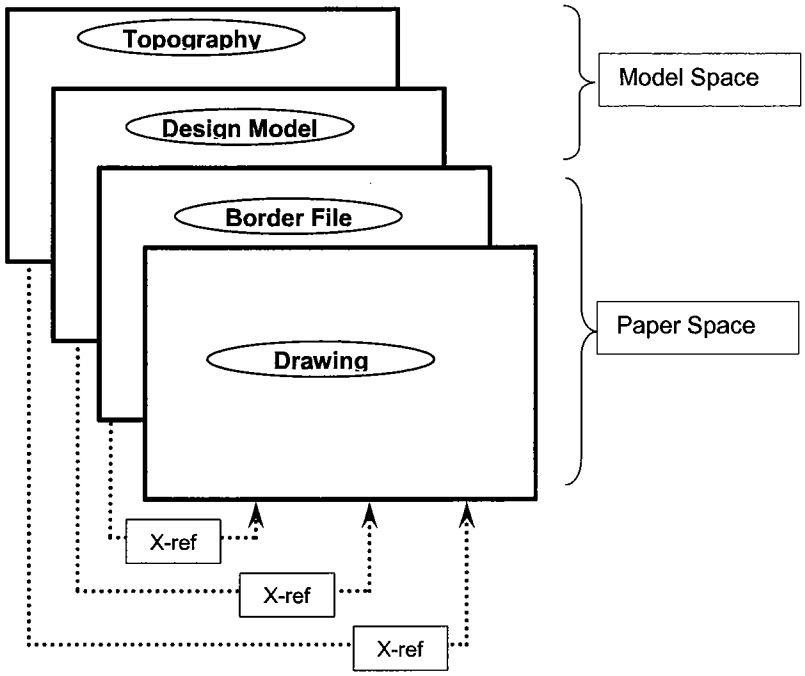


Figure 3-9, Externally Referenced Files Example

3.1.17.1 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 relative paths. Relative paths do not include the drive letter and reflect the location of the reference file as it relates to the active file.
Reference files shall be added on a specific layer and the prefix for that layer shall be "$REF-" followed by the reference file name.

3.1.18 Patterning

The patterns to be used on MAA drawings are those supplied with the CADD software, customized patterns must not be used.

3.1.19 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 3-10, Dimension Directions and Spacing Example, and Figure 3-11, Dimension and Extension Line Spacing Example for dimension examples.

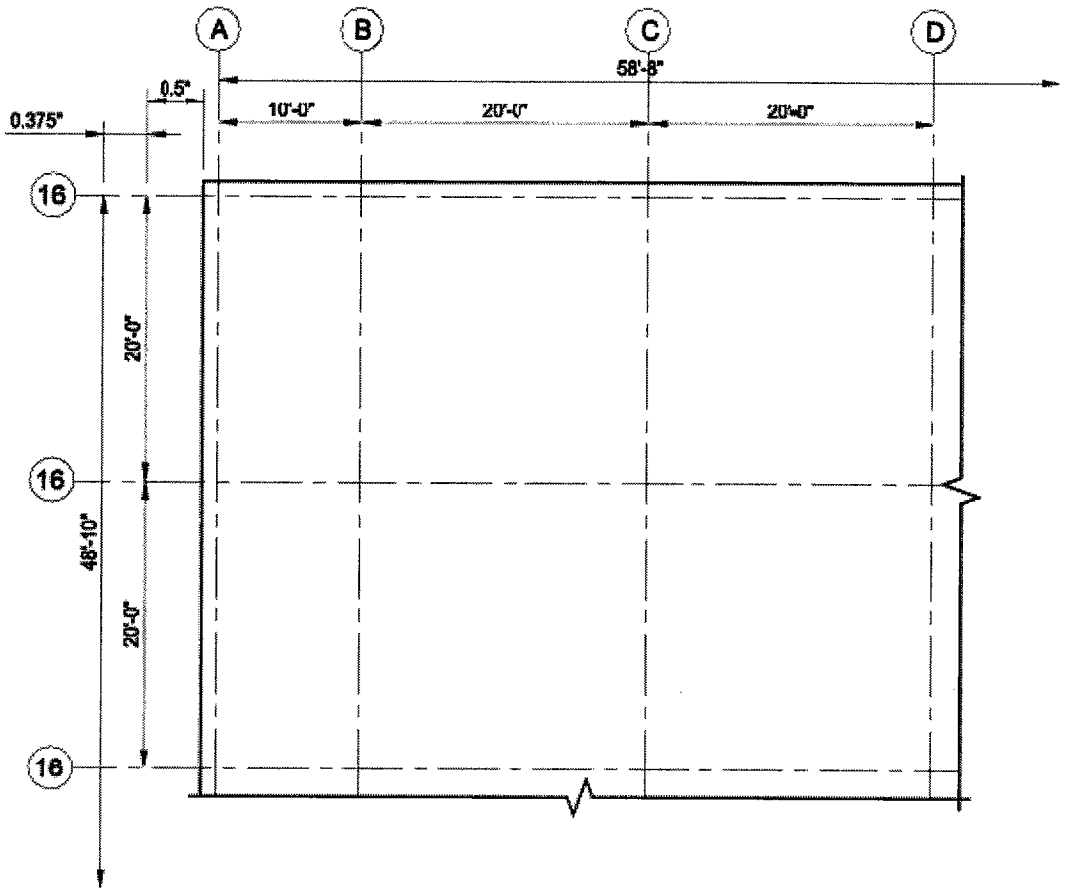


Figure 3-10, Dimension Directions and Spacing Example

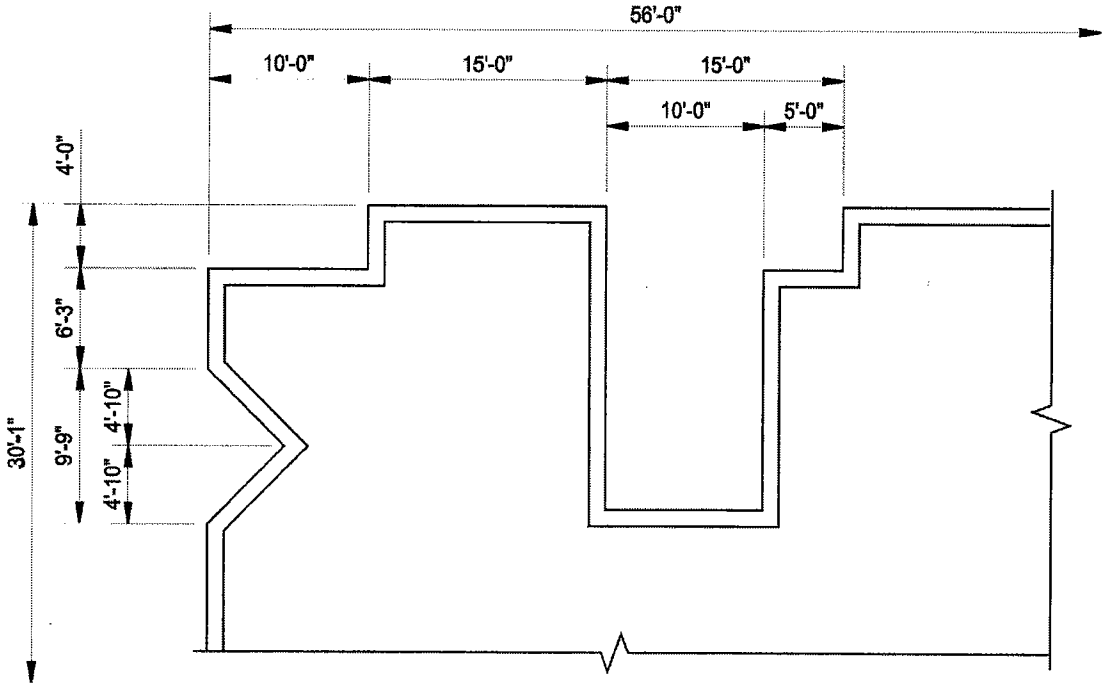


Figure 3-11, Dimension and Extension Line Spacing Example

3.1.19.1 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).
Table 3-1, Scale Factor and Text Height Conversion Chart. Refer to this table for scaling factors and text height.

3.1.19.2 Positioning Dimensions

Figure 3-10, Dimension Directions and Spacing Example. Refer to this figure 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 red" line weight.
- Arrowheads and dimension text shall be created using the "color red" line weight.
- All text shall be left justified per standard drafting standards.

3.1.19.3 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 place 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 3-12, 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 3-13, Typical Leaders Example
All leader lines and arrowheads shall be created using the "color red" line weight.

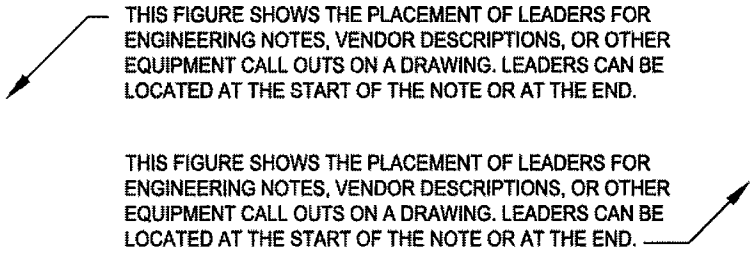


Figure 3-12, Placement of Leaders Example

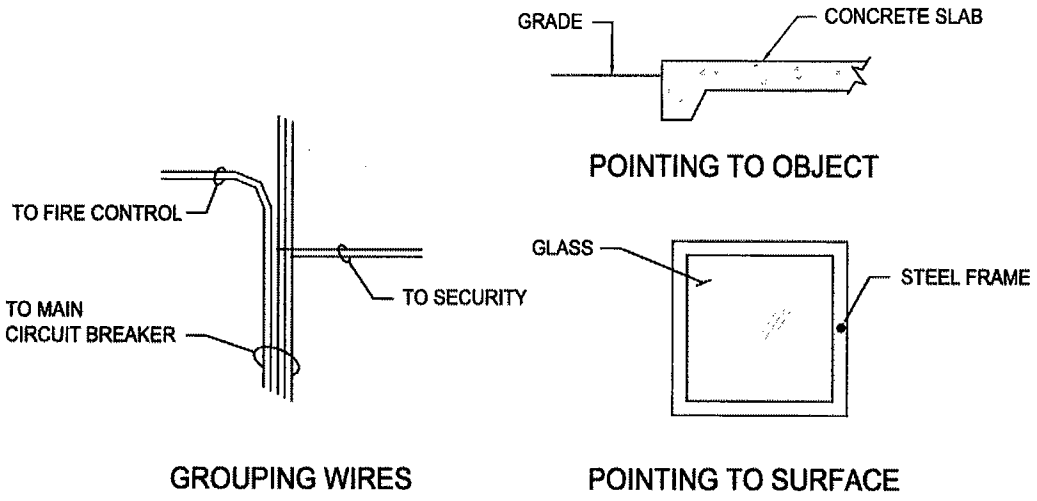


Figure 3-13, Typical Leaders Example

3.1.19.4 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.

3.1.20 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.

3.1.21 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 3-14, Standard Subtitle Annotation Example.

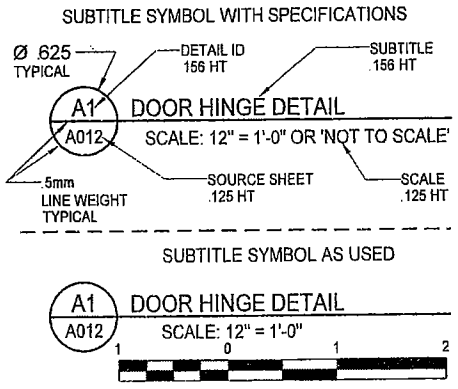


Figure 3-14, Standard Subtitle Annotation Example

3.1.22 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.

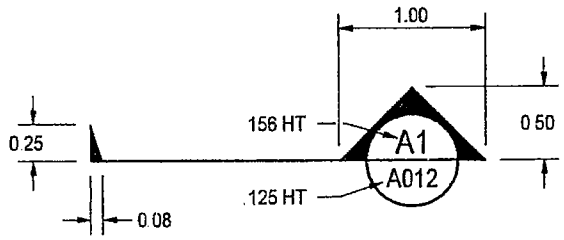
3.1.22.1 Sections

Sections must be drawn using the drafting standards shown in Figure 3-15, Standard Section Annotation Example. The three types of section indicators to be used are short sections, extended sections, and offset sections these are shown in Figure 3-16, 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. The limits of extended or offset sections limits must be indicated by a circular marker at one end of the cutting plane and by a half arrowhead at the other end. On all section cuts, the circle markers must be placed so they can be read from the direction of cut.



SECTION SYMBOL WITH SPECIFICATIONS

Figure 3-15, Standard Section Annotation Example

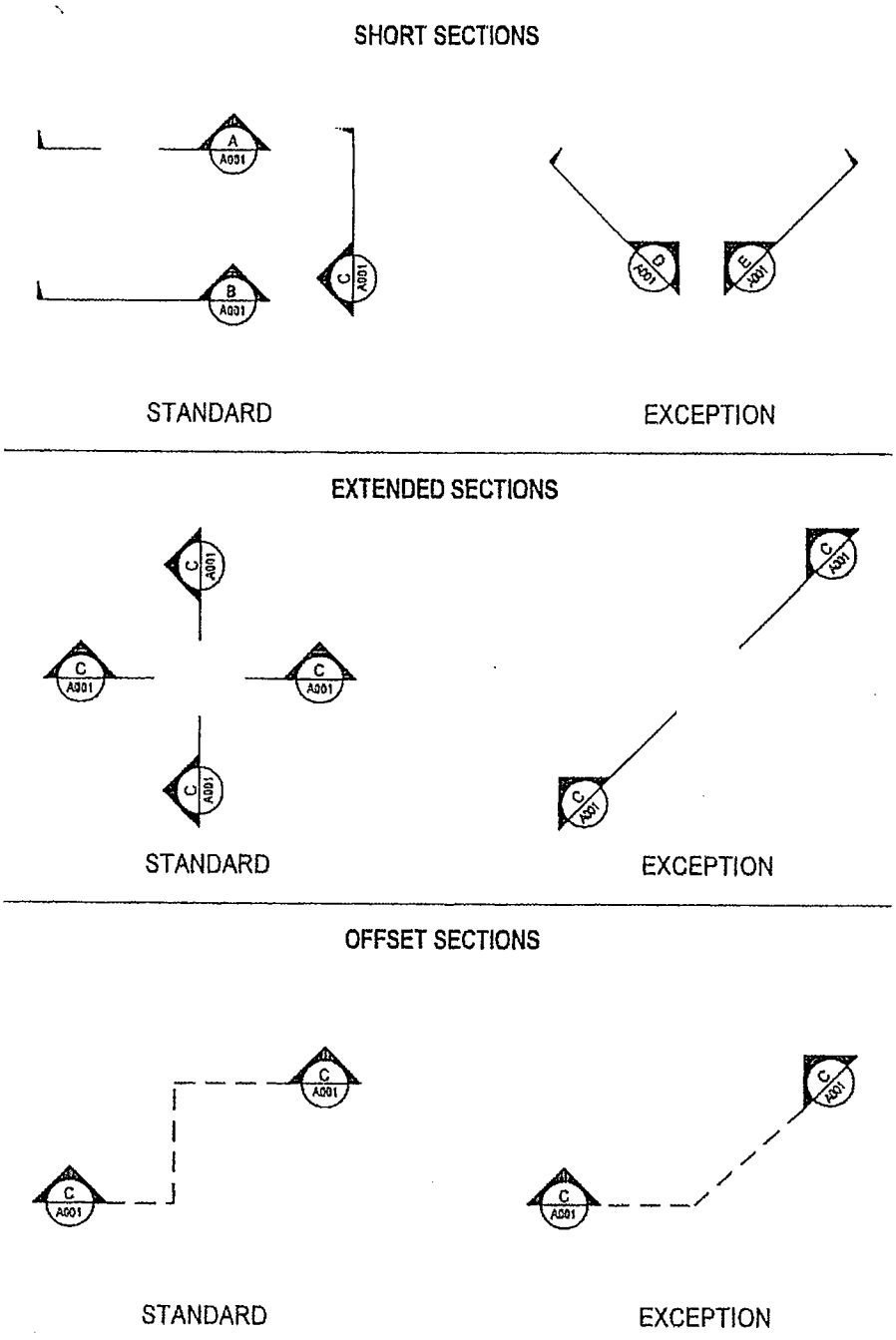


Figure 3-16, Section Types Example

3.1.22.2 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 3-17, 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.

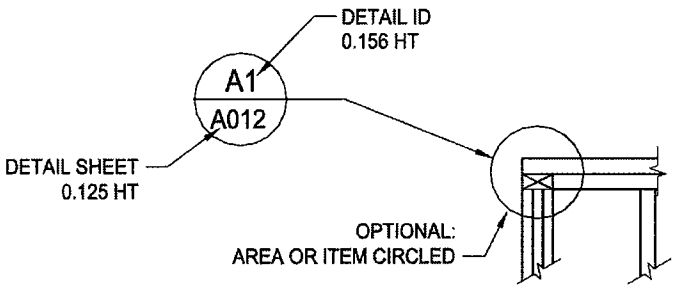


Figure 3-17, Standard Detail Symbol Example

3.1.23 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.

3.1.23.1 Required Revisions

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

3.1.23.2 Revision Methods

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

3.1.23.3 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.

3.1.23.4 Identifying Revisions on Drawings

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

3.1.23.5 Revision Locations

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

3.1.23.6 Revision Numbers

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

3.1.23.7 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.

3.1.23.8 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.

3.1.23.9 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.

3.2 Drawing Support

3.2.1 File Naming

Electronic file naming conventions are being finalized by the AEIS group and they will establish the requirements for file naming.

3.2.2 Archival of Drawings

At this time, the requirements to be set out by the AEIS have not been finalized for the archival and retrieval of electronic documents. This standard will be updated to incorporate these requirements once they are finalized.

4.0 Special Drawing Requirements (SAD)

4.1 Introduction

Prior to the commissioning of a program to provide a complete record of the BWI Terminal Building floor plans on AutoCAD, it was impossible to get a complete picture of the leased/available space in one document.
With the development of the Space Allocation Drawings (SAD), the entire architectural footprint of the Terminal Building has been compiled in a series of 49 drawings. Special features of the SAD not only provide an accurate record of existing space but also identify tenants occupying each space along with computer calculated square footages. Since the number and location of tenants is constantly changing, this SAD document can quickly become stale if not continuously updated. This manual describes the mechanics of compiling this new SAD package and instructs operators on how to manipulate and update the AutoCAD files comprising the package.
Due to the unique nature and purpose of the SAD's there are certain CADD requirements that pertain specifically to the SAD's. These requirements require specific methodologies to obtain the required results from these documents. Other than variances outlined below, standard CADD practices for the depiction of general information must be applied.

4.2 Editing Lease Information

All editing of lease information occurs in the architectural models. Samples of editing include changing of floor plans, movement of telephones or terminal courtesy phones, and changes in occupant or space designation. The following information provides guidelines on maintenance of the SAD models.

4.3 General Layer Naming Sequence

A standard naming sequence has been developed for creating layer names for the various uses of space within the terminal. Layers are named using the sequence X-Y-Z. The value of X represents a one-letter code categorizing the information contained on that particular layer. It has one of three values:

A = Architectural Feature L = Leasable Space N = Non-leasable Space

The value of Y is a three-character code identifying the occupant of the space. 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.

Examples are:

$US = US Airways (tenant) VAC = vacant COM = common

The $ sign is a placeholder when airline identifier codes consist of only two characters. The value Z is a two-letter code that describes the specific use of the occupant. A complete list of designation codes can be found in Appendix C. To illustrate the use of this convention, the layer name for a US Airways hold room would be L-$us-hr, 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 N-com-ue.

4.4 Derivation of Layer Names – Airlines

The Y-designation for the AutoCAD layer names for airline lessees is based on the International Air Transport Association (IATA) listing of airline codes. These airline codes are typically used with corresponding numbers to identify flights.

4.5 Derivation of Layer Names - Other Organizations

A number of other organizations also lease space within the Terminal Building. No particular convention is used to determine the three-letter Y-designation for these tenants. An attempt has been made to create three letter codes that are an intuitive extrapolation of the tenants' names. For new, non-airline tenants, it is advised that the operator designate a code that is as intuitive as possible. Proposed code is to be submitted to MAA for approval. The operator is also directed that in making any changes to the SAD such as new tenant codes, the changes will become part of this manual.

4.6 Identification via Hatch Patterns

The SAD's 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 (see Column 1 of Table 3-11). The color of the solid hatch is controlled by-layer using the color number identified in Column 2 of Table 3-11. 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 a -h to the end of the layer name containing the solid hatch.

For example, layer L-$ua-tc contains United Airlines solid hatching for ticket counters. Layer L-$ua-tc-h contains the patterned hatch for the same space.

Space Designation	Solid Hatch Color	Description
Airlines	11	Rentable space leased by airline corporations
Public Space	51	Space designated for unrestricted public use
Utilities	31	Telecommunications, electrical, and mechanical rooms
Finished Retail	101	Rentable space leased for food and beverage or merchandising
Car Rental	35	Rentable space leased by car rental agencies
Misc. Tenants	253	Rentable space not fitting any other category within this table
Restrooms	131	Public Restrooms
Maryland Aviation	211	MAA offices and workspaces
Vacant	161	Vacant space

Table 3-10, SAD Hatching Guidelines

4.7 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.

4.8 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.

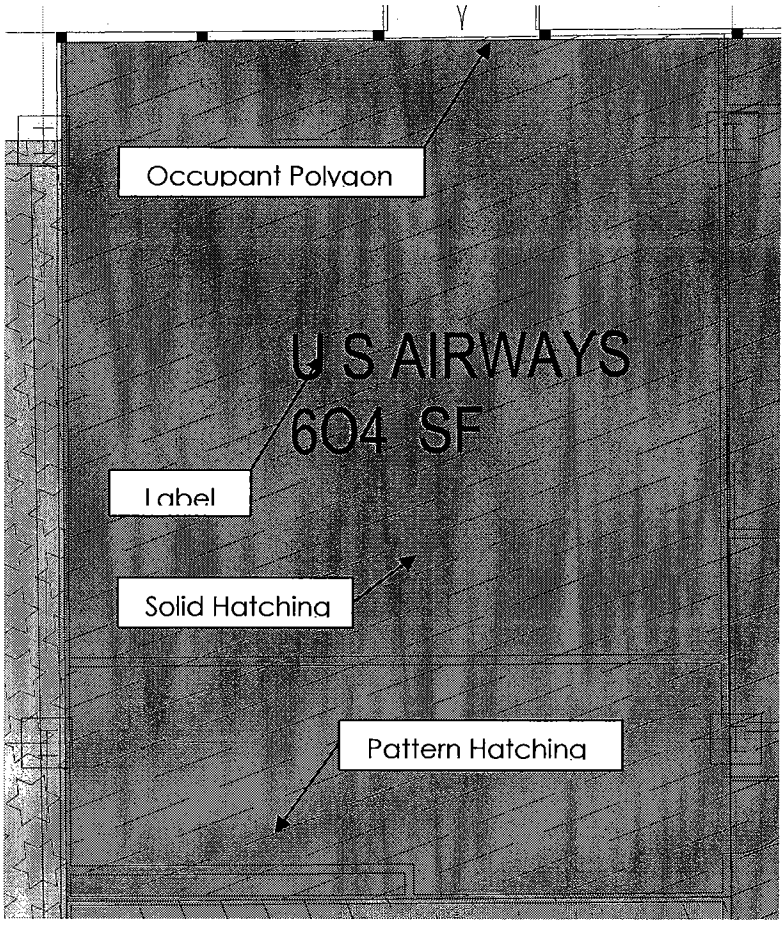


Figure 3-18, Example of Hatching, Polygons and Labels

4.9 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.

4.10 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 3.1 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 3-12 summarizes the additional information blocks considered critical to the SADs.

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

Table 3-11, Summary of Critical Information Blocks

4.11 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.

4.11.1 Drawing Origin

All SAD plans shall remain or be placed in the Maryland State Plane NAD83 coordinate system for horizontal data and NGVD88 for vertical data, the lower left corner of all other drawings should be positioned at the Cartesian coordinate point of 0, 0, 0.

4.11.2 Units

The units for all SAD drawings shall be units of feet 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. Metric units may be used if required by specific projects.

4.12 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.

4.12.1 Specific Use of Reference Files

Each the 49 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 SAD 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 SAD 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 4.2). Therefore, all updates, corrections, or additions to the architectural features must be made in the appropriate Xref model.

4.13 Revision of Drawings

Modifications to the Space Allocation Drawings are made and tracked in a manner specific to the SAD the following sections outline the procedures for incorporating and tracking changes made to the SAD.

4.13.1 Required Revisions

All changes to the SAD must be recorded as a revision in the Architectural Model files.

4.13.2 Revision Methods

All revisions are tracked in the *Architectural Models* and not in the individual SAD drawings. Only, the most recent revisions are visible in the revision block of the individual SAD drawings. Over time, the number of revisions is expected to be extensive, and it is impractical and unnecessary to view the entire revision history on the individual SAD sheets.

4.13.3 Revision Numbers

Revision numbers will be assigned with a letter prefix identifying the model file where the revision is made.
Examples:

a) The bldg-up.dwg model revision numbers will all begin with the letter U.
b) The bldg-lo.dwg model revision numbers will all begin with the letter L.

4.13.4 Revision Block

Each Architectural Model contains a revision block where all revisions are to be entered. The grid lines of the model file revision block are on the *Defpoints* layer and will not plot, the actual plot able lines are in the individual SAD sheets.
The architectural revision block will appear in a *Viewport* within each individual SAD sheet in order to show only the most recent revisions. The *Architectural Model* revision block has a *Datum Line,* which coincides with the bottom of the revision block in individual SAD sheet. As the operator updates the master revision block in the *Architectural Model*, the operator must drag the revision block down so that only a maximum of five or the most recent revisions appear above the *Datum Line*.
Only the cover/index sheet revisions are tracked on the sheet itself since there are no *Xrefed* models.

4.2 Plotting

4.2.1 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 SAD 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.

4.2.2 Default Layer Settings

Certain information within the SAD models 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 SAD's. Table 3-13 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 3-12, 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 4.2.3.

4.2.3 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.

4.2.4 Plotting Individual Space Allocation Drawings

Each individual SAD 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 SAD 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 4.2.1 Layer Manager (Express Tools)
The individual SAD's include the following *Xrefs*:

Paper Space (Layout Tabs)
Border (border-u.dwg or border-l.dwg)
North Arrow (north.dwg)
Legend (see Table 3-9)

Model Space
Architectural Model (bldg-up.dwg or bldg-lo1.dwg)

File Name	SAD Numbers
Legend1.dwg	A-U1, B-U2, C-U2, D-U2, T-U4, A-L1, B-L2, C-L1, C-L2, T-L2, T-L4
Legend2.dwg	B-U1, B-L1
Legend3.dwg	D-U1, D-L1
Legend4.dwg	T-U1, T-L1
Legend5.dwg	D-U3, D-U4, T-U2, T-U5, T-U6, E-U1, D-L3, D-L4, T-L2, T-L5, T-L6, E-L1
Legend6.dwg	T-U3, T-L3

* Inserted on Layer 0 at a scale factor of 1/196

Table 3-13, Legend Files and Associated SAD Numbers *

As previously mentioned, prior to opening and printing an individual SAD sheet, 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 4.2.1 Layer Manager (Express Tools).
This is necessary because the AutoCAD variable *VisRetain* (see note below) for the SAD drawings is set to 0. Therefore, the *Xref* files' *Layer States* will control the appearance of the final plots and not the individual SAD sheets. Once settings are completed in the Architectural Model, save the drawing and:

1) Open the appropriate SAD.
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.

5.0 ELECTRONIC DELIVERABLES

5.1 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 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.

5.1.1 Delivery Media

All drawings produced for a conformed set or As-Builts will be submitted on 24"x36" Mylar with a minimum 3-mil thickness. In addition to full size Mylar's, an electronic copy of ***all*** contract documents (CADD and Non-CADD documents) shall be delivered on Compact Disk (CD-ROM), the CD-ROM session must be closed with no zip or compressed files included.
The CD-ROM(s) will be submitted to MAA at the same time as the initial issue of approved final contract drawings, standard drawings, and directive drawings. Any drawing revisions made after this submittal will be placed on CD-ROM(s) along with the remaining non-revised drawings and submitted to MAA as a complete set. Mylar's of the revised drawings will be submitted at the same time. Revisions will be made in accordance with the directions contained in this document.
Changes made during the construction phase will be marked on the printed drawings by construction personnel so they can be incorporated into as-built drawings at the conclusion of the construction phase. Once the as-built drawing Mylar's are completed, the drawings will be placed on CD-ROM(s) along with any remaining non-revised drawings and both the Mylar's and CD-ROM(s) submitted to MAA. As-built drawings will be made in accordance with the direction contained herein.

5.1.2 Compression Software

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

5.1.3 Media Labeling

The CD's shall be clearly labeled and shall include the project name, date, consultant's name, and application version. This requirement shall apply to CADD and Non-CADD deliverables.

5.1.4 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 with 100 Percent, Conformed, and As-Built Submittals. 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.

5.1.5 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:
a) Instructions for the restoring/transferring of files from the media.
b) Each digital submission shall include one comma delimited text file named *README.DAT*. The first line of this file shall include the project name, date, consultant's name, and AutoCAD version. The remainder of the file shall include one line per file submitted. Each line shall include the file name and the file description.

5.1.6 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.

5.2 Quality Assurance

This section lists the requirements for the inspection and submittal of drawings, and the engineering data quality assurance system for contractors.

5.2.1 Responsibility for Quality

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

5.2.2 Engineering Data Quality Assurance System

Unless otherwise specified in the contract or order, the contractor/supplier needs to have an effective quality assurance system 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.

6.0 GENERAL

6.1 Drawing Definitions

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

6.1.1 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.

6.1.2 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.

6.1.3 Installation Drawings

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

6.1.4 Space Allocation Drawings

Space Allocation Drawings (SAD) comprise of the Terminal Building entire architectural footprint used to provide an accurate record of existing space, identify tenants, square footages of occupancy.

6.2 Glossary

The following are definitions of terms used in this standard:

AEIS	Architectural Engineering Information System. This is MAA's electronic data management system initiative
EDMS	Electronic Data Management System
EDRS	Electronic Document Retrieval System
AutoCAD	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.
CADD	Computer Aided Design & Drafting. Graphic software used by engineers and drafters to create and modify drawings in 2D and 3D.
Drawing Sheet Format	The sheet boundary lines, and title block geometry used to record administrative information about a CADD file.
Drawing Sheet Sizes	Standard sheet sizes are determined by the American National Standards Institute. Alphabetic characters name sheet sizes such as D, E and F.
DWG	AutoCAD's native CADD file format.
DXF	AutoCAD drawing exchange format for CADD files.
Model File	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.
Model Space	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.
Paper Space	AutoCAD Paper Space is where the user organizes different layouts for the purpose of plotting to an appropriate English or Metric drawing scale through the use of viewports.
Plot Stamp	Plots of CADD drawing files should include a plot stamp, which should include the file name and path, date, time and the user name.
Project Copy	A project copy drawing is part of the project copy process, which manages concurrent design updates to a single released drawing.
Raster	Digital image process producing lines made of rectangular dots. Examples of raster formats are TIFF, JPG, BMP, GIF, etc.
Reference File	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.
Revised Drawing	A drawing that has been revised or modified after submission.
Sheet File	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.
TIFF	Tagged Image File Format. Raster graphics format
Vector	Computer graphics comprised of mathematical representation of points, lines and other geometric entities.
Workflow	Automatic routing of documents to the users responsible for working on them.

2D	Two Dimensional
3D	Three Dimensional
A/E/C	Architectural, Engineering and Construction
AIA	American Institute of Architects
ANSI	American National Standards Institute
GIS	Geographical Information System
CD-R	Recordable Compact disk

6.3 Glossary of Acronyms for Use in Airport Documents

-A-	
AA/C –Aircraft	A/G -Air to Ground
A/H -Altitude/Height	AAC -Mike Monroney Aeronautical Center
AAF -Army Air Field	AAI -Arrival Aircraft Interval
AAP -Advanced Automation Program	AAR -Airport Acceptance Rate
ABDIS -Automated Data Interchange System Service B	ACAIS -Air Carrier Activity Information System
ACAS -Aircraft Collision Avoidance System	ACC -Area Control Center
ACCT -Accounting Records	ACD -Automatic Call Distributor
ACDO -Air Carrier District Office	ACF -Area Control Facility
ACFO -Aircraft Certification Field Office	ACFT -Aircraft
ACID -Aircraft Identification	ACLS -Automatic Carrier Landing System
ACLT -Actual Landing Time Calculated	ACO -Aircraft Certification Office
ADA -Air Defense Area	ADAP -Airport Development Aid Program
ADAS -AWOS Data Acquisition System	ADCCP -Advanced Data Communications Control Procedure
ADDA -Administrative Data	ADF -Automatic Direction Finding
ADI -Automatic De-Ice and Inhibitor	ADIN -AUTODIN Service
ADIZ -Air Defense Identification Zone	ADL -Aeronautical Data-Link
ADLY -Arrival Delay	ADO -Airline Dispatch Office
ADP -Automated Data Processing	ADS -Automatic Dependent Surveillance
ADSIM -Airfield Delay Simulation Model	ADSY -Administrative Equipment Systems
ADTN -Administrative Data Transmission Network	ADTN2000 -Administrative Data Transmission Network 2000
ADVO -Administrative Voice	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
ARINC -Aeronautical Radio, Inc.	ARLNO -Airline Office
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
AWS -Air Weather Station	
-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	
-C-	
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
CFCS -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
-D-	
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
-E-	
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
-F-	
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
-G-	
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	
-H-	
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	
-I-	
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	
-J-	
-K-	
Kbps-Kilobits Per Second	KHz -Kilohertz
KVDT -Keyboard Video Display Terminal	
-L-	

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	
-M-	
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
-N-	
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	
-O-	
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
-P-	
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
-Q-	
-R-	
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	
-S-	
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	
-T-	
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
TELMS -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)
-U-	
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	
-V-	
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
VTA -Vertex Time of Arrival	VTAC -VOR collocated with TACAN
VTOL -Vertical Takeoff and Landing	VTS -Voice Telecommunications System
-W-	
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
-X-	
-Y-	
-Z-	

APPENDIX A

Listed below are additional values, which can be used for file and layer, naming in compliance with the *CADD Layer Guidelines*

Sheet and File Naming - Discipline Codes

B = Bridge – Landside C = Airport – Landside H = Highway – Landside

Model File Naming - Drawing Type Codes

Bridge	
B-AB	Abutments
B-AP	Approach Details
B-BC	Box Culverts
B-BS	Border Sheet
B-CM	Camber Diagrams
B-DD	Dead Load Deflection
B-DE	Deck Elevations
B-DK	Deck
B-DR	Drainage Details
B-DT	Details
B-ET	Expansion Joints
B-EL	Electrical Details
B-FN	Fencing Details
B-FP	Framing Plan
B-GD	Girder Details
B-GE	Girder Elevations
B-GN	General Notes
B-GP	General Plan and Elevation
B-GS	Borings
B-PR	Piers
B-QS	Quantity Summary
B-RB	Bar Schedules and Bending Diagrams
B-RW	Retaining Wall
B-SC	Typical Sections
B-SD	Seed File
B-SK	Stakeout Plan
B-SP	Slope Protection Details
B-UT	Utilities Details
Highway	
H-BS	Border Sheet
H-DR	Drainage
H-CT	Cover Sheet
H-EL	Electrical
H-GR	Grading
H-GS	Geotechnical/Soils
H-LI	Lighting
H-ME	Mechanical
H-MK	Marking
H-NS	General Notes and Specifications
H-PF	Roadway Profiles
H-RP	Roadway, Pavement
H-RW	Retaining Walls
H-SC	Cross-Sections
H-SD	Seed File
H-SH	Tables, Schedules, Tabulations
H-SI	Signing
H-SP	Site Plan
H-SV	Survey /Geometric
H-US	Utilities
H-WS	Work Sequence and Traffic Control
Airport	

C-7P	Part 77, Airspace Plan
C-7S	Part 77, Imaginary Surfaces
C-BL	Boring Logs
C-BS	Border Sheet
C-CN	Contours/Spot Elevations
C-CS	Cover Sheet
C-CT	Contract Layout
C-DD	Drainage Details
C-DF	Drainage Profiles
C-DP	Demolition Plans
C-DR	Drainage Plan
C-EB	Exhibits
C-ED	Electrical Details
C-EP	Electrical Plans
C-ES	Erosion Sediment Control C-FE Fencing
C-FL	Fueling
C-GN	General Notes
C-GP	Geometry Plan
C-GR	Grading Plan
C-GS	Geotechnical/Soils
C-GR	Grooving
C-JD	Typical Joint Details
C-JT	Joint Layout Plan
C-KY	Key map
C-LG	Legend
C-LP	Airport Layout Plan
C-MD	Marking Details
C-MK	Pavement Marking
C-MS	Miscellaneous General
C-ND	NAVAIDS Demolition PI
C-NP	NAVAIDS Profiles
C-NV	NAVAIDS
C-PB	Presentation Boards
C-PE	Prop. Pavement Edges (Exist)
C-PF	Profiles
C-PH	Construction Phasing
C-PS	Paving Schedule
C-PV	Paving
C-RF	Report Figures
C-SC	Sections
C-SD	Shading/Hatching
C-SG	Sign Plans
C-ST	Structures
C-TP	Topography
C-TQ	Tables/Index/Quantities
C-TX	Text/Dimensions Ref. File
C-UT	Underground Utilities
C-VG	Re-vegetation Plans
C-WT	Wetland Delineation

Layer Naming

Airport Layers

Existing Topography	
C-PVMT-EXST	Airfield Pavement
C-SIGN-EXST	Airfield Signs
C-LGHT-EXST	Airfield Lights
C-BLDG-EXST	Buildings
C-BLDG-PATT-EXST	Building Hatching
C-UNDR-CLOT-EXST	Cleanouts
C-TOPO-MAJR-EXST	Major Contours
C-TOPO-MINR-EXST	Minor Contours
C-TOPO-SPOT-EXST	Spot Elevations
C-DRNG-INLT-EXST	Drainage Inlets
C-DRNG-PIPE-EXST	Drainage Pipes
C-DRNG-MH-EXST	Drainage Manholes
C-FENC-EXST	Fences
C-GRID-EXST	Grid
C-DRNG-HDWL-EXST	Drainage Headwall
C-MTCH-EXST	Matchlines
C-MRKG-EXST	Pavement Marking
C-POND-EXST	Ponds, etc.
C-SSWR-MH-EXST	Sanitary Manholes
C-SSWR-LINE-EXST	Sanitary Lines
C-TREE-EXST	Trees/Shrubs
C-PVMT-SW-EXST	Sidewalk/Driveways
C-WATR-LINE-EXST	Water Lines
C-WATR-MH-EXST	Water Manholes
C-WATR-HYDR-EXST	Water Hydrant
Proposed Pavement Geometry	
C-BSLN-NEWW	Baseline/Centerline
C-BSLN-STAT-NEWW	Baseline Stationing
C-BSLN-TICS-NEWW	Baseline Tics
C-BSLN-CO-NEWW	Baseline Info
C-BSLN-CRDS-NEWW	Baseline Coordinates
C-PVMT-APRN-NEWW	Apron Pavement
C-PVMT-RW4-NEWW	RW Pavement
C-PVMT-TW4-NEWW	TW Pavement
C-PVMT-SW-NEWW	Sidewalks/Driveways
C-MONU-PATT	Monuments
C-PVMT-CONC-PATT	Pavement/Concrete
C-PVMT-BITU-FULL-PATT	Pavement/Full Strength
C-PVMT-BITU-SHDR-PATT	Pavement/ Shoulder
C-PVMT-ROAD-PATT	Pavement/Road
C-PVMT-RMVL-PATT	Pavement/ Removal
C-PVMT-OVLY-PATT	Pavement/ Overlay
C-PVMT-MILL-PATT	Pavement/Milling
Grading	
C-CONT-LABL-NEWW	Contour Labels
C-CONT-MAJR-NEWW	Major Contours
C-CONT-MINR-NEWW	Minor Contours
C-CONT-SPOT-NEWW	Spots
Drainage	
C-DRNG-PIPE-NEWW	Drainage Pipes
C-GLCL-PIPE-NEWW	Glycol Pipes
C-DRNG-MH-NEWW	Drainage Manholes
C-GLCL-MH-NEWW	Glycol Manholes
C-INLT-DV-NEWW	Inlets
C-DRNG-DV-NEWW	Diversion Vault
C-DRNG-LS-NEWW	Lift Station
C-DRNG-OWS-NEWW	Oil/Water Separator
C-DRNG-BUBL-NEWW	Drainage Bubble Callout
C-GLCL-BUBL-NEWW	Glycol Bubble Callout
C-BUBL-EXST	Existing Bubble Callout
Sediment and Erosion Control	
C-SILT-FENC-NEWW	Silt Fencing
C-LIMT-CNST-NEWW	Limit of Disturbance
C-FLOW-PATH-NEWW	Flow
C-DVDE-NEWW	Drainage Divides
C-DVDE-SUB-NEWW	Sub Divide Areas
C-TARG-PNT-NEWW	Target Points
C-RIPR-NEWW	Riprap
C-TRAP-NEWW	Traps
C-INFL-TRCH-NEWW	Infiltration Trench
C-INLT-PROT-NEWW	Inlet Protection
Pavement Markings	
C-HOLD-NEWW	Hold Lines
C-TWPM-CL-NEWW	Taxiway C/I Marking
C-TWPM-EDGE-NEWW	Taxiway Edge Marking
C-RWPM-CL-NEWW	Runway C/I Marking
C-RWPM-EDGE-NEWW	Runway Edge Marking
C-APPM-NEWW	Apron Marking
Jointing	
C-JNTS	Joints
C-JNTS-PATT	Jointing Hatch
C-JNTS-SYMB	Symbols
Grooving	
C-GRVE-NEWW	Proposed Grooves
C-GRVE-EXST	Existing Grooves
Fencing	
C-FNCE-NEWW	Fence
C-FNCE-TEMP	Temporary Fence
Profiles and Sections	
C-GRND-NEWW	Proposed Ground
C-GRND-EXST	Existing Ground
C-DATM-NEWW	Datum Line
C-CNTR-NEWW	Centerline
C-STRT-NEWW	Structures
C-PIPE-NEWW	Pipes
C-PVMT-SECT-NEWW	Proposed Pavement
C-PVMT-SECT-EXST	Existing Pavement
C-ELEC-UTIL-EXST	Existing Utilities
C-PVMT-PATT	Pavement Hatch
Details	
C-OBJT-LINE-NEWW	Object Line
C-HIDD-LINE-NEWW	Hidden
C-CONC-PATT	Concrete Hatch
C-CNTR-NEWW	Centerlines
C-REBR-NEWW	Rebar
C-PIPE-NEWW	Piping
C-GRND-NEWW	Proposed Ground
Far Part 77 Surfaces	
C-PT77-RPZ-EXST	Existing
C-PT77-RPZ-NEWW	Proposed RPZ
C-PT77-APP-EXST	Existing Approach
C-PT77-APP-NEWW	Proposed Approach
C-PT77-PRIM-NEWW	Primary
C-PT77-HORZ-NEWW	Horizontal
C-PT77-TRAN-NEWW	Transitional
Proposed Planning	

C-APRN-NEWW	Aprons
C-RNWY-NEWW	Runways
C-TXWY-NEWW	Taxiways
C-BLDG-NEWW	Building Hatch
C-FENC-NEWW	Fencing
C-OFA-NEWW	OFA
C-RSA-NEWW	RSA
C-BRL-NEWW	BRL
C-CNTR-NEWW	Centerline
Miscellaneous and Border Information	
C-NRTH	North Arrow
C-SCHD-THCK-NEWW	Schedule/Thick Line
C-SCHD-MEDM-NEWW	Schedule/Medium Line
C-SCHD-THIN-NEWW	Schedule/Thin Line
C-SCAL	Graphic Scale
C-MTCH	Plan Matchline
Electrical	
E-HH-NEWW	Handhole
E-HH-EXST	Handhole

E-MH-NEWW	Manhole
E-MH-EXST	Manhole
E-COMM-MH-NEWW	Communications Mh
E-JBOX-NEWW	Junction Box, Proposed
E-JBOX-EXST	Junction Box, Existing
E-SIGN-NEWW	Guidance Sign
E-LITE-NEWW	Airport Lighting
E-LITE-POLE-NEWW	Light Pole
E-LITE-POLE-EXST	Light Pole
E-UTIL-POLE-NEWW	Utility Pole
E-CABL-GRND-NEWW	Ground Rod
E-EQUP-NEWW	Equipment
E-DUCT-MRKR-NEWW	Duct Marker
E-CARL-NEWW	Direct Buried Cable
E-CABL-CONC-NEWW	Concrete Encased Cable
E-DUCT-NEWW	Ductbank
E-CARL-MAA-NEWW	MAA Cable
E-SIGN-NEWW	Sign

Discipline Layer Naming

Discipline	Major	Minor	Optional	Layer Description
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
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
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
A	CLNG	ACCS		Access panels
A	CLNG	CTLJ		Ceiling control joints
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
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
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.)
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
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
A	FLOR	CASE		Casework (manufactured cabinets)
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	LEVL		Level changes, shafts, ramps, pits, breaks in construction, and depressions
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, escalators, ladders
A	FLOR	TPTN		Toilet partitions
A	FLOR	WDWK		Architectural woodwork (field built cabinets and counters)
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
A	LITE	CLNG		Specialty ceiling lights not shown on Electrical Lighting Plan
A	PROP	LEAS		Lease line (interior)
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
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
A	STAT	DEMO		Demolition
A	STAT	DEMO	PHS1	Demolition - phase 1
A	STAT	DEMO	PHS2	Demolition - phase 2
A	STAT	DEMO	PHS3	Demolition - phase 3
A	STAT	EXST		Existing to remain
A	STAT	FUTR		Future work
A	STAT	MOVE		Items to be moved
A	STAT	NEWW		New work
A	STAT	NICN		Not in contract
A	STAT	PHS#		Phase numbers (#=1-9)
A	STAT	RELO		Relocated items
A	STAT	TEMP		Temporary work
A	WALL	CAVI		Cavity wall lines

A	WALL	CNTR		Wall centerlines
A	WALL	CWMG		Curtain wall mullions and glass
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)
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	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
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	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
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
C	ALGN	DATA		Alignment coordinates and curve data
C	ALGN	LINE		Alignments
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
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		Shoulder stripes
C	APRN	SIGN		Airfield signs on the apron
C	BLDG	IDEN		Building and other structure annotation
C	BLDG	OTLN		Buildings and other structures
C	BLDG	PATT		Building hatching and patterns
C	BORW	IDEN		Borrow/Spoil area annotation

C	BORW	LINE		Borrow/Spoil area
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
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
C	DOMW	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
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
C	DRED	LIMT		Dredge limit lines

C	DRED	OHWM		Ordinary high water marks
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
C	FUEL	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
C	FUEL	VLVE		Valve pits
C	GRAD	EXST		Existing grade, ground line
C	GRAD	FNSH		Finished grade
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
C	HELI	BLST		Helipad blast pad and stopway markings
C	HELI	CNTR		Centerline
C	HELI	CNTR	MARK	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
C	INDW	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
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	NGAS	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
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
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
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	OTLN		Parking lots
C	PKNG	SBMP		Speed bumps in parking areas
C	PKNG	STRP		Parking lot striping, handicapped symbols, pavement markings
C	PROF	CUID		Existing grade and grading cuts - annotation
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
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
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
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
C	ROAD	CNTR		Centerlines
C	ROAD	CNTR	IDEN	Centerline annotation
C	ROAD	CURB		Curbs
C	ROAD	DRIV		Driveway edge of pavement
C	ROAD	DRIV	CNTR	Driveway centerline
C	ROAD	GRAL		Guardrails
C	ROAD	IDEN		Road, curb, and guardrail annotation
C	ROAD	OTLN		Roads
C	ROAD	POIN		Road Point
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	MARK	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	MARK	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
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
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
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.)
C	SITE	STRS		Stairs and ramps
C	SITE	WALK		Walks, trails and bicycle paths
C	SSWR	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	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
C	STAT	DEMO		Demolition
C	STAT	DEMO	PHS1	Demolition - phase 1
C	STAT	DEMO	PHS2	Demolition - phase 2
C	STAT	DEMO	PHS3	Demolition - phase 3
C	STAT	EXST		Existing to remain
C	STAT	FUTR		Future work
C	STAT	MOVE		Items to be moved
C	STAT	NEWW		New work
C	STAT	NICN		Not in contract
C	STAT	PHS#		Phase numbers (#=1-9)
C	STAT	RELO		Relocated items
C	STAT	TEMP		Temporary work
C	STRC	IDEN		Bridges, piers, breakwaters, docks, floats, etc. - annotation
C	STRC	OTLN		Bridges, piers, breakwaters, docks, floats, etc. - outlines
C	STRC	TOWR		Tower
C	STRM	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
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
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
C	TAXI	CNTR		Taxiway centerline
C	TAXI	CNTR	IDEN	Centerline annotation
C	TAXI	CNTR	MARK	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
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
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
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
E	AIRF	DEVC		Capacitors, voltage regulators, motors, buses, generators, meters, grounds, and markers
E	AIRF	DUCT		Ductbanks
E	AIRF	JBOX		Junction boxes, pull boxes, manholes, handholes, pedestals, splices
E	AIRF	VALT		Airfield lighting vaults

E	ALRM	IDEN		Identifier tags, symbol modifier, and text
E	ALRM	SYMB		Miscellaneous alarm system symbols
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
E	BCNS	IDEN		Identifier tags, symbol modifier, and text
E	BCNS	MISC		Miscellaneous navaids - windcones and beacons
E	BCNS	STRB		Strobe beacons
E	BELL	IDEN		Identifier tags, symbol modifier, and text
E	BELL	SYMB		Bell system symbols
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
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
E	CCTV	IDEN		Identifier tags, symbol modifier, and text
E	CCTV	SYMB		Closed-circuit television system symbols
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
E	CLOK	IDEN		Identifier tags, symbol modifier, and text
E	CLOK	SYMB		Clock system symbols
E	COMM	EQPM		Other communications distribution equipment
E	COMM	JBOX		Communication junction boxes, pull boxes, manholes, handholes, pedestals, splices
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
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
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
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.)
E	DUCT	MULT		Ductbank
E	DUCT	MULT	IDEN	Identifier tags, symbol modifier and text
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
E	EMCS	IDEN		Identifier tags, symbol modifier, and text
E	EMCS	SYMB		Energy monitoring control system symbols
E	EMER	EMER		Emergency systems equipment
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)
E	GRND	CIRC		Circuits
E	GRND	DIAG		Ground system diagram
E	GRND	EQUI		Equipotential ground system
E	GRND	REFR		Reference ground system
E	INTC	IDEN		Identifier tags, symbol modifier, and text
E	INTC	SYMB		Intercom/PA system symbols
E	LITE	APPR		Approach lights
E	LITE	APRN		Apron Lighting
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	RNWY	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	DTGS1	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
E	LTNG	COND		Lightning protection conductors
E	LTNG	TERM		Lightning protection terminals
E	NURS	IDEN		Identifier tags, symbol modifier, and text
E	NURS	SYMB		Nurse call/paging system symbols
E	POLE	GUYS		Guying equipment
E	POLE	GUYS	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
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
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	WALL		Wall/floor outlets (receptacles and switches)
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
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
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
E	SOUN	IDEN		Identifier tags, symbol modifier, and text
E	SOUN	SYMB		Sound system symbols
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
E	STAT	DEMO	PHS1	Demolition - phase 1
E	STAT	DEMO	PHS2	Demolition - phase 2

E	STAT	DEMO	PHS3	Demolition - phase 3
E	TRAN	PADM		Pad mounted transformers
E	TRAN	PADM	IDEN	Identifier tags, symbol modifier, and text
E	TRAN	POLE		Pole mounted transformers
E	TRAN	POLE	IDEN	Identifier tags, symbol modifier, and text
E	TVAN	IDEN		Identifier tags, symbol modifier, and text
E	TVAN	SYMB		TV antenna system symbols
F	AFFF	EQPM		Equipment
F	AFFF	PIPE		Piping
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
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
F	CO2S	EQPM		Equipment
F	CO2S	PIPE		CO2 piping or CO2 discharge nozzle piping
F	CTRL	PANL		Control panels
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
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)
F	HALN	EQPM		Halon equipment
F	HALN	PIPE		Halon piping
F	IGAS	EQPM		Inert gas equipment
F	IGAS	PIPE		Inert gas piping
F	LITE	EMER		Emergency fixtures
F	LITE	EXIT		Exit fixtures
F	LSFT	EGRE		Egress requirements designator
F	LSFT	OCCP		Occupant load for egress capacity
F	LSFT	TRVL		Maximum travel distances
F	PROT	CABN		Fire hose cabinets
F	PROT	EXTN		Fire extinguishers and fire extinguisher cabinets
F	PROT	HOSE		Fire hoses
F	RATE	DOOR		Door fire ratings
F	RATE	WALL		Wall fire ratings
F	SMOK	DAMP		Dampers
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
F	STAT	DEMO		Demolition (Note: comprehensive demolition is handled in Model File Type: Demolition Plan)
F	STAT	DEMO	PHS1	Demolition - phase 1
F	STAT	DEMO	PHS2	Demolition - phase 2
F	STAT	DEMO	PHS3	Demolition - phase 3
F	STAT	EXST		Existing to remain
F	STAT	FUTR		Future work
F	STAT	MOVE		Items to be moved
F	STAT	NEWW		New work
F	STAT	NICN		Not in contract
F	STAT	PHS#		Phase numbers (#=1-9)
F	STAT	RELO		Relocated items
F	STAT	TEMP		Temporary work
F	WATR	CONN		Fire department connections
F	WATR	HYDR		Hydrants
F	WATR	PIPE		Piping
F	WATR	PUMP		Fire pumps
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
G	GRID	EXTR		Column grid outside building
G	GRID	IDEN		Column grid tags
G	PLAN	OTLN		Floor outline/perimeter/building footprint
G	SITE	OTLN		Site plan - key map
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
H	BLDG	IDEN		Annotation
H	BLDG	OTLN		Command posts, information centers
H	DECN	EQPM		Decontamination equipment
H	DECN	IDEN		Annotation
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
H	DISP	HAZW		Hazardous waste
H	DISP	IDEN		Annotation
H	DISP	MUNT		Munitions
H	DISP	TANK		Spill containment tanks
H	FIXT	EYEW		Emergency eyewashes
H	FIXT	SHOW		Emergency showers
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
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
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
H	SAMP	SWTR		Surface water samples
H	SAMP	WAST		Waste samples
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
H	STAT	DEMO	PHS1	Demolition - phase 1
H	STAT	DEMO	PHS2	Demolition - phase 2
H	STAT	DEMO	PHS3	Demolition - phase 3
H	STOR	HAZM		Hazardous materials
H	STOR	HAZW		Hazardous waste
H	STOR	IDEN		Annotation
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
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
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
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
I	FLOR	SIGN		Signage
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
I	FURN	SEAT		Chairs, sofas, etc.
I	FURN	STOR		File cabinets, high density storage, shelving, storage cabinets
I	STAT	DEMO	PHS1	Demolition - phase 1
I	STAT	DEMO	PHS2	Demolition - phase 2
I	STAT	DEMO	PHS3	Demolition - phase 3
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
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
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
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
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
L	PLNT	TURF		Lawn areas (turfing limits)
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
L	STAT	DEMO		Demolition (Note: comprehensive demolition is handled in Model File Type: Demolition Plan)
L	STAT	DEMO	PHS1	Demolition - phase 1
L	STAT	DEMO	PHS2	Demolition - phase 2
L	STAT	DEMO	PHS3	Demolition - phase 3
L	STAT	EXST		Existing to remain
L	STAT	FUTR		Future work
L	STAT	MOVE		Items to be moved
L	STAT	NEWW		New work
L	STAT	NICN		Not in contract

L	STAT	PHS#		Phase numbers (#=1-9)
L	STAT	RELO		Relocated items
L	STAT	TEMP		Temporary work
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
M	AFRZ	PIPE		Anti-freeze piping
M	AFRZ	WAST		Waste anti-freeze piping
M	ALGN	DATA		Alignment coordinates and curve data
M	ALGN	LINE		Alignments
M	ALGN	STAT		Alignment stationing and tick marks
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
M	BRIN	EQPM		Brine system equipment
M	BRIN	PIPE		Brine system piping
M	CHEM	EQPM		Equipment
M	CHEM	PIPE		Piping (includes fittings, valves)
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
M	CWTR	EQPM		Equipment
M	CWTR	PIPE		Piping (includes fittings, valves)
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
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
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
M	DISC	INFO		Clearances and working space information
M	DUAL	EQPM		Equipment
M	DUAL	PIPE		Piping (includes fittings, valves)
M	DUST	DUCT		Dust and fume ductwork
M	DUST	EQPM		Dust and fume collection equipment
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
M	EXHS	CDFF		Exhaust air ceiling registers and grilles
M	EXHS	DUCT		Exhaust ductwork
M	EXHS	EQPM		Equipment
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)
M	GTHP	EQPM		Equipment
M	GTHP	PIPE		Piping (includes fittings, valves)
M	HTCW	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
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
M	HVAC	ACCS		Equipment access doors
M	HVAC	CDFF		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
M	HWTR	EQPM		Equipment
M	HWTR	PIPE		Piping (includes fittings, valves)
M	HYDR	EQPM		Hydraulic system equipment
M	HYDR	PIPE		Hydraulic system piping
M	INSL	EQPM		Insulating oil equipment
M	INSL	PIPE		Insulating oil piping
M	LUBE	EQPM		Lubrication oil equipment
M	LUBE	PIPE		Lubrication oil piping
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
M	MATL	HOIS		Hoists and hooks
M	MATL	LIFT		Miscellaneous lifting equipment
M	PENE	FLOR		Floor penetrations
M	PENE	ROOF		Roof penetrations
M	PROC	EQPM		Equipment
M	PROC	PIPE		Process piping
M	RCOV	EQPM		Equipment
M	RCOV	PIPE		Piping (includes fittings, valves)
M	REFG	EQPM		Equipment
M	REFG	PIPE		Piping (includes fittings, valves)
M	RWTR	EQPM		Raw water equipment
M	RWTR	PIPE		Raw water piping
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
M	STAT	DEMO		Demolition
M	STAT	DEMO	PHS1	Demolition - phase 1
M	STAT	DEMO	PHS2	Demolition - phase 2
M	STAT	DEMO	PHS3	Demolition - phase 3
M	STAT	EXST		Existing to remain
M	STAT	FUTR		Future work
M	STAT	MOVE		Items to be moved
M	STAT	NEWW		New work
M	STAT	NICN		Not in contract
M	STAT	PHS#		Phase numbers (#=1-9)
M	STAT	RELO		Relocated items
M	STAT	TEMP		Temporary work
M	STEM	EQPM		Equipment

M	STEM	PIPE		Steam piping
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
P	CMPA	EQPM		Equipment
P	CMPA	PIPE		Piping
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
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
P	DISC	INFO		Information and notes for other disciplines
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
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)
P	FUEL	EQPM		Equipment
P	FUEL	FGAS		Fuel gas piping
P	FUEL	FOIL		Fuel oil piping
P	FUEL	NGAS		Natural gas piping
P	LGAS	EQPM		Equipment
P	LGAS	PIPE		Piping
P	MDGS	EQPM		Equipment
P	MDGS	PIPE		Piping
P	PENE	FLOR		Floor penetrations
P	PENE	ROOF		Roof penetrations
P	SANR	COND		Condensate piping
P	SANR	EQPM		Equipment (e.g., sand/oil/water separators)
P	SANR	FIXT		Plumbing fixtures
P	SANR	FLDR		Floor drains, sinks, and cleanouts
P	SANR	PIPE		Piping
P	SANR	RISR		Sanitary risers
P	SANR	VENT		Vent piping
P	STAT	DEMO		Demolition
P	STAT	DEMO	PHS1	Demolition - phase 1
P	STAT	DEMO	PHS2	Demolition - phase 2
P	STAT	DEMO	PHS3	Demolition - phase 3
P	STAT	EXST		Existing to remain

P	STAT	FUTR		Future work
P	STAT	MOVE		Items to be moved
P	STAT	NEWW		New work
P	STAT	NICN		Not in contract
P	STAT	PHS#		Phase numbers (#=1-9)
P	STAT	RELO		Relocated items
P	STAT	TEMP		Temporary work
P	STRM	PIPE		Storm drain piping
P	STRM	RFDR		Roof drains
P	STRM	RISR		Storm drain risers
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
S	BEAM	CNTR		Beam centerlines
S	BEAM	PRIM		Primary beams, girders
S	BEAM	SECD		Secondary beams, girders
S	BRAC	LATL		Lateral bracing
S	BRAC	SHEA		Shear walls
S	BRAC	VERT		Vertical bracing
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
S	DECK	FLOR		Floor deck
S	DECK	OPEN		Openings and penetrations
S	DECK	RBAR		Deck/slab reinforcing
S	DECK	ROOF		Roof deck
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
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)
S	FNDN	CNTR		Beam centerlines
S	FNDN	FTNG		Footings
S	FNDN	GRBM		Grade beams
S	FNDN	PEDS		Column pedestals
S	FNDN	PILE		Piles (steel sheet, concrete, wood), piers, caisson piers, drilled piers
S	FNDN	RBAR		Foundation reinforcing
S	GRAT	ELEV		Elevated grating (catwalks)

S	GRAT	FLOR		Floor grating
S	GRAT	SUBS		Subsurface grating
S	GRDL	EXGL		Existing ground
S	GRDL	FNGR		Finished grade
S	GRDL	WATR		Water surface
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)
S	JOIN	CNST		Construction joints
S	JOIN	CTRL		Control/expansion joints
S	JOIS	BRDG		Bridging
S	JOIS	PRIM		Primary joists
S	JOIS	SECD		Secondary joists
S	METL	MISC		Miscellaneous metal
S	OPEN	MISC		Openings and penetrations
S	PADS	EQPM		Equipment pads
S	PIPE	GATE		Gates (flap gates, sluice gates, other)
S	PIPE	MISC		Miscellaneous piping/culverts
S	PIPE	TRSH		Trash racks
S	REIN	RBAR		Rebar, welded wire mesh
S	SAFE	FENC		Fencing
S	SAFE	HRAL		Handrails
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
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)
S	SLAB	EDGE		Edge of slab
S	SLAB	OPEN		Openings and penetrations
S	SLAB	RBAR		Slab reinforcing
S	SPPT	MISC		Miscellaneous fasteners, anchor bolts, supports
S	SPPT	SHPS		Miscellaneous shapes, plates
S	STAT	DEMO		Demolition
S	STAT	DEMO	PHS1	Demolition - phase 1
S	STAT	DEMO	PHS2	Demolition - phase 2
S	STAT	DEMO	PHS3	Demolition - phase 3
S	STAT	EXST		Existing to remain
S	STAT	FUTR		Future work
S	STAT	MOVE		Items to be moved

S	STAT	NEWW		New work
S	STAT	NICN		Not in contract
S	STAT	PHS#		Phase numbers (#=1-9)
S	STAT	RELO		Relocated items
S	STAT	TEMP		Temporary work
S	STRS	FRAM		Stair/elevator framing
S	STRS	LADD		Ladders, ladder handrails, safety guard, grab bars
S	STRS	RBAR		Stair reinforcing
S	TRUS	PRIM		Primary trusses
S	TRUS	SECD		Secondary trusses
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
T	ALRM	EQPM	SECU	Security Alarm Equipment
T	ALRM	IDEN		Identifier tags, symbol modifier, and text
T	ALRM	SYST		Miscellaneous alarm system symbols
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
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
T	CLOK	IDEN		Identifier tags, symbol modifier, and text
T	CLOK	SYST		Clock system symbols
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
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
T	DISC	INFO		Information and notes for other disciplines
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
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)
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
T	NURS	IDEN		Identifier tags, symbol modifier, and text
T	NURS	SYST		Nurse call system symbols
T	SOUN	IDEN		Identifier tags, symbol modifier, and text
T	SOUN	SYST		Sound system symbols
T	STAT	DEMO	PHS1	Demolition - phase 1
T	STAT	DEMO	PHS2	Demolition - phase 2
T	STAT	DEMO	PHS3	Demolition - phase 3
V	AERI	BNDY		Aerial photography boundaries
V	AERI	INDX		Aerial photo index
V	AERI	PATH		Aerial flight lines/paths
V	AIRF	DEVC		Capacitors, voltage regulators, motors, buses, generators, meters, grounds, and markers
V	AIRF	DUCT		Ductbanks
V	AIRF	JBOX		Junction boxes, pull boxes, manholes, handholes, pedestals, splices
V	ALGN	DATA		Alignment coordinates and curve data
V	ALGN	LINE		Alignments
V	ALGN	MARK		Alignment tick marks
V	ALGN	STAT		Alignment stationing and tick marks
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
V	BCNS	IDEN		Identifier tags, symbol modifier, and text
V	BCNS	MISC		Miscellaneous navaids - windcones and beacons
V	BCNS	STRB		Strobe beacons
V	BLDG	IDEN		Building and other structure annotation
V	BLDG	OTLN		Buildings and other structures
V	CATH	ANOD		Sacrificial anode system
V	CATH	CURR		Impress current system
V	CATH	IDEN		Identifier tags, symbol modifier, and text
V	CATH	TEST		Test stations

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	LIMT		Channel limits, anchorages, turning basins, disposal areas, etc.
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
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
V	DOMW	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
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
V	DUCT	MULT		Ductbank
V	DUCT	MULT	IDEN	Identifier tags, symbol modifier and text
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

V	FUEL	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
V	GRAD	EXST		Existing grade, ground line
V	GRAD	FNSH		Finished grade
V	GRID	FRAM		Frame
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)
V	HTCW	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
V	INDW	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
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
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
V	NGAS	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
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
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

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
V	PROP	BRNG		Bearings and distance labels
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
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
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
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
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
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
V	SSWR	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	JBOX		Junction boxes and manholes
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
V	SSWR	TANK		Septic tanks
V	STAT	DEMO		Demolition (Note: comprehensive demolition is handled in Model File Type: Demolition Plan)
V	STAT	EXST		Existing to remain
V	STAT	FUTR		Future work
V	STAT	MOVE		Items to be moved
V	STAT	NEWW		New work
V	STAT	NICN		Not in contract
V	STAT	PHS#		Phase numbers (#=1-9)
V	STAT	RELO		Relocated items
V	STAT	TEMP		Temporary work
V	STRC	IDEN		Bridges, piers, breakwaters, docks, floats, etc. - annotation
V	STRC	OTLN		Bridges, piers, breakwaters, docks, floats, etc. - outlines
V	STRC	TOWR		Tower
V	STRM	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
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	TOPO	BKLN		Breaklines
V	TOPO	BORE		Boring locations
V	TOPO	COOR		Coordinate grid ticks and text
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
V	TRAN	PADM		Pad mounted transformers
V	TRAN	PADM	IDEN	Identifier tags, symbol modifier, and text
V	TRAN	POLE		Pole mounted transformers
V	TRAN	POLE	IDEN	Identifier tags, symbol modifier, and text
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 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	

3 Digit Code	2 Digit Code	Name	Ticketing Code
	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
	AX	AIR AURORA (CARGO)	386
	ZX	AIR B.C.	742
	AJ	AIR BELGIUM	
	KF	AIR BOTNIA	
	BP	AIR BOTSWANA	636
		AIR BRASIL	853

3 Digit Code	2 Digit Code	Name	Ticketing Code
		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
	7N	AIR MANITOBA	268
	NN	AIR MARTINIQUE	606
	MR	AIR MAURITANIE	174
MAU	MK	AIR MAURITIUS	239
		AIR MERCURY INT (CARGO)	

3 Digit Code	2 Digit Code	Name	Ticketing Code
	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 VITKOVICE	
	ZW	AIR WISCONSIN	303
AZR	QC	AIR ZAIRE	207
	UM	AIR ZIMBABWE CORPORATION	168
	ZF	AIRBORNE OF SWEDEN	
	4C	AIRES	
	XL	AIR-GLACIERS	

3 Digit Code	2 Digit Code	Name	Ticketing Code
	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
	AP	ASPEN AIRWAYS	
		ASTRO AIR INTERNATIONAL	769
	9T	ATHABASKA AIRWAYS	909

3 Digit Code	2 Digit Code	Name	Ticketing Code
	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
		BRANIFF INTERNATIONAL A/L	577
	JJ	BRASIL CENTRAL LINHA AEREA REG	

3 Digit Code	2 Digit Code	Name	Ticketing Code
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	
	CC	CISKEI INTERNATIONAL	222

3 Digit Code	2 Digit Code	Name	Ticketing Code
	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	

3 Digit Code	2 Digit Code	Name	Ticketing Code
	LK	GOLDFIELDS AIR SERVICES	
	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 SALTSPRING	
	8H	HARBOR AIR SERVICE	458
	HG	HARBOR AIRLINES	495
	HA	HAWAIIAN AIRLINES	173
	ZL	HAZELTON AIRLINES	
		HEAVYLIFT CARGO AIRL. (CARG0)	
	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	

3 Digit Code	2 Digit Code	Name	Ticketing Code
	IS	ISLAND AIRLINES	
	2S	ISLAND EXPRESS	
	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

3 Digit Code	2 Digit Code	Name	Ticketing Code
	QL	LESOTHO AIRWAYS	721
	4X	L'EXPRESS AIRLINES	534
	LI	LIAT	140
	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		MONTSERRAT AIRWAYS	

3 Digit Code	2 Digit Code	Name	Ticketing Code
	NM	MOUNT COOK LINE OF NEW ZEALAND	445
	ZR	MUK AIR	796
	UB	MYANMA AIRWAYS CORPORATION	209
	JO	N.V LUCHTVAARTMAATSCHAPPIJ TWN	
	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	

3 Digit Code	2 Digit Code	Name	Ticketing Code
	9P	PELANGI AIR	
	PD	PEM AIR	329
	KS	PENINSULA AIRWAYS	339
		PENNSYLVANIA AIRLINES	395
	4P	PEOPLES AIR	906
	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	PROVINICIAL 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 AEREOS 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	

3 Digit Code	2 Digit Code	Name	Ticketing Code
	WB	SAN	739
	BB	SANSA	907
	UF	SARO AIRLINES	
	SP	SATA AIA ACORES	737
	ZT	SATENA	
SVA	SV	SAUDI ARABIAN	065
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 TRANPORT (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

3 Digit Code	2 Digit Code	Name	Ticketing Code
	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
	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

3 Digit Code	2 Digit Code	Name	Ticketing Code
	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
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

3 Digit Code	2 Digit Code	Name	Ticketing Code
	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
ITS	International Total

Y - designation	Company
	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

Z-Designation	Description	Patterned Hatch	Scale/Angle
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 D

MAA STANDARD CONTRACT DRAWINGS

MARTIN STATE AIRPORT

BWI BALTIMORE/WASHINGTON INTERNATIONAL Thurgood Marshall AIRPORT

GENERAL CONSTRUCTION NOTES

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

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

3. PROJECT PHASING – THE PROJECT IS TO BE COMPLETED IN CLOSE CONFORMANCE WITH THE PHASING PLANS 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. THE IMPORTANCE OF THIS IS STRESSED BY THE INCLUSION OF LIQUIDATED DAMAGES IN THE CONTRACT DOCUMENTS.

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

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

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

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

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

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

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

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

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

GENERAL AIRFIELD SAFETY DURING CONSTRUCTION

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

2. PROTECTION OF ALL PERSONS SHALL BE PROVIDED THROUGHOUT THE PROGRESS OF THE WORK. THE WORK SHALL PROCEED IN SUCH A MANNER AS TO PROVIDE SAFE CONDITIONS FOR ALL WORKERS, WHETHER CONTRACTOR OR AIRPORT PERSONNEL. THE SEQUENCE OF OPERATION SHALL BE SUCH THAT MAXIMUM PROTECTION IS AFFORDED TO INSURE THAT NO WORKERS WITHIN THE WORK AREA ARE SUBJECT TO ANY DANGEROUS CONDITIONS. THE CONTRACTOR MUST PROVIDE SAFETY MEASURES TO GUARD AGAINST INJURY.

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 SAFETY DEVICES REQUIRED FOR THE PROTECTION OF THE CONTRACTOR'S PERSONNEL.

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 GENERAL PROJECT LAYOUT. 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 ON-SITE AND OFF-SITE HAUL ROUTES SHALL BE SELECTED TO MINIMIZE DISTURBANCE TO THE PUBLIC AND THE AIRPORT AND SHALL BE APPROVED IN ADVANCE BY THE ENGINEER AND MAA OPERATIONS. UNLESS OTHERWISE INDICATED IN THE CONTRACT DRAWINGS, THE CONTRACTOR'S ON-AIRPORT HAUL ROUTES SHALL BE EXISTING HAUL ROADS, WHERE AVAILABLE, OR ALONG TAXIWAY/TAXILANE PAVEMENTS. 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.

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 CONSTRUCTIN 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. ANY PROJECT OR CONSTRUCTION ACTIVITY WHICH INVOLVES ACCESS TO THE BWI AIR OPERATIONS AREA/SECURITY IDENTIFICATION DISPLAY AREA (AOA/SIDA) OR THE RECONFIGURATION OF THE BWI AOA/SIDA BOUNDARIES, REQUIRES WRITTEN NOTIFICATION TO THE AIRPORT SECURITY DIVISION FORTY-FIVE BUSINESS DAYS PRIOR TO THE PROPOSED ACTIVITY. THE NOTIFICATION MUST CONTAIN THE DETAILS OF THE ACTIVITY INCLUDING THE NAME OF THE CONTRACTING FIRM, DESCRIPTION OF THE ACTIVITY, LOCATION, STARTING DATE, AND DURATION. A DIAGRAM SHOULD BE PROVIDED AS APPLICABLE.

2. ENTRANCE TO THE AIRFIELD IS SUBJECT TO STRICT SECURITY REGULATIONS. ALL PERSONNEL ENTERING THE AIRFIELD UNESCORTED MUST OBTAIN AND DISPLAY SECURITY IDENTIFICATION BADGES AND ALL VEHICLES MUST HAVE AND DISPLAY SPECIAL PERMITS WHICH ARE AVAILABLE THROUGH THE MAA.

3. 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. ALL ACCESS TO THE AIRFIELD MOVEMENT AREAS WILL REQUIRE CONTRACTOR PERSONNEL TO COMPLETE THE BWI AIRPORT MOVEMENT AREA TRAINING PROGRAM PROVIDED BY AIRPORT OPERATIONS. 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.

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

   a. 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.

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

   c. ALL PERMITTED VEHICLES SHALL BE CLEARLY MARKED WITH THE COMPANY NAME, LOGO, OR OTHER IDENTIFICATION ACCEPTABLE TO THE MAA. VEHICLE IDENTIFICATION SHALL BE IN ACCORDANCE WITH BWI TENANT DIRECTIVE 200.2, PARAGRAPH 3.2.B 'VEHICLE REGISTRATION PROGRAM', WHICH STATES THAT CHARACTERS ON THE SIDE ARE TO BE A MINIMUM OF 8 INCHES HIGH; CHARACTERS ON THE TOP (OR HOOD) ARE TO BE A MINIMUM OF 12 INCHES HIGH. TOP MARKINGS ARE TO BE ORIENTED LOGITUDINALLY. 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.

   d. 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.

   e. 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.

5. RADIO COMMUNICATIONS – FOR THOSE AUTHORIZED TO OPERATE OR WORK IN THE AIRFIELD MOVEMENT AREA, RADIO COMMUNMICATION 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 VIA RADIO COMMUNCATION BY ATCT 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 FREQUENCYOF 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.

6. SECURITY:

   a. IT IS THE CONTRACTORS RESPONSIBILITY TO BECOME FAMILIAR WITH THE VARIOUS ASPECTS OF 49 CFR 1542. ANY VIOLATION BY THE CONTRACTOR AND ANY SUBSEQUENT FINES IMPOSED DUE TO THE VIOLATION WILL BE THE RESPONSIBILITY OF THE CONTRACTOR.

   b. THE CONTRACTOR IS REQUIRED TO HAVE AT LEAST ONE SUPERVISOR WITH AN AIRPORT IDENTIFICATION BADGE WITH ESCORT PRIVILEGES ON THE PROJECT SITE AT ALL TIMES. TO OBTAIN ID BADGES, THE APPLICANT MUST PARTICIPATE IN A ONE-HOUR TRAINING PROGRAM. THE CONTRACTOR CAN CONTACT THE SECURITY OFFICE AT (410) 859-7124 DIRECTLY FOR BADGING HOURS.

   c. ANY VEHICLE TO BE USED ON THE AIRPORT SHALL BE REGISTERED WITH AIRPORT OPERATIONS. IT IS THE CONTRACTOR'S RESPONSIBILITY TO ENSURE THAT VEHICLES ARE REGISTERED IN A TIMELY MANNER AS NOT TO DELAY THE PROJECT.

   d. IF GUARDS ARE REQUIRED BY THE PROJECT, THE CONTRACTOR SHALL BE REQUIRED TO HIRE GATE GUARDS FROM THE CURRENT COMPANY UNDER CONTRACT TO THE MARYLAND AVIATION ADMINISTRATION.

7. AIRFIELD PERIMETER SECURITY – AIRFIELD SECURITY MUST BE MAINTAINED AT ALL TIMES. A TEN-FOOT CLEAR ZONE MUST BE MAINTAINED ALONG BOTH THE INSIDE AND THE OUTSIDE OF THE ENTIRE AIRPORT PERIMETER FENCE LINE. THE AIRPORT'S SECURITY PROGRAM AND FEDERAL REGULATIONS REQUIRE THAT VEHICLES AND EQUIPMENT ARE STORED OUTSIDE OF THIS CLEAR ZONE AT ALL TIMES. FOR ANY TEMPORARY CHANGES TO THE ALIGNMENT OF THE SECURITY FENCE THAT WILL BE IN PLACE FOR SIXTY DAYS OR LESS, THE OFFICE OF AIRPORT SECURITY SHALL BE NOTIFIED TEN DAYS PRIOR TO IMPLEMENTATION OF THE CHANGE. FOR ANY CHANGES TO THE ALIGNMENT OF THE SECURITY FENCE THAT WILL BE IN PLACE FOR MORE THAN SIXTY DAYS, THE OFFICE OF AIRPORT SECURITY SHALL BE NOTIFIED FORTY-FIVE DAYS IN ADVANCE OF ANY MODIFICATIONS. PRIOR TO ANY SECURITY FENCE REMOVAL, PROPOSED SECURITY FENCE MUST BE INSTALLED AND READY TO CONNECT TO THE APPROPRIATE LOCATION OF THE EXISTING FENCE.

CLIENT LOGO HERE.

DESIGNED:
DRAWN:
CHECKED:
APPROVED:

REVISION NO.:	REVISION DATE:	DESCRIPTION:

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

PROJECT TITLE: –
–

SHEET TITLE: GENERAL CONSTRUCTION AND SAFETY NOTES I

SCALE: AS SHOWN

DATE: –

CONTRACT NO.:

SHEET NO.:

FILE NAME: H:\20827658\C-GN-01.dwg LAYOUT NAME: Sheet 1 PLOTTED: Friday, June 09, 2006 – 10:08am

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 AIRPORT FIRE AND RESCUE STATION. 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 15B 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 WATER 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 DAMAGED CABLES 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	
EMERGENCIES GENERAL INFORMATION	(410) 222-8400 (410) 222-7520
BALTIMORE COUNTY	
SEWER WATER	(410) 887-5210 (410) 396-5352

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) 859-7815/7500
ii. BWI FIRE/RESCUE/MEDICAL EMERGENCY	(410) 859-7222
iii. BWI POLICE EMERGENCY	(410) 859-7040
iv. BWI DUTY AIRPORT OPERATIONS MGR	(410) 859-7018
v. CONSOLIDATED DISPATCH CENTER	(410) 859-7117
vi. BWI OFFICE OF AIRPORT SECURITY	(410) 859-7162
vii. FAA ATCT	(410) 859-7636
viii. FAA AIRWAY FACILITIES SSC	(410) 859-7252
ix. MDE OIL CONTROL PROGRAM (COMPLIANCE AND REMEDIATION)	(410) 537-3442

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

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 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.

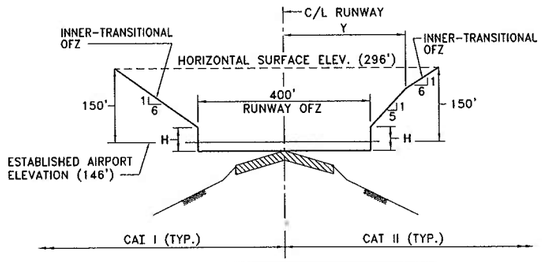
      iii. AC 70/7460-2, 'PROPOSED CONSRUCTION OF OBJECTS THAT MAY AFFECT THE NAVIGABLE AIRSPACE', CURRENT EDITION, PROVIDES INFORMATION TO PERSONS PROPOSING TO ERECT OR ALTER AN OBJECT THAT MAY AFFECT NAVIGABLE AIRSPACE. THE AC EXPLAINS THE REQUIREMENT TO NOTIFY THE FAA BEFORE CONSTRUCTION BEGINS AND THE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

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

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

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

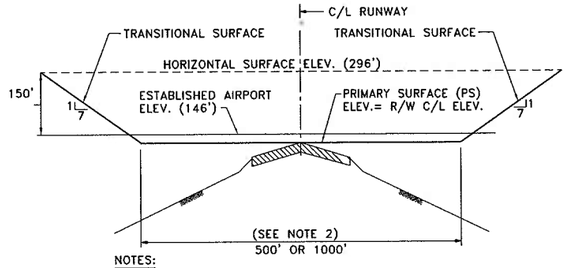
      iii. SAFETY AREA – THE SURFACE ADJACENT TO RUNWAYS, TAXIWAYS, AND TAXILANES OVER WHICH AIRCRAFT SHOULD, IN DRY WEATHER, BE ABLE TO CROSS AT NORMAL SPEEDS WITHOUT INCURRING ANY SIGNIFICANT DAMAGE. A SAFETY AREA IS GRADED, DRAINED AND COMPACTED. IT IS FREE OF ANY HOLES, TRENCHES, BUMPS OR OTHER SIGNIFICANT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



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

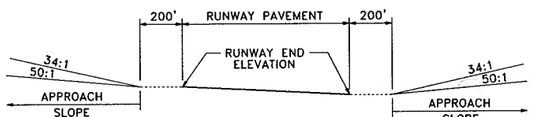
*VERTICAL TO A HEIGHT OF 150' ABOVE ESTABLISHED AIRPORT ELEVATION

TYPICAL SECTION
OBSTACLE FREE ZONE (OFZ)
NOT TO SCALE



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

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



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

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

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

PROJECT TITLE: -
-

SHEET TITLE: GENERAL CONSTRUCTION AND SAFETY NOTES II

SCALE: AS SHOWN

DATE: -

CONTRACT NO.:

SHEET NO.:

FILE NAME: H:\20827658\C-GN-01.dwg LAYOUT NAME: Sheet 2 PLOTTED: Friday, June 09, 2006 - 10:14am

GENERAL NOTES

1. DESCRIPTION

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

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

2. TEMPORARY CONTROLS

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

3. STANDARDS & SPECIFICATIONS

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

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

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

4. DEFINITIONS

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

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

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

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

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

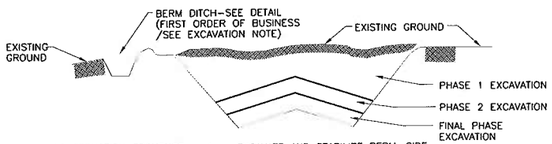
5. CLEARING AND GRUBBING

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

6. EXCAVATION

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

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



CONSTRUCTION SEQUENCE:

1. EXCAVATE AND STABILIZE BERM, SIDE AND OUTLET DITCHES.
2. PERFORM PHASE 1 EXCAVATION, DRESS, SEED & MULCH SLOPES WITH PERMANENT SEED & MULCH.
3. PERFORM PHASE 2 EXCAVATION, DRESS, SEED & MULCH SLOPES WITH PERMANENT SEED & MULCH.
4. 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.

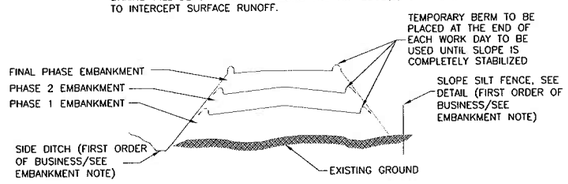
PHASING PLAN-CUT SECTION

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.

CONSULTANTS

DESIGNED:
DRAWN BY:
CHECKED:
APPROVED:

SEAL

REVISION NO.	REVISION DATE	REVISION DESCRIPTION

BWI THURGOOD MARSHALL OR MARTIN STATE LOGO

MARYLAND DEPARTMENT OF TRANSPORTATION
MARYLAND AVIATION ADMINISTRATION
OFFICE OF ENGINEERING AND CONSTRUCTION MANAGEMENT
BALTIMORE/WASHINGTON INTERNATIONAL THURGOOD MARSHALL AIRPORT OR MARTIN STATE AIRPORT

PROJECT TITLE: PROJECT TITLE

SHEET TITLE: EROSION AND SEDIMENT CONTROL NOTES I

CONTRACT NO. C-XXXSED
SCALE:
SHEET NO.
DATE: XXXX

STANDARD EROSION AND SEDIMENT CONTROL NOTES

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

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

   A. THE REQUIRED PRE-CONSTRUCTION MEETING.

   B. FOLLOWING INSTALLATION OF SEDIMENT CONTROL MEASURES.

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

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

   E. PRIOR TO REMOVAL OF ALL SEDIMENT CONTROL DEVICES.

   F. PRIOR TO FINAL ACCEPTANCE.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

   C. TRENCHES FOR UTILITY INSTALLATION SHALL BE 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 CONVEYING SEDIMENT LADEN WATER, ALL STORM DRAIN INLETS IN NON-SUMP AREAS SHALL HAVE TEMPORARY ASPHALT BERMS CONSTRUCTED AT THE TIME OF BASE PAVING TO DIRECT GUTTER FLOW INTO THE INLETS TO AVOID SURCHARGING AND OVERFLOW OF INLETS IN SUMP AREAS.

27. SITE INFORMATION:

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

DESIGN CERTIFICATION

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

Date _____ Designer's Signature _____

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

STANDARD STABILIZATION NOTE

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

OWNER'S/DEVELOPER'S CERTIFICATION

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

Date _____ Owner/Developer Signature _____

Card No. _____ Printed Name and Title _____

EROSION AND SEDIMENT CONTROL SEQUENCE OF CONSTRUCTION

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

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

INITIAL PHASE

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

FINAL PHASE (IF REQUIRED)

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

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

FOR EROSION AND SEDIMENT CONTROL ONLY.

CONSULTANTS	DESIGNED:	SEAL	REVISION NO.	REVISION DATE	REVISION DESCRIPTION
	DRAWN BY:				
	CHECKED:				
	APPROVED:				

BWI THURGOOD MARSHALL OR MARTIN STATE LOGO

MARYLAND DEPARTMENT OF TRANSPORTATION
MARYLAND AVIATION ADMINISTRATION
OFFICE OF ENGINEERING AND CONSTRUCTION MANAGEMENT
BALTIMORE/WASHINGTON INTERNATIONAL THURGOOD MARSHALL AIRPORT OR MARTIN STATE AIRPORT

PROJECT TITLE: PROJECT TITLE

SHEET TITLE: EROSION AND SEDIMENT CONTROL NOTES II

CONTRACT NO. C-XXXSED

SCALE:

SHEET NO.

DATE: XXXX

SEDIMENT CONTROL LEGEND

(CONSULTANT CAN MODIFY PER PROJECT SPECIFIC)

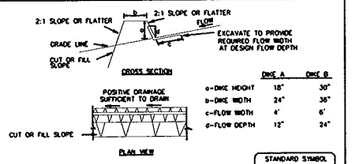
EARTH DIKE	A-2 / B-3
SWALE	A-2 / B-3
PERIMETER DIKE/SWALE	PD/S-1
PIPE SLOPE DRAIN	PSD-12
ROCK OUTLET PROTECTION	
STONE CHECK DAM	
STONE OUTLET STRUCTURE	
SILT FENCE	SF
SUPER SILT FENCE	SSF
STRAW BALE DIKE	SBD
STANDARD INLET PROTECTION	SIP
AT GRADE INLET PROTECTION	AGIP
CURB INLET PROTECTION	CIP
MEDIAN INLET PROTECTION	MIP
GABION INFLOW PROTECTION	GM
RIP-RAP INFLOW PROTECTION	RRP
SUMP PIT	SP
STABILIZED CONSTRUCTION ENTRANCE	SCE-20
REMOVABLE PUMPING STATION	RPS
LIMIT OF DISTURBANCE	LOD
DRAINAGE BOUNDARY	
TREE PROTECTION FENCE	
ROOT PRUNING	

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

FOR EROSION AND SEDIMENT CONTROL ONLY.

	CONSULTANTS	DESIGNED: DRAWN BY: CHECKED: APPROVED:	SEAL	REVISION NO.	REVISION DATE	REVISION DESCRIPTION	BWI THURGOOD MARSHALL OR MARTIN STATE LOGO	MARYLAND DEPARTMENT OF TRANSPORTATION MARYLAND AVIATION ADMINISTRATION OFFICE OF ENGINEERING AND CONSTRUCTION MANAGEMENT BALTIMORE/WASHINGTON INTERNATIONAL THURGOOD MARSHALL AIRPORT OR MARTIN STATE AIRPORT	PROJECT TITLE: PROJECT TITLE SHEET TITLE: EROSION AND SEDIMENT CONTROL PLAN	CONTRACT NO. C-XXXSED SCALE: SHEET NO. DATE: XXXX

DETAIL 1 - EARTH DIKE



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

STANDARD SYMBOL: A-2 B-3

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

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

CONSTRUCTION SPECIFICATIONS

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

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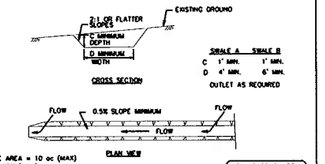
DETAIL 2 - TEMPORARY SWALE



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

STANDARD SYMBOL: A-3 B-3

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

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

CONSTRUCTION SPECIFICATIONS

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

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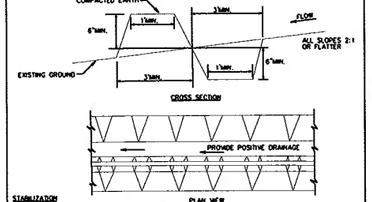
DETAIL 3 - PERIMETER DIKE / SWALE



STABILIZATION

PD/S-1 SEED AND MULCH (DRAINING ≤ 1 ACRE)
PD/S-2 SEED AND COVER WITH SOIL STABILIZATION MATTING OR LIME WITH SOD (DRAINING BETWEEN 1 AND 2 ACRES)

STANDARD SYMBOL: PD/S-1 PD/S-2

CONSTRUCTION SPECIFICATIONS

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

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

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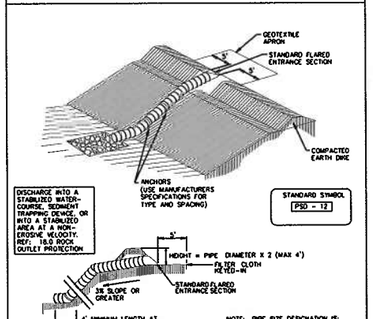
DETAIL 4 - PIPE SLOPE DRAIN



STANDARD SYMBOL: PSD - 12

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

TABLE 6 DESIGN CRITERIA FOR PIPE SLOPE DRAIN

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

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PIPE SLOPE DRAIN

CONSTRUCTION SPECIFICATIONS - PIPE SLOPE DRAIN

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

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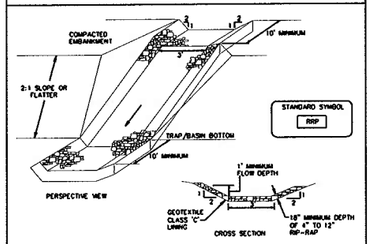
DETAIL 5 - RIP-RAP INFLOW PROTECTION



STANDARD SYMBOL: RRP

CONSTRUCTION SPECIFICATIONS

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

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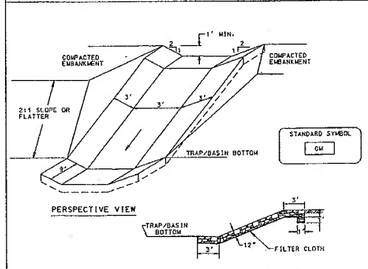
DETAIL 6 - GABION INFLOW PROTECTION



STANDARD SYMBOL: GM

Construction Specifications

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

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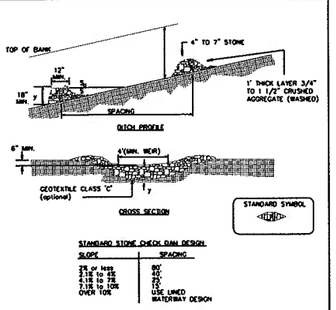
DETAIL 7 - STONE CHECK DAM



STANDARD SYMBOL: CD

STANDARD STONE CHECK DAM DESIGN

SLOPE	SPACING
2% or less	100'
3.1% to 5%	75'
5.1% to 7%	50'
7.1% to 10%	25'
OVER 10%	USE LINED WATERWAY DESIGN

CONSTRUCTION SPECIFICATIONS

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

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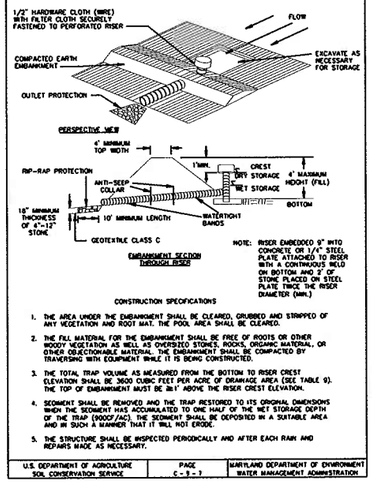
DETAIL 8 - PIPE OUTLET SEDIMENT TRAP - ST I



NOTE: RISER EMBEDDED 8" INTO CONCRETE OR 1/4" STEEL PLATE ATTACHED TO RISER WITH A CONTINUOUS WELD ON BOTTOM AND 3' OF STONE PLACED ON STEEL PLATE TWICE THE RISER DIAMETER (MIN.)

CONSTRUCTION SPECIFICATIONS

1. THE AREA UNDER THE EMBANKMENT SHALL BE CLEARED, GRUBBED AND STRIPPED OF ANY VEGETATION AND ROOT MAT. THE POOL AREA SHALL BE CLEARED.
2. THE FILL MATERIAL FOR THE EMBANKMENT SHALL BE FREE OF ROOTS OR OTHER WOODY VEGETATION AS WELL AS OVERSIZED STONES, ROCKS, ORGANIC MATERIAL, OR OTHER OBJECTIONABLE MATERIAL. THE EMBANKMENT SHALL BE COMPACTED BY TRAVERSING WITH EQUIPMENT WHILE IT IS BEING CONSTRUCTED.
3. THE TOTAL TRAP VOLUME AS MEASURED FROM THE BOTTOM TO RISER CREST ELEVATION SHALL BE 3600 CUBIC FEET PER ACRE OF DRAINAGE AREA (SEE TABLE 9). THE TOP OF EMBANKMENT MUST BE 2ft' ABOVE THE RISER CREST ELEVATION.
4. SEDIMENT SHALL BE REMOVED AND THE TRAP RESTORED TO ITS ORIGINAL DIMENSIONS WHEN THE SEDIMENT HAS ACCUMULATED TO ONE HALF OF THE WET STORAGE DEPTH OF THE TRAP (900CF/AC). THE SEDIMENT SHALL BE DEPOSITED IN A SUITABLE AREA AND IN SUCH A MANNER THAT IT WILL NOT ERODE.
5. THE STRUCTURE SHALL BE INSPECTED PERIODICALLY AND AFTER EACH RAIN AND REPAIRS MADE AS NECESSARY.

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PIPE OUTLET SEDIMENT TRAP - ST I

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

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

FOR EROSION AND SEDIMENT CONTROL ONLY.

CONSULTANTS

DESIGNED:
DRAWN BY:
CHECKED:
APPROVED:

SEAL

REVISION NO.	REVISION DATE	REVISION DESCRIPTION

BWI THURGOOD MARSHALL OR MARTIN STATE LOGO

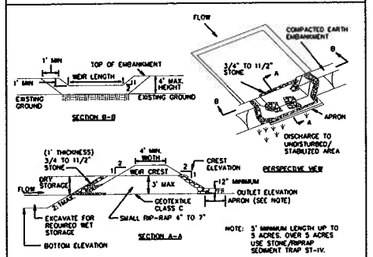
MARYLAND DEPARTMENT OF TRANSPORTATION
MARYLAND AVIATION ADMINISTRATION
OFFICE OF ENGINEERING AND CONSTRUCTION MANAGEMENT
BALTIMORE/WASHINGTON INTERNATIONAL THURGOOD MARSHALL AIRPORT OR MARTIN STATE AIRPORT

PROJECT TITLE: PROJECT TITLE

SHEET TITLE: EROSION AND SEDIMENT CONTROL DETAILS I

CONTRACT NO. C-XXXSED
SCALE:
SHEET NO.
DATE: XXXX

DETAIL 9 – STONE OUTLET SEDIMENT TRAP – ST II



CONSTRUCTION SPECIFICATIONS

1. AREA UNDER EMBANKMENT SHALL BE CLEARED, GRUBBED AND STRIPPED OF ANY VEGETATION AND ROOT MAT. THE POOL AREA SHALL BE CLEARED.
2. THE FILL MATERIAL FOR THE EMBANKMENT SHALL BE FREE OF ROOTS AND OTHER WOODY VEGETATION AS WELL AS OVER-SIZED STONES, ROCKS, ORGANIC MATERIAL OR OTHER OBJECTIONABLE MATERIAL. THE EMBANKMENT SHALL BE COMPACTED BY TRAVERSING WITH EQUIPMENT WHILE IT IS BEING CONSTRUCTED.
3. ALL CUT AND FILL SLOPES SHALL BE 2:1 OR FLATTER.
4. THE STONE USED IN THE OUTLET SHALL BE SMALL RIP-RAP 4" TO 7" IN SIZE WITH A 1' THICK LAYER OF 3/4" TO 11/2" WASHED AGGREGATE PLACED ON THE UPSTREAM FACE OF THE OUTLET STONE FACING SHALL BE AS NECESSARY TO PREVENT CLOGGING. GEOTEXTILE CLASS C MAY BE SUBSTITUTED FOR THE STONE FACING BY PLACING IT ON THE INSIDE FACE OF THE STONE OUTLET.
5. SEDIMENT SHALL BE REMOVED AND TRAP RESTORED TO ITS ORIGINAL DIMENSIONS WHEN THE SEDIMENT HAS ACCUMULATED TO ONE HALF OF THE WET STORAGE DEPTH OF THE TRAP. REMOVED SEDIMENT SHALL BE DEPOSITED IN A SUITABLE AREA AND IN SUCH A MANNER THAT IT WILL NOT ERODE.

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STONE OUTLET SEDIMENT TRAP – ST II

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

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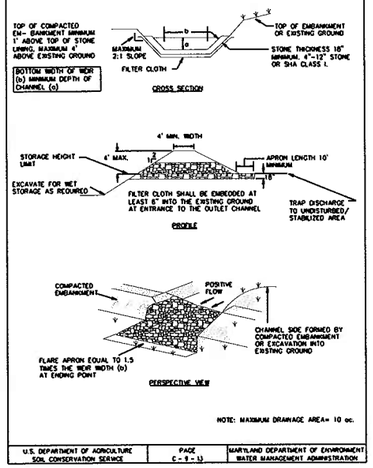
DETAIL 10 – RIP-RAP OUTLET SEDIMENT TRAP – ST III



NOTE: MAXIMUM DRAINAGE AREA= 10 ac.

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RIP-RAP OUTLET SEDIMENT TRAP – ST III

CONSTUCTION SPECIFICATIONS

1. THE AREA UNDER EMBANKMENT SHALL BE CLEARED, GRUBBED AND STRIPPED OF ANY VEGETATION AND ROOT MAT. THE POOL AREA SHALL BE CLEARED.
2. THE FILL MATERIAL FOR THE EMBANKMENT SHALL BE FREE OF ROOTS OR OTHER WOODY VEGETATION AS WELL AS OVER-SIZED STONES, ROCKS, ORGANIC MATERIAL OR OTHER OBJECTIONABLE MATERIAL. THE EMBANKMENT SHALL BE COMPACTED BY TRAVERSING WITH EQUIPMENT WHILE IT IS BEING CONSTRUCTED. MAXIMUM HEIGHT OF EMBANKMENT SHALL BE 4', MEASURED AT CENTERLINE OF EMBANKMENT.
3. ALL CUT AND FILL SLOPES SHALL BE 2:1 OR FLATTER.
4. ELEVATION OF THE TOP OF ANY DIKE DIRECTING WATER INTO TRAP MUST EQUAL OR EXCEED THE HEIGHT OF TRAP EMBANKMENT.
5. STORAGE AREA PROVIDED SHALL BE FIGURED BY COMPUTING THE VOLUME MEASURED FROM TOP OF EXCAVATION. (FOR STORAGE REQUIREMENTS SEE TABLE 10).
6. FILTER CLOTH SHALL BE PLACED OVER THE BOTTOM AND SIDES OF THE OUTLET CHANNEL PRIOR TO PLACEMENT OF STONE. SECTION OF FABRIC MUST OVERLAP AT LEAST 1' WITH SECTION NEAREST THE ENTRANCE PLACED ON TOP. FABRIC SHALL BE EMBEDDED AT LEAST 6" INTO EXISTING GROUND AT ENTRANCE OF OUTLET CHANNEL.
7. STONE USED IN THE OUTLET CHANNEL SHALL BE 4" – 7" PLACED 18" THICK.
8. OUTLET – AN OUTLET SHALL BE PROVIDED, WHICH INCLUDES A MEANS OF CONVEYING THE DISCHARGE IN AN EROSION FREE MANNER TO AN EXISTING STABLE CHANNEL. PROTECTION AGAINST SCOUR AT THE DISCHARGE END SHALL BE PROVIDED AS NECESSARY.
9. OUTLET CHANNEL MUST HAVE POSITIVE DRAINAGE FROM THE TRAP.
10. SEDIMENT SHALL BE REMOVED AND TRAP RESTORED TO ITS ORIGINAL DIMENSIONS WHEN THE SEDIMENT HAS ACCUMULATED TO 1/4 OF THE WET STORAGE DEPTH OF THE TRAP (330 CF/AC). REMOVED SEDIMENT SHALL BE DEPOSITED IN A SUITABLE AREA AND IN SUCH A MANNER THAT IT WILL NOT ERODE.
11. THE STRUCTURE SHALL BE INSPECTED PERIODICALLY AFTER EACH RAIN AND REPAIRED AS NEEDED.
12. CONSTRUCTION OF TRAPS SHALL BE CARRIED OUT IN SUCH A MANNER THAT SEDIMENT POLLUTION IS ABATED. ONCE CONSTRUCTED, THE TOP AND OUTSIDE FACE OF THE EMBANKMENT SHALL BE STABILIZED WITH SEED AND MULCH. POINTS OF CONCENTRATED INFLOW SHALL BE PROTECTED IN ACCORDANCE WITH GRADE STABILIZATION STRUCTURE CRITERIA. THE REMAINDER OF THE INTERIOR SLOPES SHOULD BE STABILIZED (ONE TIME) WITH SEED AND MULCH UPON TRAP COMPLETION AND MONITORED AND MAINTAINED EROSION FREE DURING THE LIFE OF THE TRAP.
13. THE STRUCTURE SHALL BE DEWATERED BY APPROVED METHODS, REMOVED AND THE AREA STABILIZED WHEN THE DRAINAGE AREA HAS BEEN PROPERLY STABILIZED.

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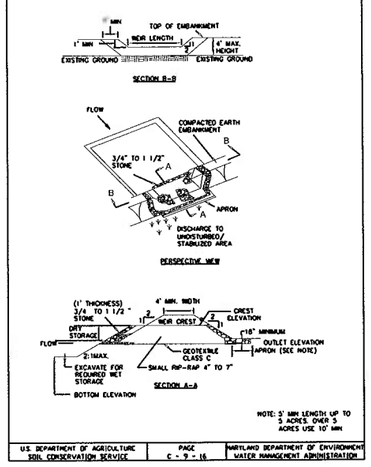
DETAIL 10A – STONE RIP-RAP OUTLET SEDIMENT TRAP – ST IV



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

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STONE RIP-RAP OUTLET SEDIMENT TRAP – ST IV

CONSTUCTION SPECIFICATIONS

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

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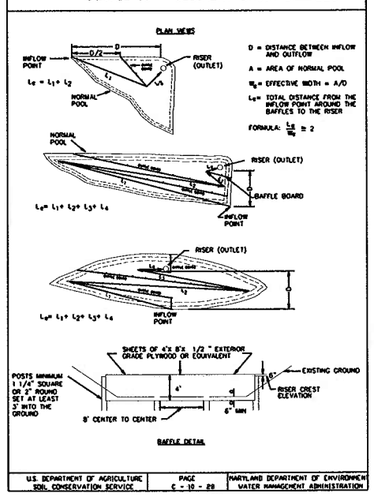
DETAIL 18 – SEDIMENT BASIN BAFFLES



D = DISTANCE BETWEEN INFLOW AND OUTFLOW

A = AREA OF NORMAL POOL

W_e = EFFECTIVE WIDTH = A/D

L_e = TOTAL DISTANCE FROM THE INFLOW POINT AROUND THE BAFFLES TO THE RISER

FORMULA: $\frac{L_e}{W_e} \geq 2$

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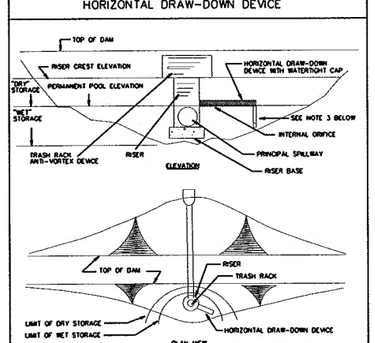
BASIN DRAWDOWN SCHEMATIC HORIZONTAL DRAW-DOWN DEVICE



CONSTRUCTION SPECIFICATIONS

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

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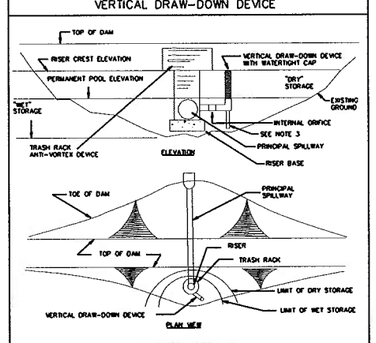
BASIN DRAWDOWN SCHEMATIC VERTICAL DRAW-DOWN DEVICE



CONSTRUCTION SPECIFICATIONS

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

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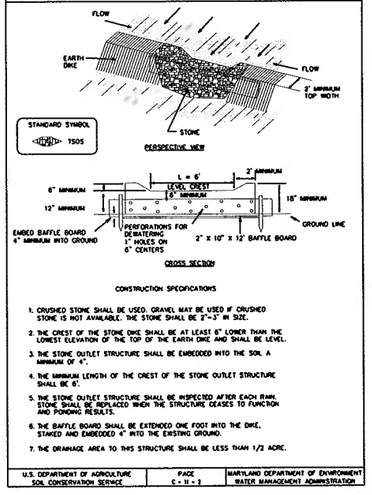
DETAIL 19 – STONE OUTLET STRUCTURE



CONSTRUCTION SPECIFICATIONS

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

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MDE NO. XX-SF-XXXX

NOTE TO CONTRACTOR:
SEDIMENT CONTROL WILL BE STRICTLY ENFORCED

FOR EROSION AND SEDIMENT CONTROL ONLY.

CONSULTANTS

DESIGNED:
DRAWN BY:
CHECKED:
APPROVED:

SEAL

REVISION NO.	REVISION DATE	REVISION DESCRIPTION

BWI THURGOOD MARSHALL OR MARTIN STATE LOGO

MARYLAND DEPARTMENT OF TRANSPORTATION
MARYLAND AVIATION ADMINISTRATION
OFFICE OF ENGINEERING AND CONSTRUCTION MANAGEMENT
BALTIMORE/WASHINGTON INTERNATIONAL THURGOOD MARSHALL AIRPORT
OR
MARTIN STATE AIRPORT

PROJECT TITLE:
PROJECT TITLE

SHEET TITLE:
EROSION AND SEDIMENT CONTROL DETAILS II

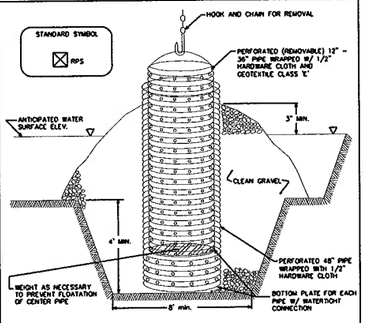
CONTRACT NO.
C-XXXSED

SCALE:

SHEET NO.

DATE:
XXXX

DETAIL 20A – REMOVABLE PUMPING STATION



ELEVATION (CUT AWAY)

CONSTRUCTION SPECIFICATIONS

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

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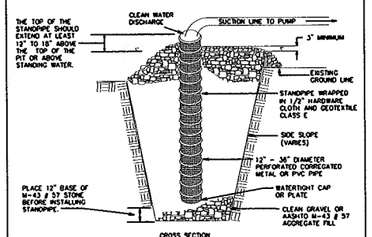
DETAIL 20B – SUMP PIT



CROSS SECTION

CONSTRUCTION SPECIFICATIONS

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

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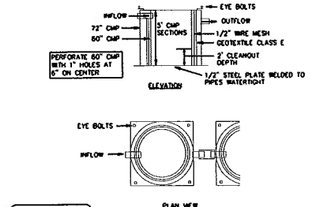
DETAIL 21 – PORTABLE SEDIMENT TANK



CONSTRUCTION SPECIFICATIONS

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

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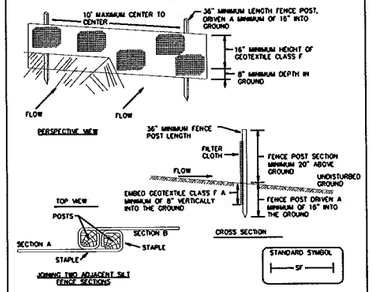
DETAIL 22 – SILT FENCE



CONSTRUCTION SPECIFICATIONS

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

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

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

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SILT FENCE

SILT FENCE DESIGN CRITERIA

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

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

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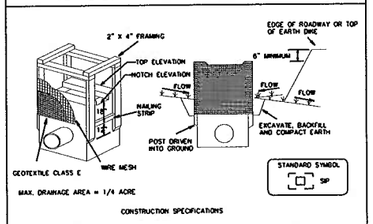
DETAIL 23A – STANDARD INLET PROTECTION



MAX. DRAINAGE AREA = 1/4 ACRE

CONSTRUCTION SPECIFICATIONS

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

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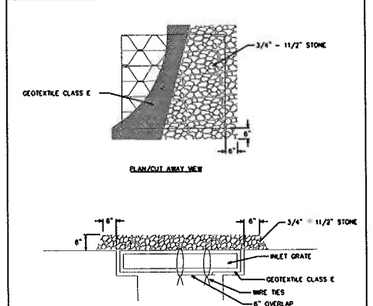
DETAIL 23B – AT GRADE INLET PROTECTION



MAX. DRAINAGE AREA = 1 ACRE

CONSTRUCTION SPECIFICATIONS

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

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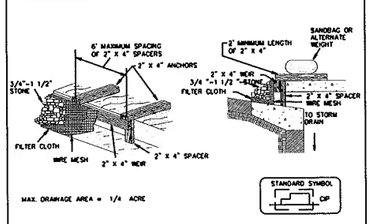
DETAIL 23C – CURB INLET PROTECTION (COG OR COS INLETS)



MAX. DRAINAGE AREA = 1/4 ACRE

CONSTRUCTION SPECIFICATIONS

1. ATTACH A CONTINUOUS PIECE OF WIRE MESH (30" MINIMUM WIDTH BY THROAT LENGTH PLUS 4') TO THE 2" X 4" WEIR (MEASURING THROAT LENGTH PLUS 2') AS SHOWN ON THE STANDARD DRAWING.
2. PLACE A CONTINUOUS PIECE OF GEOTEXTILE CLASS E THE SAME DIMENSIONS AS THE WIRE MESH OVER THE WIRE MESH AND SECURELY ATTACH IT TO THE 2" X 4" WEIR.
3. SECURELY NAIL THE 2" X 4" WEIR TO A 9" LONG VERTICAL SPACER TO BE LOCATED BETWEEN THE WEIR AND THE INLET FACE (MAX. 4' APART).
4. PLACE THE ASSEMBLY AGAINST THE INLET THROAT AND NAIL (MINIMUM 2' LENGTHS OF 2" X 4" TO THE TOP OF THE WEIR AT SPACER LOCATIONS). THESE 2" X 4" ANCHORS SHALL EXTEND ACROSS THE INLET TOP AND BE HELD IN PLACE BY SANDBAGS OR ALTERNATE WEIGHT.
5. THE ASSEMBLY SHALL BE PLACED SO THAT THE END SPACERS ARE A MINIMUM 1' BEYOND BOTH ENDS OF THE THROAT OPENING.
6. FORM THE 1/2" X 1/2" WIRE MESH AND THE GEOTEXTILE FABRIC TO THE CONCRETE GUTTER AND AGAINST THE FACE OF THE CURB ON BOTH SIDES OF THE INLET. PLACE CLEAN 3/4" X 1 1/2" STONE OVER THE WIRE MESH AND GEOTEXTILE IN SUCH A MANNER TO PREVENT WATER FROM ENTERING THE INLET UNDER OR AROUND THE GEOTEXTILE.
7. THIS TYPE OF PROTECTION MUST BE INSPECTED FREQUENTLY AND THE FILTER CLOTH AND STONE REPLACED WHEN CLOGGED WITH SEDIMENT.
8. ASSURE THAT STORM FLOW DOES NOT BYPASS THE INLET BY INSTALLING TEMPORARY EARTH OR ASPHALT DIKE TO DIRECT THE FLOW TO THE INLET.

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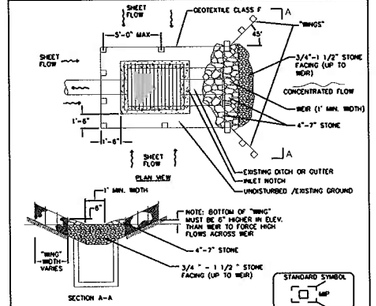
DETAIL 23D – MEDIAN INLET PROTECTION



CONSTRUCTION SPECIFICATIONS

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

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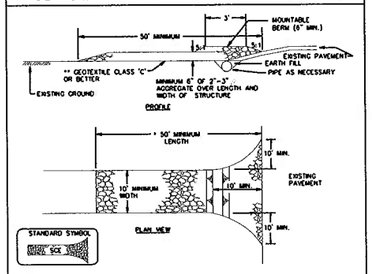
DETAIL 24 – STABILIZED CONSTRUCTION ENTRANCE



CONSTRUCTION SPECIFICATION

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

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

FOR EROSION AND SEDIMENT CONTROL ONLY.

CONSULTANTS

DESIGNED:	
DRAWN BY:	
CHECKED:	
APPROVED:	

SEAL

REVISION NO.	REVISION DATE	REVISION DESCRIPTION

BWI THURGOOD MARSHALL OR MARTIN STATE LOGO

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MARYLAND AVIATION ADMINISTRATION
OFFICE OF ENGINEERING AND CONSTRUCTION MANAGEMENT
BALTIMORE/WASHINGTON INTERNATIONAL THURGOOD MARSHALL AIRPORT OR MARTIN STATE AIRPORT

PROJECT TITLE: PROJECT TITLE

SHEET TITLE: EROSION AND SEDIMENT CONTROL DETAILS III

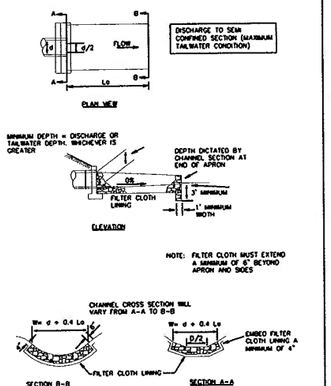
CONTRACT NO. C-XXXSED

SCALE:

SHEET NO.

DATE: XXXX

DETAIL 25 – ROCK OUTLET PROTECTION I



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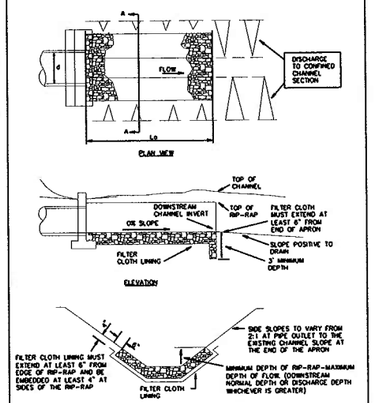
DETAIL 26 – ROCK OUTLET PROTECTION II



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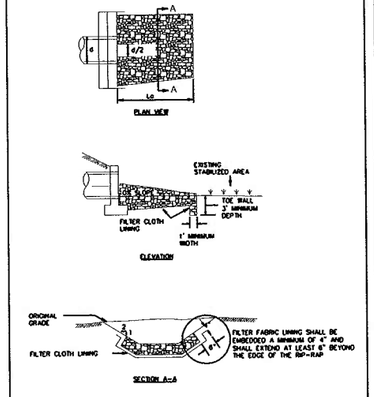
DETAIL 27 – ROCK OUTLET PROTECTION III



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ROCK OUTLET PROTECTION

CONSTRUCTION SPECIFICATIONS

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

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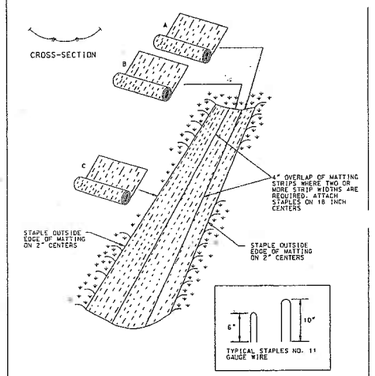
DETAIL 30 EROSION CONTROL MATTING



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EROSION CONTROL MATTING

CONSTRUCTION SPECIFICATIONS

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

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

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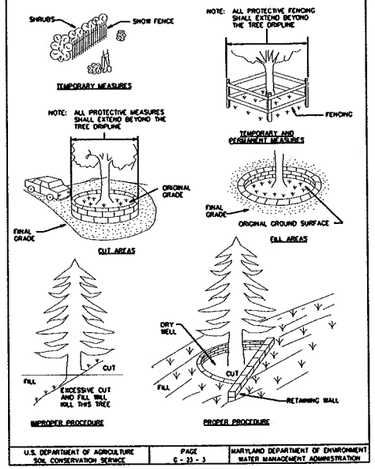
DETAIL 31 – TREE PROTECTION



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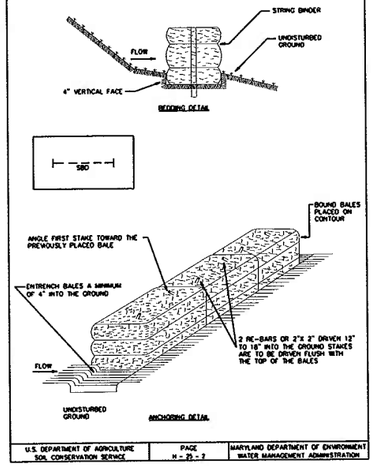
DETAIL 32 – STRAW BALE DIKE



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STRAW BALE DIKE

CONSTRUCTION SPECIFICATIONS

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

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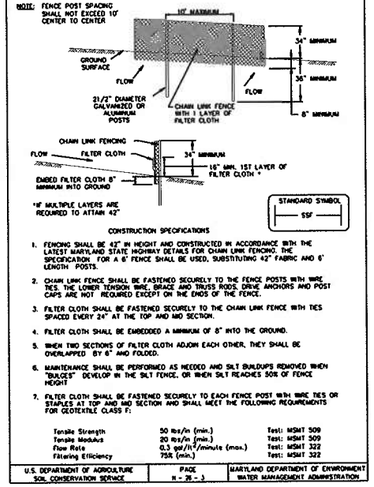
DETAIL 33 – SUPER SILT FENCE



CONSTRUCTION SPECIFICATIONS

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

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

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

FOR EROSION AND SEDIMENT CONTROL ONLY.

CONSULTANTS

DESIGNED:
DRAWN BY:
CHECKED:
APPROVED:

SEAL

REVISION NO.	REVISION DATE	REVISION DESCRIPTION

BWI THURGOOD MARSHALL OR MARTIN STATE LOGO

MARYLAND DEPARTMENT OF TRANSPORTATION
MARYLAND AVIATION ADMINISTRATION
OFFICE OF ENGINEERING AND CONSTRUCTION MANAGEMENT
BALTIMORE/WASHINGTON INTERNATIONAL THURGOOD MARSHALL AIRPORT OR MARTIN STATE AIRPORT

PROJECT TITLE: PROJECT TITLE

SHEET TITLE: EROSION AND SEDIMENT CONTROL DETAILS IV

CONTRACT NO. C-XXXSED
SCALE:
SHEET NO.
DATE: XXXX

SUPER SILT FENCE

DESIGN CRITERIA

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

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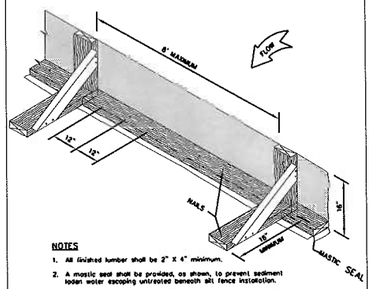
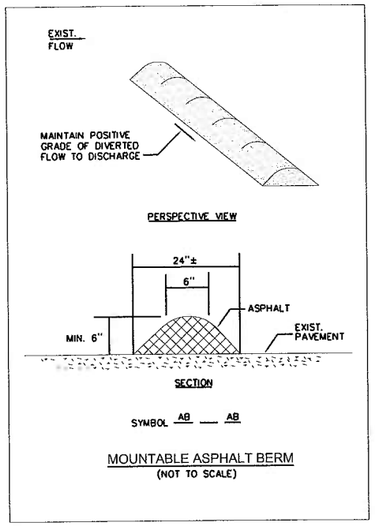


NOTES

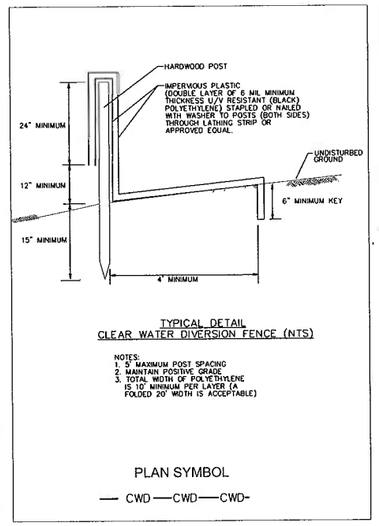
1. All finished lumber shall be 2" X 4" minimum.
2. A mastic seal shall be provided, as shown, to prevent sediment laden water escaping untreated beneath silt fence installation.
3. Silt fence fabric shall be taut and securely stapled to face of upright supports.
4. Nails used to secure boards to pavement shall be 20d X 4" minimum length.
5. Application design and materials criteria shall be as stated in the Maryland Standards and Specifications for Soil Erosion and Sediment Control.
6. Use SF/AP to designate on sediment control plan.

SILT FENCE INSTALLATION
ON ASPHALT PAVEMENT
(NOT TO SCALE)



SYMBOL AB ___ AB

MOUNTABLE ASPHALT BERM
(NOT TO SCALE)

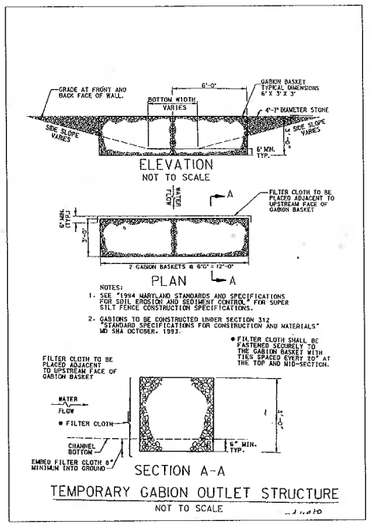


TYPICAL DETAIL
CLEAR WATER DIVERSION FENCE (NTS)

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

PLAN SYMBOL

— CWD —CWD—CWD-



TEMPORARY GABION OUTLET STRUCTURE
NOT TO SCALE

MDE NO. XX-SF-XXXX
NOTE TO CONTRACTOR:
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FOR EROSION AND SEDIMENT CONTROL ONLY.

	CONSULTANTS	DESIGNED:	SEAL	REVISION NO.	REVISION DATE	REVISION DESCRIPTION
		DRAWN BY:				
		CHECKED:				
		APPROVED:				

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OFFICE OF ENGINEERING AND CONSTRUCTION MANAGEMENT
BALTIMORE/WASHINGTON INTERNATIONAL THURGOOD MARSHALL AIRPORT OR MARTIN STATE AIRPORT

PROJECT TITLE: PROJECT TITLE

SHEET TITLE: EROSION AND SEDIMENT CONTROL DETAILS V

CONTRACT NO. C-XXXSED

SCALE:

SHEET NO.

DATE: XXXX

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

[1] 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.

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 (Cordous 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* NOT LESS THAN %	MINIMUM % GERMINATION	PURE LIVE SEED FACTOR
CERTIFIED TURF-TYPE TALL FESCUE (Festuca arundinacea)	98	90	1.13
CERTIFIED KENTUCKY BLUE GRASS (Poa pratensis)	90	80	1.39
HARD FESCUE (Festuca longifolia)	98	90	1.13
CHEWING RED FESCUE (Festuca rubra commutata)	98	90	1.13
ANNUAL RYEGRASS (Lolium multiflorum)	95	85	1.24
PERENNIAL RYEGRASS (Lolium perenne)	90	80	1.37
FOWL MEADOW GRASS (Poa palustris)	90	80	1.39
LITTLE BLUESTEM (Andropogon scoparius)	62	94	1.71

* THE PERCENTAGE WEIGHT OF PURE SEED PRESENT SHALL BE FREE OF ANY AGRICULTURE SEEDS, INERT MATTER, AND OTHER SEEDS DISTINGUISHABLE BY THEIR PERCENTAGE.
THE PERCENTAGE OF GERMINATION SHALL BE ACTUAL SPROUTS AND SHALL NOT INCLUDE HARD SEEDS UNLESS SPECIFICALLY PERMITTED BY THE MAA ENGINEER.

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

name and address of laboratory,
date of test,
lot number,
the results of tests as to name, percentages of purity and of germination,
percentage of weed content for the seed furnished,
and, in the case of a mixture, the proportions of each kind of seed.

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

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

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

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

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

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

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

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

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

Seed		Rate of Application (lbs of PLS/acre)
60%	Fowl Meadow Grass	83
30%	Chewings Fescue	34
0%	Perennial Ryegrass	14
Supplemental Seed		
	Redtop	3

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

SEEDING SEASONS

PERMANENT COOL-SEASON GRASSES	MARCH 1 TO APRIL 20 AND AUGUST 1 TO OCTOBER 20, INCLUSIVE.
TEMPORARY COVER OF ANNUAL RYE/REDTOP	MARCH 1 TO APRIL 30 AND AUGUST 1 TO NOVEMBER 30, INCLUSIVE.
TEMPORARY COVER OF WARM-SEASON GRASSES (LITTLE BLUESTEM ONLY)	MAY 1 TO JULY 31, INCLUSIVE. RATE OF APPLICATION SHOULD BE 13.6 LBS. PLS PER ACRE.

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

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

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

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

The fertilizers may be supplied in the following forms:

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

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

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

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

CONSTRUCTION METHODS AND EQUIPMENT

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

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

If an area to be seeded is sparsely sodded, weedy, barren and unworked, or packed and hard, all grass and weeds shall first be cut or otherwise satisfactorily disposed of, and the soil then scarified or otherwise loosened to a depth not less than 5 inches (125 mm). Clods shall be broken and the top 3 inches (75 mm) of soil shall be worked into a satisfactory condition by discing or by use of cultipackers, rakes, 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 topsoil shall be loose to a depth of 1 inch.

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

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

903-3.3.1 DRY APPLICATION METHOD

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

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

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

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

903-3.3.2 WET APPLICATION METHOD/HYDROSEEDING

A. GENERAL. THE CONTRACTOR MAY ELECT TO APPLY SEED AND FERTILIZER AS PER PARAGRAPHS C AND D OF THIS SECTION IN THE FORM OF AN AQUEOUS MIXTURE BY SPRAYING OVER THE PREVIOUSLY PREPARED SEEDBED USING METHODS AND EQUIPMENT APPROVED BY MAA. THE RATES OF APPLICATION SHALL BE AS SPECIFIED IN PARAGRAPHS 903-2.1 THROUGH 903-2.3.

B. SPRAYING EQUIPMENT. THE SPRAYING EQUIPMENT SHALL HAVE A CONTAINER OR WATER TANK EQUIPPED WITH A LIQUID LEVEL GAUGE CAPABLE OF READING INCREMENTS OF 50 GALLONS OR LESS OVER THE ENTIRE RANGE OF THE TANK CAPACITY. THE LIQUID LEVEL GAUGE SHALL BE MOUNTED SO AS TO BE VISIBLE TO THE NOZZLE OPERATOR AT ALL TIMES. THE CONTAINER OR TANK SHALL ALSO BE EQUIPPED WITH A MECHANICAL POWER-DRIVEN AGITATOR CAPABLE OF KEEPING ALL THE SOLIDS IN THE MIXTURE IN COMPLETE SUSPENSION AT ALL TIMES UNTIL USED.

THE SPRAYING EQUIPMENT SHALL ALSO INCLUDE A PRESSURE PUMP CAPABLE OF DELIVERING 100 GALLONS PER MINUTE AT A PRESSURE OF 100 POUNDS PER SQUARE INCH. THE PRESSURE PUMP ASSEMBLAGE SHALL BE CONFIGURED TO ALLOW THE MIXTURE TO FLOW THROUGH THE TANK WHEN NOT BEING SPRAYED FROM THE NOZZLE. ALL PUMP PASSAGES AND PIPELINES SHALL BE CAPABLE OF PROVIDING CLEARANCE FOR 5/8-INCH SOLIDS. THE POWER UNIT FOR THE PUMP AND AGITATOR SHALL HAVE CONTROLS MOUNTED SO AS TO BE ACCESSIBLE TO THE NOZZLE OPERATOR. A PRESSURE GAUGE SHALL BE CONNECTED TO AND MOUNTED IMMEDIATELY BEHIND THE NOZZLE.

THE NOZZLE PIPE SHALL BE MOUNTED ON AN ELEVATED SUPPORTING STAND IN SUCH A MANNER THAT IT CAN BE ROTATED THROUGH 360 DEGREES HORIZONTALLY AND INCLINED VERTICALLY FROM AT LEAST 20 DEGREES BELOW TO AT LEAST 60 DEGREES ABOVE THE HORIZONTAL. THERE SHALL BE A QUICK-ACTING, THREE-WAY CONTROL VALVE CONNECTING THE RECIRCULATING LINE TO THE NOZZLE PIPE AND MOUNTED SO THAT THE NOZZLE OPERATOR CAN CONTROL AND REGULATE THE AMOUNT OF FLOW OF MIXTURE TO BE SUPPLIED SO THAT MIXTURES MAY BE PROPERLY SPRAYED OVER A DISTANCE VARYING FROM 20 FEET TO 100 FEET. ONE SHALL BE A CLOSE-RANGE RIBBON NOZZLE, ONE A MEDIUM-RANGE RIBBON NOZZLE, AND ONE A LONG-RANGE JET NOZZLE. FOR EASE OF REMOVAL AND CLEANING, ALL NOZZLES SHALL BE CONNECTED TO THE NOZZLE PIPE BY MEANS OF QUICK-RELEASE COUPLINGS. IN ORDER TO REACH AREAS INACCESSIBLE TO THE REGULAR EQUIPMENT, AN EXTENSION HOSE AT LEAST 50 FEET IN LENGTH SHALL BE PROVIDED TO WHICH THE NOZZLES MAY BE CONNECTED.

C. MIXTURES. LIME SHALL BE APPLIED SEPARATELY IN THE QUANTITY SPECIFIED, PRIOR TO THE FERTILIZING AND SEEDING OPERATIONS. LIME SHOULD BE ADDED TO AND MIXED WITH WATER AT A CONCENTRATION NOT TO EXCEED 220 POUNDS OF LIME FOR EVERY 100 GALLONS OF WATER. AFTER LIME HAS BEEN APPLIED, THE TANK SHOULD BE EMPTIED AND RINSED WITH FRESH WATER. SEED AND FERTILIZER SHALL BE MIXED TOGETHER IN THE RELATIVE PROPORTIONS SPECIFIED, BUT THE RESULTING CONCENTRATION SHOULD NOT EXCEED 220 POUNDS OF MIXTURE PER 100 GALLONS OF WATER AND SHOULD BE APPLIED WITHIN 30 MINUTES TO PREVENT FERTILIZER BURN OF THE SEEDS.

ALL WATER USED SHALL BE OBTAINED FROM FRESH WATER SOURCES AND SHALL BE FREE FROM INJURIOUS CHEMICALS AND OTHER TOXIC SUBSTANCES HARMFUL TO PLANT LIFE. BRACKISH WATER SHALL NOT BE USED AT ANY TIME. THE CONTRACTOR SHALL IDENTIFY ALL SOURCES OF WATER TO THE MAA ENGINEER AT LEAST TWO WEEKS PRIOR TO USE. THE ENGINEER MAY TAKE SAMPLES OF THE WATER AT THE SOURCE OR FROM THE TANK AT ANY TIME AND HAVE A LABORATORY TEST THE SAMPLES FOR CHEMICAL AND SALINE CONTENT. THE CONTRACTOR SHALL NOT USE ANY WATER FROM ANY SOURCE THAT IS DISAPPROVED BY THE ENGINEER FOLLOWING SUCH TESTS.

ALL MIXTURES SHALL BE CONSTANTLY AGITATED FROM THE TIME THEY ARE MIXED UNTIL THEY ARE FINALLY APPLIED TO THE SEEDBED. ALL SUCH MIXTURES SHALL BE USED WITHIN 30 MINUTES FROM THE TIME THEY WERE MIXED OR THEY SHALL BE WASTED AND DISPOSED OF AT A LOCATION ACCEPTABLE TO THE ENGINEER.

D. SPRAYING. LIME SHALL BE SPRAYED UPON PREVIOUSLY PREPARED SEEDBEDS ON WHICH THE LIME, IF REQUIRED, SHALL HAVE BEEN WORKED IN ALREADY. THE MIXTURES SHALL BE APPLIED USING A HIGH-PRESSURE SPRAY WHICH SHALL ALWAYS BE DIRECTED UPWARD INTO THE AIR SO THAT THE MIXTURES WILL FALL TO THE GROUND IN A UNIFORM SPRAY. NOZZLES OR SPRAYS SHALL NEVER BE DIRECTED TOWARD THE GROUND IN SUCH A MANNER THAT MIGHT PRODUCE EROSION OR RUNOFF. PARTICULAR CARE SHALL BE EXERCISED TO ENSURE THAT THE APPLICATION IS MADE UNIFORMLY, AT THE PRESCRIBED RATE, AND TO GUARD AGAINST MISSES AND OVERLAPPED AREAS. PREDETERMINED QUANTITIES OF THE MIXTURE SHALL BE USED IN ACCORDANCE WITH SPECIFICATIONS TO COVER SPECIFIED SECTIONS OF KNOWN AREAS. TO CHECKS THE RATE AND UNIFORMITY OF APPLICATION, THE APPLICATOR WILL OBSERVE THE DEGREE OF WETTING OF THE GROUND OR DISTRIBUTE TEST SHEETS OF PAPER OR PANS OVER THE AREA AT INTERVALS AND OBSERVE THE QUANTITY OF MATERIAL DEPOSITED THEREON.

ON SURFACES THAT ARE TO BE MULCHED AS INDICATED BY THE PLANS OR DESIGNATED BY THE MAA ENGINEER, SEED AND FERTILIZER APPLIED BY THE SPRAY METHOD NEED NOT BE RAKED INTO THE SOIL OR ROLLED. HOWEVER, ON SURFACES ON WHICH MULCH IS NOT TO BE USED, THE RAKING AND ROLLING OPERATIONS WILL BE REQUIRED AFTER THE SOIL HAS DRIED.

903-3.4 MAINTENANCE OF SEEDED AREAS. THE CONTRACTOR SHALL PROTECT SEEDED AREAS AGAINST TRAFFIC OR OTHER USE BY WARNING SIGNS OR BARRICADES, AS APPROVED BY THE ENGINEER. SURFACES GULLIED OR OTHERWISE DAMAGED FOLLOWING SEEDING SHALL BE REPAIRED BY REGRADING AND RESEEDING AS DIRECTED. THE CONTRACTOR SHALL MOW, WATER AS DIRECTED, AND OTHERWISE MAINTAIN SEEDED AREAS IN A SATISFACTORY CONDITION UNTIL FINAL INSPECTION AND ACCEPTANCE OF THE WORK.

WHEN EITHER THE DRY OR WET APPLICATION METHOD OUTLINED ABOVE IS USED FOR WORK PERFORMED OUT OF SEASON, THE CONTRACTOR WILL BE REQUIRED TO ESTABLISH A GOOD STAND OF GRASS OF UNIFORM COLOR AND DENSITY TO THE SATISFACTION OF THE ENGINEER. IF AT THE TIME WHEN THE CONTRACT HAS BEEN OTHERWISE COMPLETED IT IS NOT POSSIBLE TO MAKE AN ADEQUATE DETERMINATION OF THE COLOR, DENSITY, AND UNIFORMITY OF SUCH STAND OF GRASS, PAYMENT FOR THE UNACCEPTED PORTIONS OF THE AREAS SEEDED OUT OF SEASON WILL BE WITHHELD UNTIL SUCH TIME AS THESE REQUIREMENTS HAVE BEEN MET.

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

FOR EROSION AND SEDIMENT CONTROL ONLY.

	CONSULTANTS	DESIGNED:	SEAL	REVISION NO.	REVISION DATE	REVISION DESCRIPTION	BWI THURGOOD MARSHALL OR MARTIN STATE LOGO	MARYLAND DEPARTMENT OF TRANSPORTATION MARYLAND AVIATION ADMINISTRATION OFFICE OF ENGINEERING AND CONSTRUCTION MANAGEMENT BALTIMORE/WASHINGTON INTERNATIONAL THURGOOD MARSHALL AIRPORT OR MARTIN STATE AIRPORT	PROJECT TITLE: PROJECT TITLE SHEET TITLE: VEGETATIVE STABILIZATION NOTES	CONTRACT NO. C-XXXSED SCALE: SHEET NO. DATE: XXXX
		DRAWN BY:								
		CHECKED:								
		APPROVED:								

APPENDIX E

STANDARD SPECIFICATIONS

MARTIN STATE AIRPORT

BWI BALTIMORE/WASHINGTON INTERNATIONAL Thurgood Marshall AIRPORT

ITEM 900 LANDSCAPING

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

ITEM 901 TOPSOIL

DESCRIPTION

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

MATERIALS

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

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

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

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

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

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

CONSTRUCTION METHODS

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

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

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

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

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

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

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

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

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

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

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

METHOD OF MEASUREMENT

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

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

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

BASIS OF PAYMENT

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

Payment will be made under:

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

END OF ITEM 901

ITEM 902 PLANT INSTALLATION

DESCRIPTION

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

MATERIALS

902-2.1 PLANTS.

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

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

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

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

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

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

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

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

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

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

CONSTRUCTION METHODS

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

METHOD OF MEASUREMENT

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

BASIS OF PAYMENT

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

Payment will be made under Item 902-5 Planting.

END OF ITEM 902

ITEM 903 SEEDING

DESCRIPTION

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

MATERIALS

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

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

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

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

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

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

APPROVED PLANT SPECIES
MAA SEED MIXTURES

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

The fertilizers may be supplied in the following forms:

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

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

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

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

CONSTRUCTION METHODS AND EQUIPMENT

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

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

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

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

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

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

903-3.3.1 DRY APPLICATION METHOD

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

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

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

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

903-3.3.2 WET APPLICATION METHOD/HYDROSEEDING

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

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

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

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

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

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

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

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

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

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

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

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

METHOD OF MEASUREMENT

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

BASIS OF PAYMENT

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

Payment will be made under:

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

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

END OF ITEM 903

ITEM 904 SODDING

DESCRIPTION

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

MATERIALS

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

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

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

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

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

CONSTRUCTION REQUIREMENTS

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

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

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

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

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

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

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

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

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

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

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

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

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

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

904-3.7 ESTABLISHING TURF.

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

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

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

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

METHOD OF MEASUREMENT

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

BASIS OF PAYMENT

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

Payment will be made under:

Item 904-5.1 Sodding—per square yard.
Item 904-5.2 Amendments – per square yard
Item 904-5.3 Fertilizer – per square yard

END OF ITEM 904

ITEM 905 MULCHING

DESCRIPTION

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

MATERIALS

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

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

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

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

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

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

*Technical Association of Pulp and Paper Industry

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

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

CONSTRUCTION REQUIREMENTS

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

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

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

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

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

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

METHOD OF MEASUREMENT

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

BASIS OF PAYMENT

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

Payment will be made under:

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

END OF ITEM 905

APPENDIX A

APPROVED SPECIES LIST

Perennials, Ground Covers, Annuals & Bulbs

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

Perennials, Ground Covers, Annuals & Bulbs

Scientific name	**Common name**
Verbena canadensis	Rose Verbena
Veronica spp.	Speedwell
Vinca minor	Periwinkle
Yucca filamentosa	Adam's-needle Yucca

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

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

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

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

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

Scientific name	**Common name**
Abelia "Edward Goucher"	Edward Goucher Abelia
Abelia x grandiflora	Glossy Abelia
Acer campestre	Hedge Maple
Berberis x mentorensis	Mentor Barberry
Buddleia davidii	Butterfly Bush
Calluna vulgaris	Common Heather
Clethra alnifolia	Sweet Pepperbush
Cotoneaster dammeri	Bearberry Cotoneaster
Deutzia gracilis	Slender Deutzia
Euonymus americanus	Strawberry Bush
Euonymus kiautschovicus	Spreading Euonymus
Forsythia x intermedia	Border Forsythia
Forsythia suspensa	Weeping Forsythia
Forsythia viridissima	Greenstem Forsythia
Hamamelis vernalis	Vernal Witchhazel
Hamamelis virginiana	Common Witchhazel
Hydrangea arborescens	Smooth Hydrangea
Hydrangea quercifolia	Oakleaf Hydrangea
Hypericum patulum	Goldencup St. Johnswort
Hypericum frondosum	Golden St. Johnswort
Ilex spp.	Holly species (male cultivars only)
Ilex x attenuata "Fosteri"	Foster's Holly (male cultivars only)
Ilex crenata	Japanese Holly (male cultivars such as 'Glass', 'Green Dragon', 'Green Island', 'Helleri', 'Howard', 'Northern Beauty' and 'Sentinel' only)
Ilex x "Edward J Stevens"	Edward Stevens Holly
Ilex glabra	Inkberry (male cultivars such as 'Chamzin' and 'Shamrock' only)
Ilex x meserveae	Meserve Hybrid Hollies (male cultivars such as 'Blue Boy', 'Blue Prince', 'Blue Stallion', and 'China Boy' only)
Ilex opaca	American Holly (male cultivars such as 'Jersey Knight' only)
Itea virginica	Virginia Sweetspire
Jasminum nudiflorum	Winter Jasmine
Juniperis conferta	Shore Juniper
Juniperis chinensis	Chinese Juniper (male cultivars such as 'Globosa' and 'Pfitzeriana Glauca' only)
Juniperis horizontalis	Creeping Juniper (male cultivars such as 'Fountain', 'Glomerata', 'Jade River', 'Jade Spreader', 'Plumosa' and 'Plumosa Compacta Youngstown' only)
Juniperis procumbens	Japgarden Juniper (male cultivars only)
Juniperis sabina	Savin Juniper (male cultivars only)
Juniperis scopulorum	Rocky Mountain Juniper (male cultivars such as 'Gray Gleam', 'Medora', and 'Silver King' only)
Kalmia latafolia	Mountain Laurel
Lavandula angustifolia	Common Lavender
Leucothoe axillaris	Fetterbush
Ligustrum japanicum	Japanese Privet
Lindera benzoin	Spicebush (use male cultivars such as 'Green Gold' and 'Rubra' only)

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

Scientific name	**Common name**
Magnolia virginiana	Sweetbay Magnolia
Microbiota decussata	Russian Arborvitae
Mynca pennsylvanica	Northern Bayberry (male cultivars such as 'Myriman' only)
Nandina domestica	Heavenly Bamboo (non-fruiting cultivars such as 'Atropurpurea Nana' only)
Osmanthus heterophyllus	False-holly
Photinia x fraseri	Fraser Photinia
Prunus laurocerasus	Common Cherrylaurel (only cultivars with non-showy fruit such as 'Schipkaensis' only)
Pyracantha koidzumii	Formosa Firethorn
Rhododendron arborescens	Sweet Azalea
Sarcococca hookeriana	Sweetbox
Spiraea spp.	Meadowsweet
Spiraea nipponica 'Snowmound'	Snowmound Spiraea
Syringa vulgaris	Common Lilac
Taxus baccata	English Yew (male cultivars only)
Taxus x media	Anglojap Yew (male cultivars such as 'Amherst', 'Brownii', 'Hatfieldii' and 'Sebian' only)
Viburnum x burkwoodii	Burkwood Viburnum
Viburnum plicatum var. tomentosum	Doublefile Viburnum (use non-fruiting cultivars such as 'Roseum' only)
Viburnum rhytidophyllum	Leatherleaf Viburnum
Weigela florida	Old-fashioned Wegelia

Grasses (Ornamental, Turf, Erosion Control)

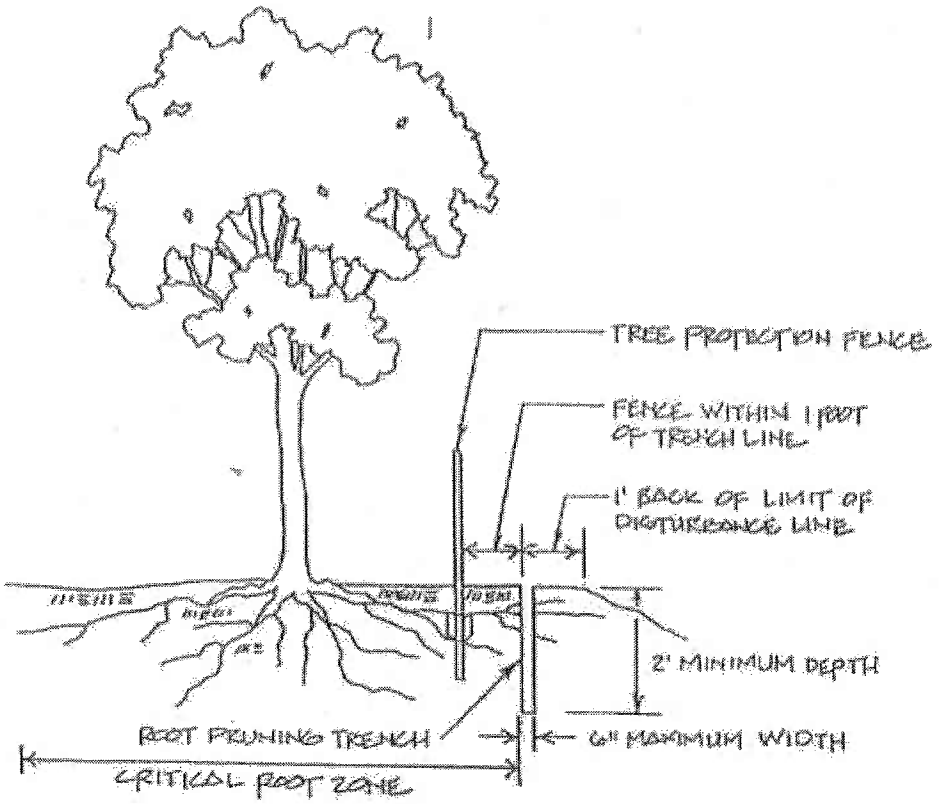
Scientific name	**Common name**
Andropogon scoparius	Little Bluestem
Calamagrostis x acutiflora	Feather Reed Grass
Calamagrostis arundinacea 'Karl Foerster'	Foerster's Feather Reed Grass
Calamagrostis stricta	Slimstem Reed Grass
Festuca arundinacea	Certified turf-type Tall Fescue
Festuca longifolia	Hard Fescue
Festuca rubra var. commutata	Chewings Fescue
Lolium multiflorum	Annual Ryegrass
Lolium perenne	Perennial Ryegrass
Miscanthus sinensis var. gracillimus	Maiden Grass
Panicum virgatum	Switch-grass
Pennisetum alopecuroides	Fountain Grass
Pennisetum alopecuroides 'Hameln'	'Hameln' Fountain Grass
Pennisetum alopecuroides 'Little Bunny'	'Little Bunny' Fountain Grass
Pennisetum villosum	Feathertop
Poa pratensis	Kentucky Bluegrass

APPENDIX B

APPROVED INSTALLATION METHODS

Figure J - 1

Root Pruning

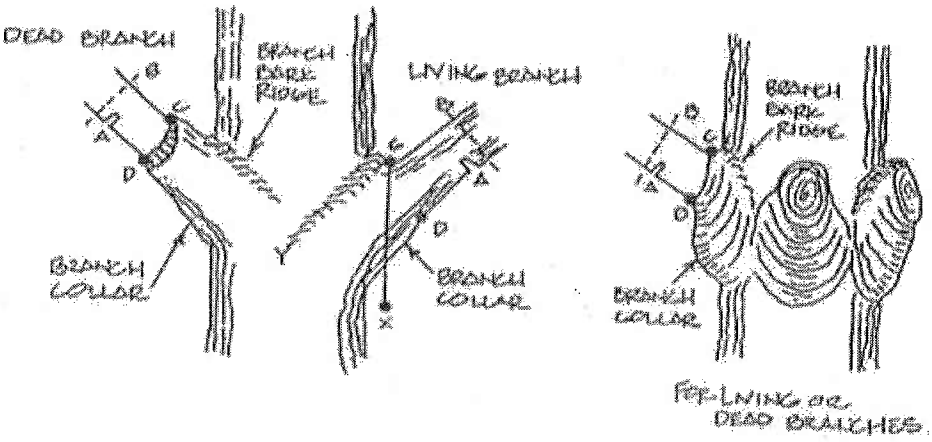


Notes:
1. Retention Areas will be set as part of the review process
2. Boundaries of Retention Areas should be staked flagged prior to trenching
3. Exact location of trench should be identified
4. Trench should be immediately backfilled with soil removed or other high organic soil
5. Roots should be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

Source: City of Gaithersburg, Maryland; City Tree Manual

Figure J-2

Crown Reduction

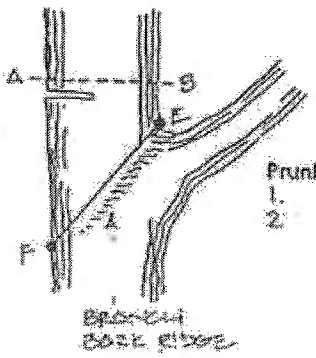


HARDWOODS

CONIFERS

Pruning a Branch

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



Pruning a Leader or To Reduce Size

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

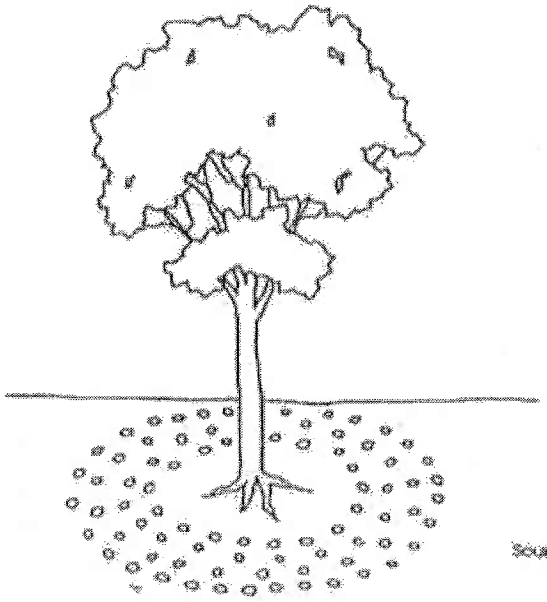
Source: Fairfax County, Virginia
Vegetation Preservation & Planting

Notes:

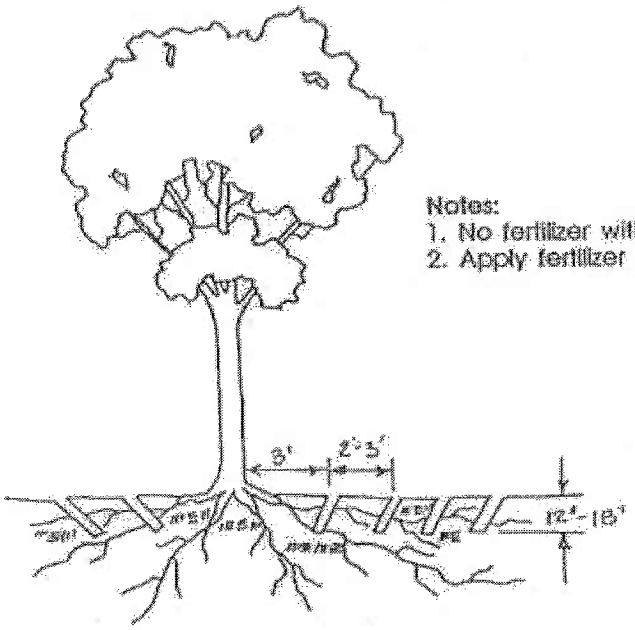
1. Only prune at specified times
2. No more than 30% of crown to be removed at one time.

Figure J-3

Application of Fertilizers by Injection



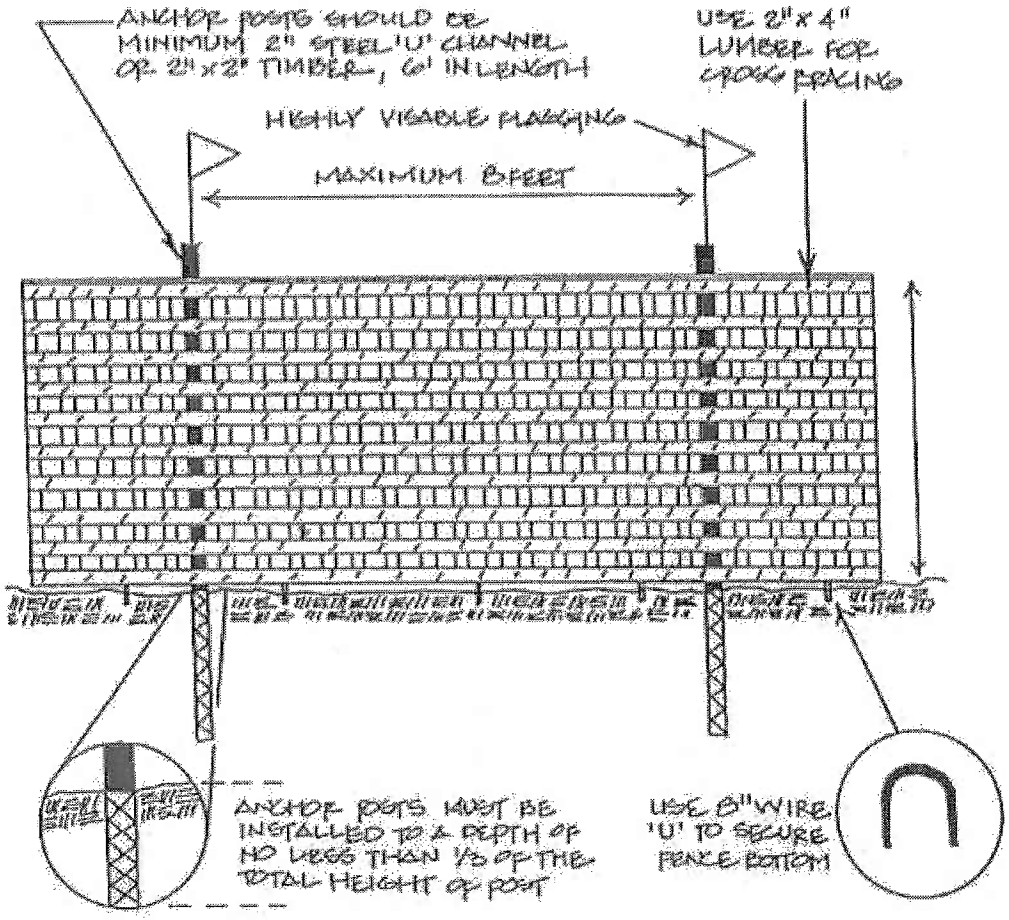
Source: Pirone, 1978



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

Figure J-4

Blaze Orange Plastic Mesh

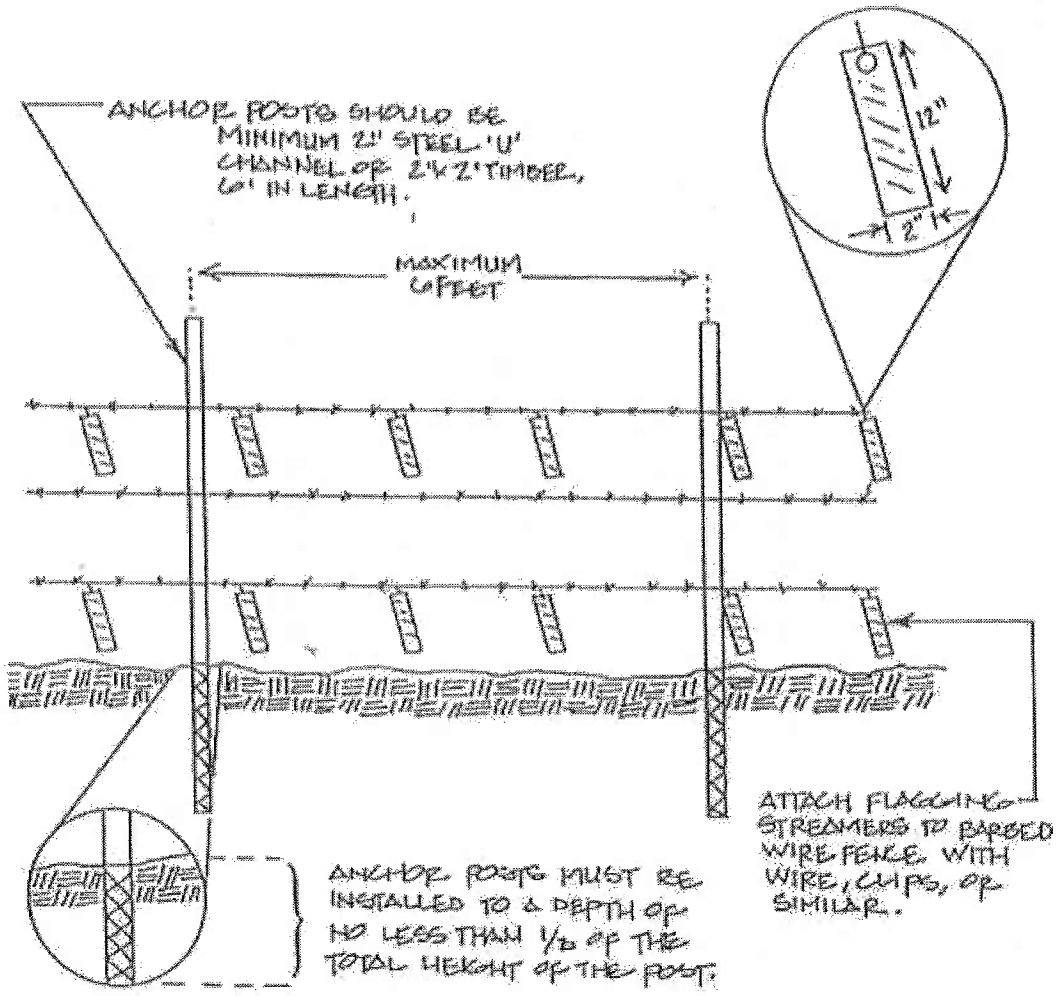


Notes
1. Forest protection device only.
2. Retention Area will be set as part of the review process.
3. Boundaries of Retention Area should be staked and flagged prior to installing device.
4. Root damage should be avoided.
5. Protective signage may also be used.
6. Device should be maintained throughout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

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

Figure J-5

Three Strand Barbed Wire



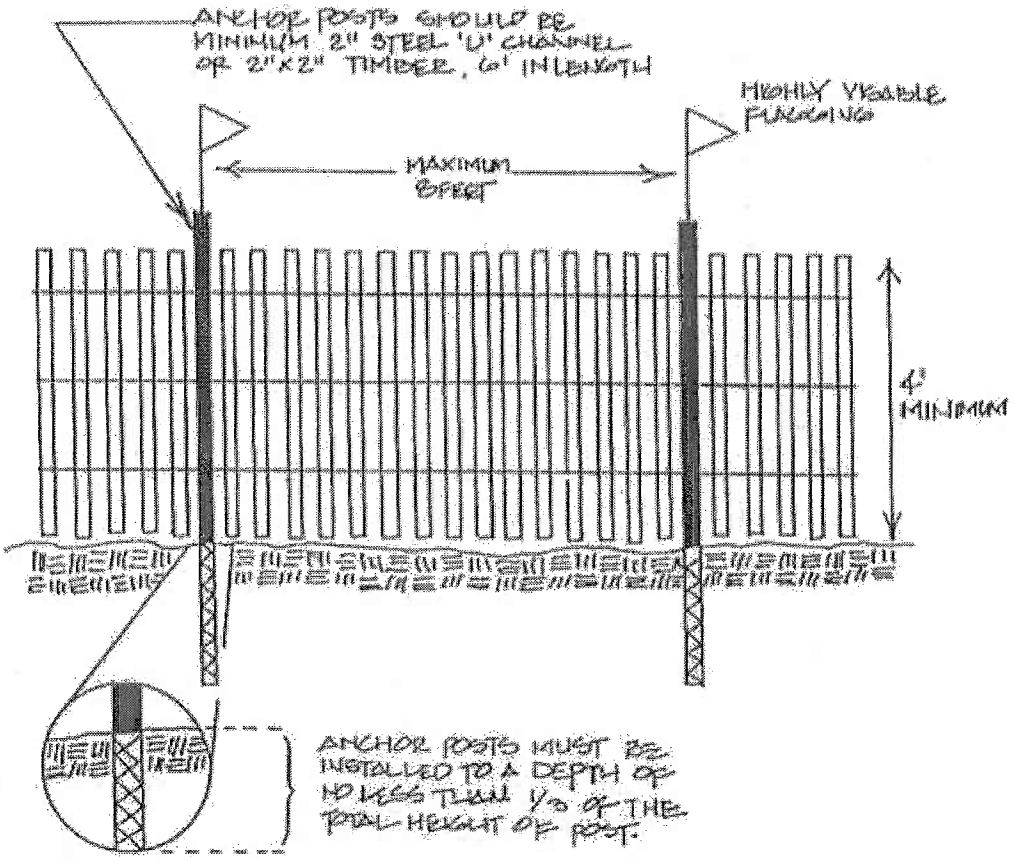
Notes

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

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

Figure J-6

Snow Fence



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

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

Figure J-7

Signage

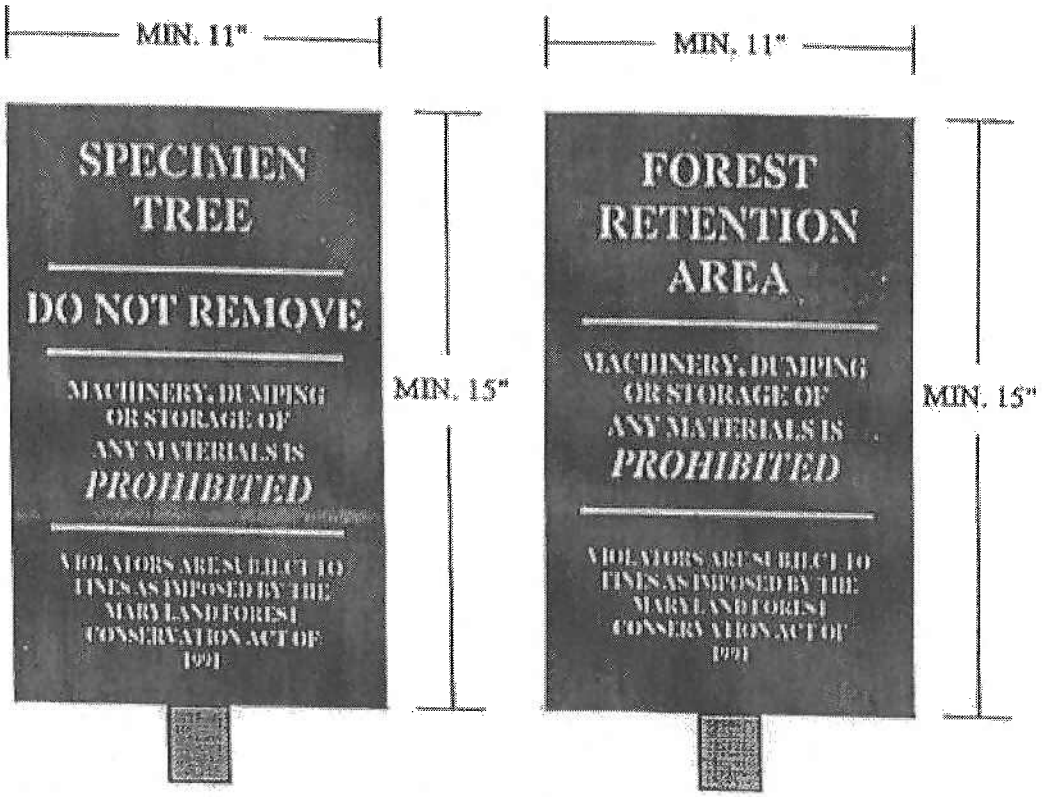
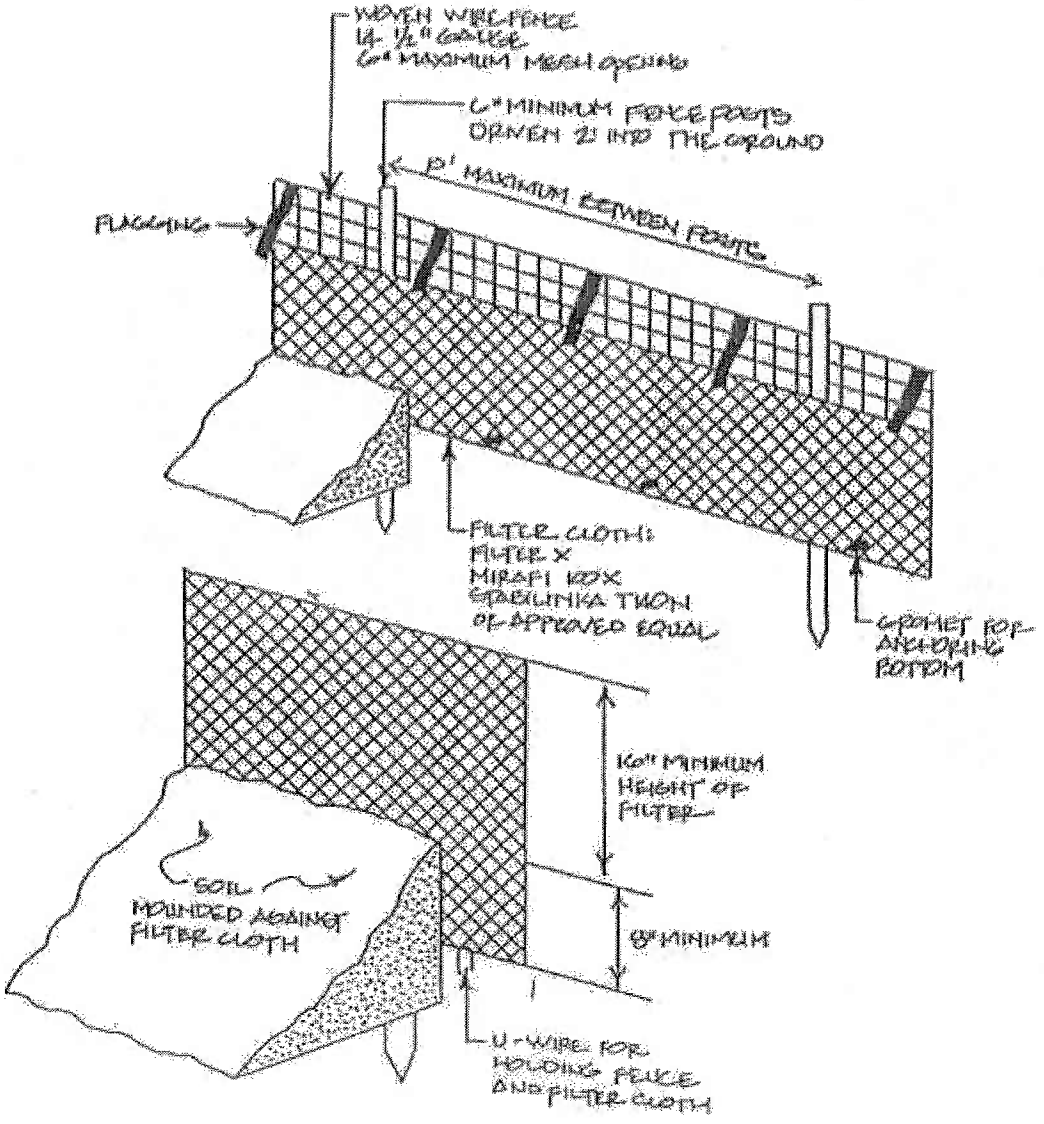


Figure J-8

Filter Cloth on Wire Mesh

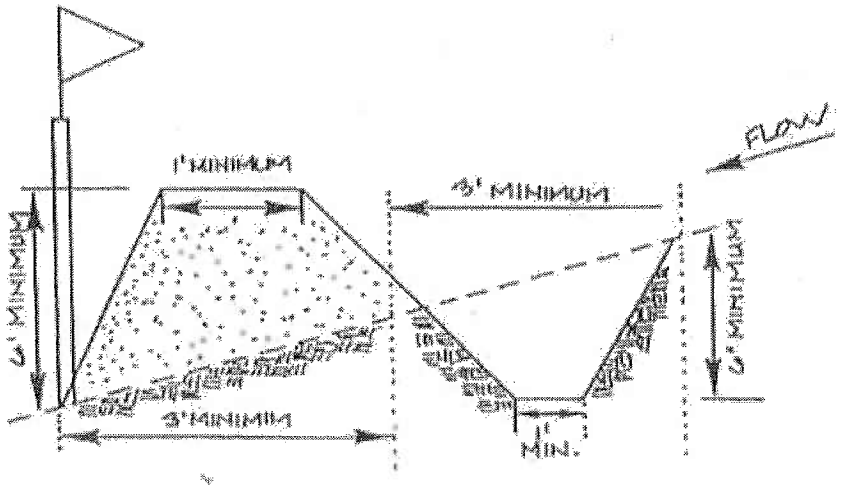


Source: Prince George's County, Maryland: Woodland Conservation Manual

Notes:

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

Figure J-10 **Earthen Dike and Swale**

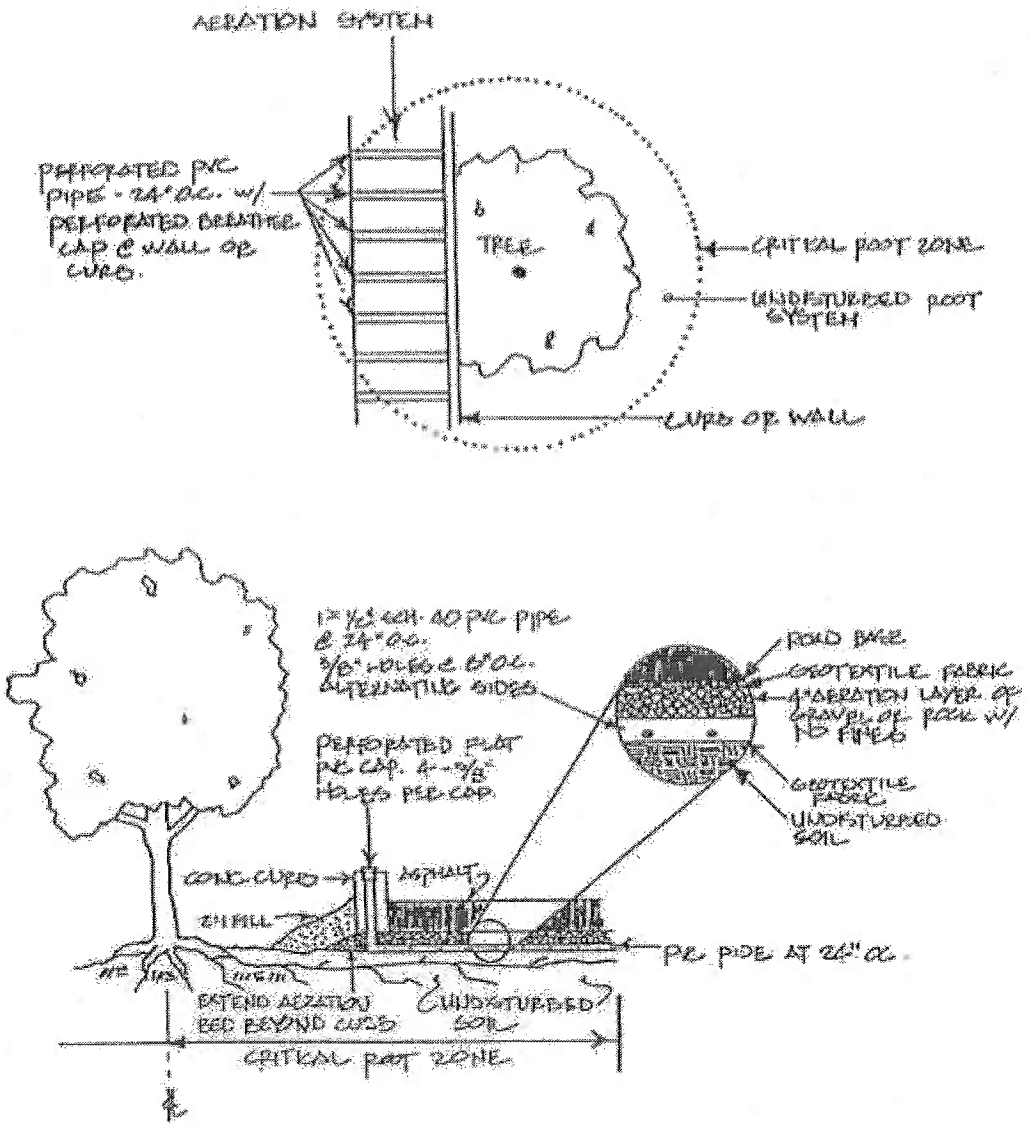


Notes:
1. Combination sediment control and protective device
2. Retention area will be set as part of the review process
3. Boundaries of Retention Area should be staked prior to installing protective device
4. Root damage should be avoided
5. The top or toe of slope should be within the limit of disturbance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

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

Figure J- 11

Aeration System

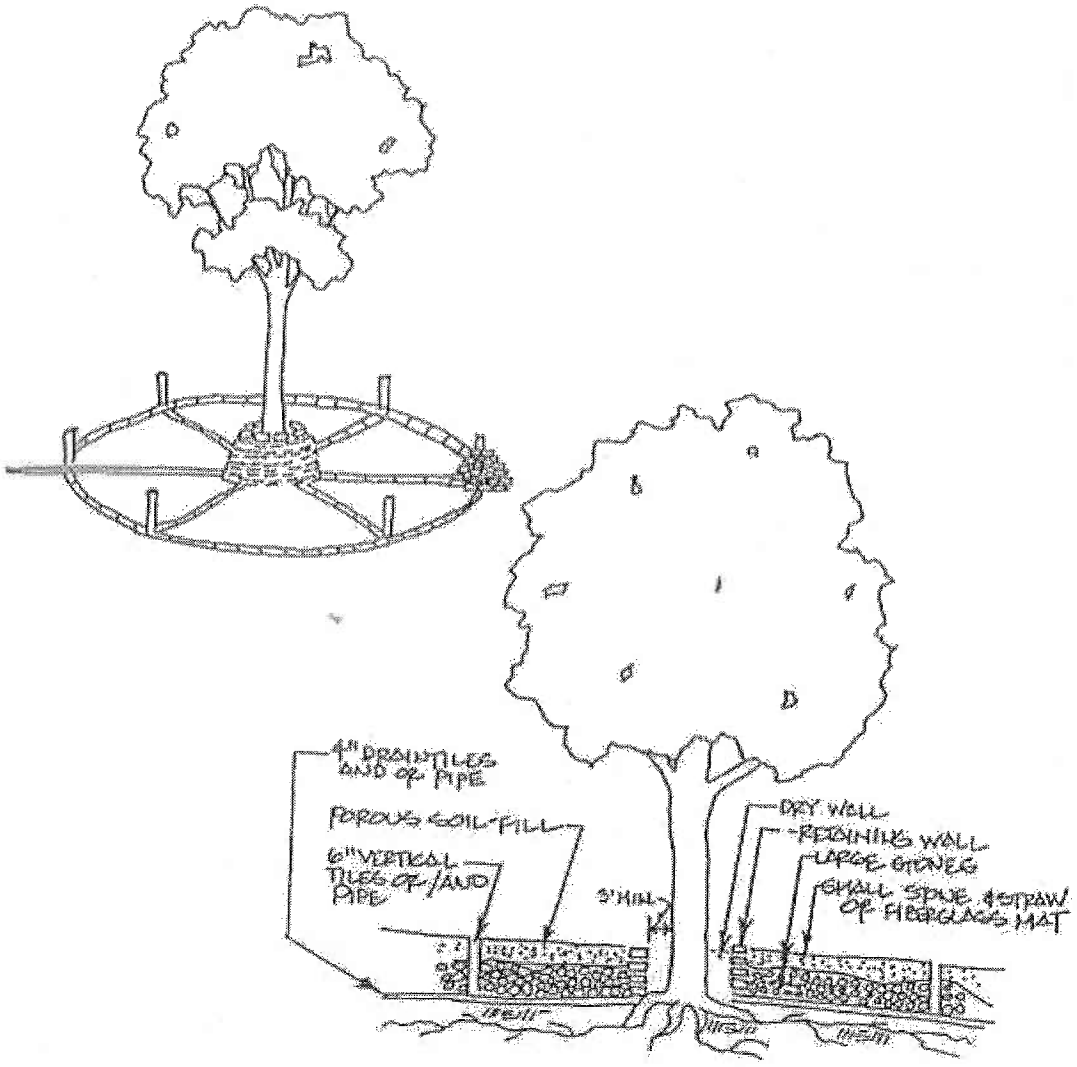


Notes:
1. Bed preparation should not exceed two inches.
2. Vertical pipe should be capped with a perforated cap with 4-3/8 inch holes per cap.
3. Gravel or rock should contain no fines.
4. Can also be used when critical root zone is covered by fill instead of asphalt.

Source: Steve Clark & Associates

Figure J -12

Tree Well

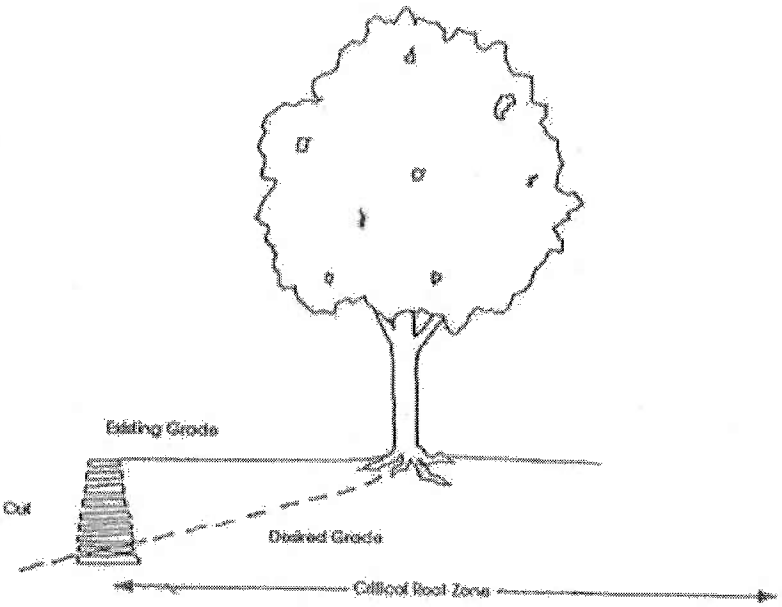


Notes:
1. Well wall should be no closer than 3 feet from tree trunk or more for smaller trees.
2. Drainage pipe layout should extend beyond the critical root zone
3. Vertical pipes shall be capped with a perforated flat cap with 4-3/8 inch holes per cap
4. Radiating spokes should be on 3 foot centers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

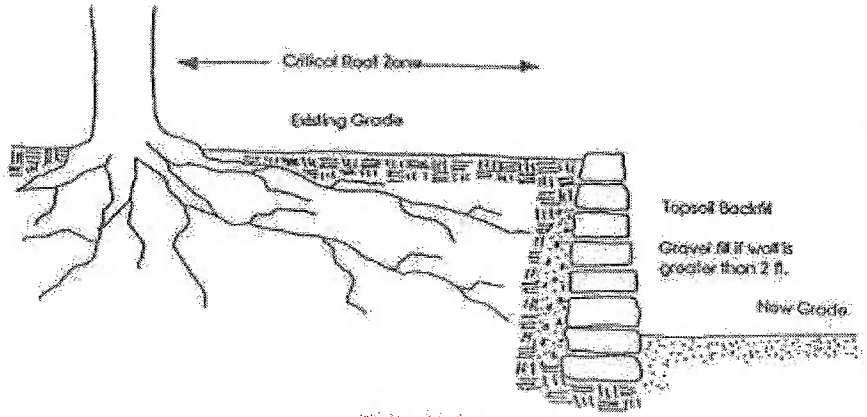
Source: Fairfax County, Virginia: Vegetation Preservation & Planting

Figure J- 13

Retaining Walls



Source: Fulton County, Georgia
Tree Preservation Ordinance

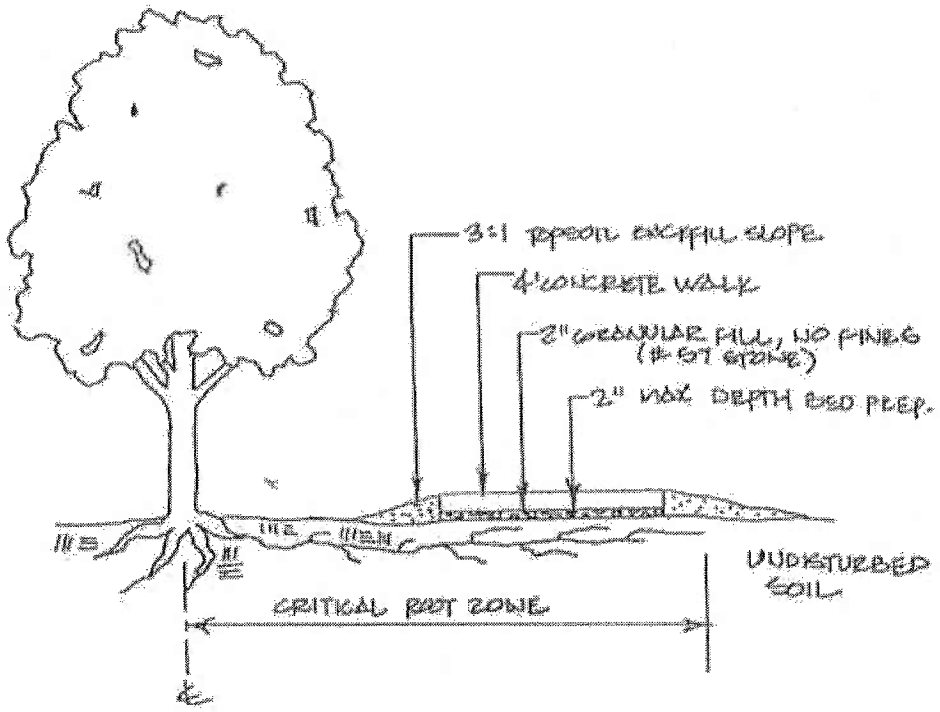


Source: Fairfax County, Virginia
Vegetation Preservation & Planting

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

Figure J-14

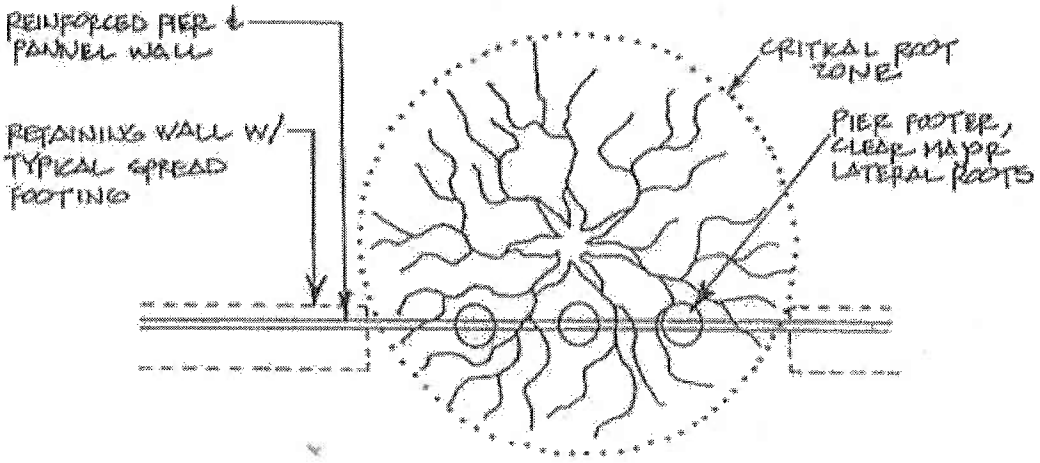
Raised Sidewalk



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

Source: City of Gaithersburg, Maryland: City Tree Manual

Figure J-15 **Reinforced Pier and Panel Wall**

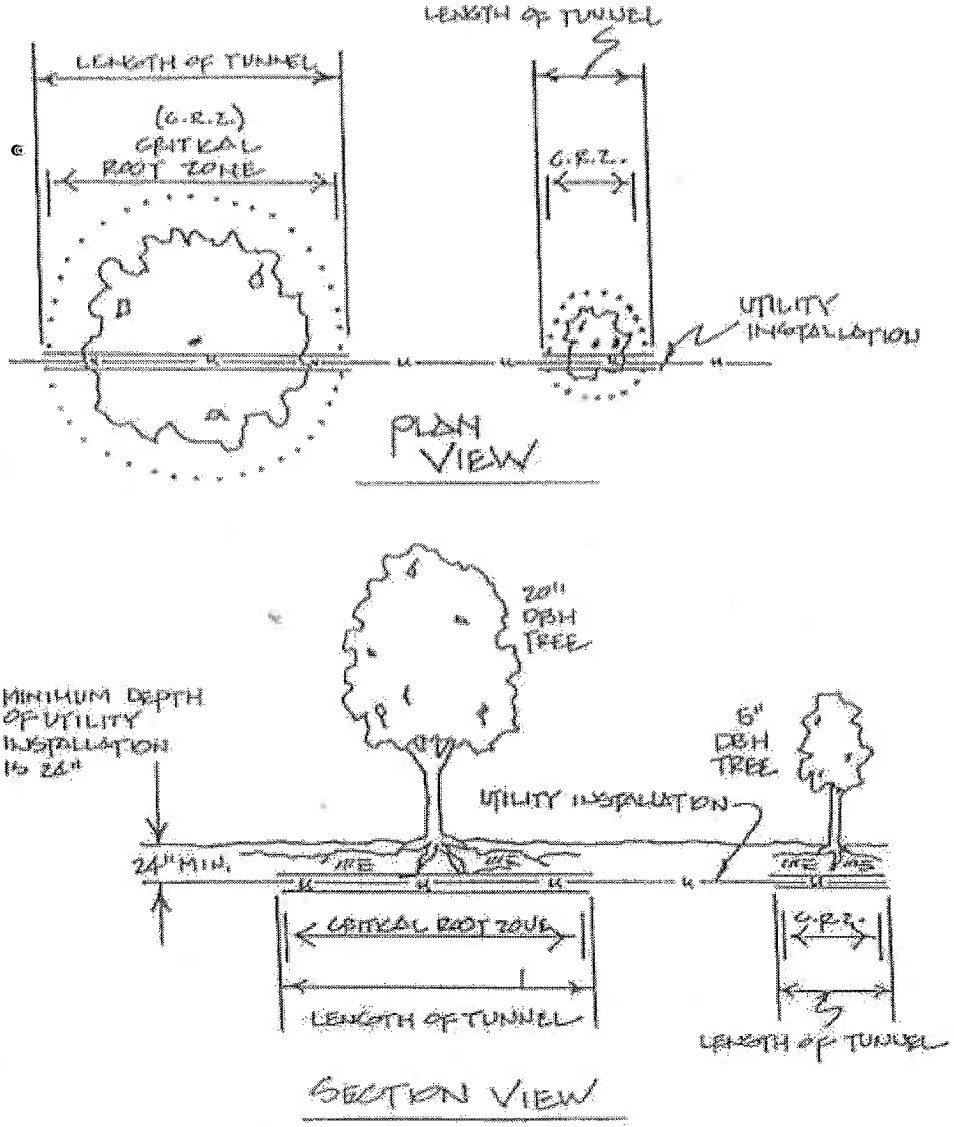


Notes:
1. Area of disturbance should be minimized
2. Care should be taken to avoid major lateral roots
3. Roots should be cleanly cut using a vibratory knife or other similar equipment

Source: Steve Clark & Associates

Figure J- 16

Tunnelling



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

Adopted 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 loading" 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:

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

END OF ITEM U-15

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 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 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

BWI
BALTIMORE / WASHINGTON
INTERNATIONAL AIRPORT

Prepared By

URS Corporation
Airport Square 19
1099 Winterson Road
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_2 Multiplexer--Controls the sampling sequence and storing of the three measured CO_2 concentrations.

b. CO_2 Sensor Autozero function--Causes the controller to read outdoor air CO_2 concentrations for one hour each day for the auto zeroing algorithm in the CO_2 sensor.

c. Outdoor Air Flow Calculator--Uses the CO_2 concentration data to calculate the outdoor air flow rate.

d. Outdoor Air Flow Controller--Uses the outdoor air flow rate as a controlled variable input for closed loop PI control of outdoor air flow. The primary setpoint is determined by the Outdoor Air Flow Controller's Setpoint Selector.

e. Outdoor Air Flow Controller Backup--Takes over control when the ODA Flow Calculator output is not dependable for any reason. This is a redundancy that is not required for outdoor air flow control but is provided for space pressurization considerations.

f. Outdoor Air Flow Setpoint Selector (with CO_2 High Limit Control)--The Setpoint Selector determines the setpoint of the Outdoor Air Flow Controller based on the highest of three signals: Scheduled setpoint based on estimated occupancy, space pressurization (i.e., volume matching) setpoint, and the CO_2 high limit control setpoint. The CO_2 high limit control function supplements the scheduled outdoor air flow function, addressing any higher than expected occupancy periods.

g. Return Air CO_2 Alarm capability--Alerts building operators to conditions of high CO_2 levels, indicating loss of ventilation control, or conditions of low CO_2 levels indicating a CO_2 sensor fault.

h. Controller Manager--Selects between the Outdoor Air Flow Controller and the conventional discharge air temperature controller/economizer for control of the mixed air dampers.

i. CO_2 Concentration Values Check--Warns the operator if the CO_2 concentration values are not in the proper relationship; supply air CO_2 concentration should be higher than that of the outdoor air and lower than that of the return air.

j. Lead Ventilation--Provides ventilation prior to occupancy, diluting building source contaminants to acceptable levels.

k. Trend Tool--This Excel work, in conjunction with an OWS and Metalink™, provides expanded graphic presentation of trend data.

l. Outdoor Air Actuator Ramp Generator--Diagnostic software process compound ramps outdoor air damper through 0%, 50% and 100% positions for precommissioning tests and ventilation control verification.

m. Trend Automator--Starts and stops trending of object attributes when the air handling unit is started and stopped. This avoids wasted disk space which occurs if trending continues during equipment off periods.

n. Reliability Checker--Replaces unreliable trend data with zero.

o. Outdoor Air Flow Calculator - Energy Balance Method--Uses mixed, return and outdoor air temperature data to calculate the outdoor air flow rate for comparison purposes (not for control).

3. Measurement of Outdoor Air Flow Rate

a. ASHRAE Standard 62-1989 states: "When mechanical ventilation is used, provision for air flow measurement should be included" and "sufficient ventilation shall be demonstrable." This is being interpreted to mean that for VAV systems, measurement of the outdoor air flow is required to meet the Standard. An additional benefit of outdoor air flow measurement is to improve the operation of space pressurization and mixed air controls.

b. Outdoor air flow is measured indirectly, using the "CO_2 Concentration Balance" measurement method. In the "CO_2 Concentration Balance" method, the outdoor air flow is calculated from supply air flow (measured directly via airflow measuring station), and from three CO_2 concentrations. Outdoor, supply, and return air CO_2 concentrations are used to compute the fraction of outdoor air in the supply air stream. This provides a calculated outdoor air flow value as a controlled variable input for the Outdoor Air Flow Controller.

c. The volumetric concentration balance for the outdoor and return air streams being mixed can be calculated for any "tracer gas" injected into the air streams. Since human respiration generates significant amounts of CO_2 in the return air stream and CO_2 sensors are available, CO_2 is a good tracer gas for this method.

4. Implementation of Outdoor Air Flow Software Control Strategies

a. The multiplexed method of CO_2 measurement that is used to provide accurate CO_2 concentration values for the Outdoor Air Flow Calculator has additional capabilities in that it can compensate for exhaust air bypass and mixing plenum air leaks. It is the only method that can distinguish between outdoor and re-entrained return or exhaust air.

b. The method is derived from equations describing the mixing of the outdoor and return air streams in a common air handling unit. Each of these air streams contains some concentration of the tracer gas, CO_2

c. The outdoor air flow rate can then be determined as

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

using the supply air volumetric flow rate in CFM (or m^3/sec) and the CO_2 concentrations in ppm (parts per million).

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

d. The expression $CO_{2,RA}-CO_{2,OA}$ can be viewed as a "flow coefficient" that determines the "outdoor air fraction" in the supply air. The typical return air CO_2 concentration in an occupied building is in the range of 500 to 1000 ppm while the outdoor air CO_2 concentration is in the range of 350 to 450 ppm. The mixing of the outdoor and return air streams will always cause the supply air CO_2 concentration to be higher than that of the outdoor air and lower than that of the return air. When the outdoor and exhaust air dampers are fully closed and all the return air is being recirculated, the supply air CO_2 concentration is equal to that of the return air and the flow coefficient will have a value of zero, correctly indicating that no outdoor air is being introduced into the space. When the outdoor and exhaust air dampers are fully open, the supply air CO_2 concentration is equal to that of the outdoor air and the flow coefficient will have value of one, indicating that the air handling unit is using 100% outdoor air.

e. Single CO_2 sensor with a sampling air pump and appropriate software is used to measure and store, in sequence, CO_2 concentrations of the three air streams. Two solenoid air valves are used to connect the appropriate sampling line to the air sampling pump and to the sensor. Adequate time is provided for purging each sampling line and for the time response of the CO_2 sensor.

f. With the use of a single CO_2 sensor, the relative differences between CO_2 concentrations can be measured with an error of less than 5 ppm. The effect of sensing errors such as drift, temperature effect and short term output variations will be identical for all three CO_2 measurements. Because the flow coefficient requires only calculation of the ratio of the CO_2 differentials, the identical errors in the individual measurements will cancel out. Only infrequent field calibration of the CO_2 sensor is required because only the differentials are used, rather than absolute values.

g. The return air CO_2 concentration, one of the three CO_2 concentrations read and stored during the multiplexing cycle, can be utilized in some cases for purposes other than indirect outdoor air flow calculation. For example, it can be used for CO_2 high limit control and for Return Air CO_2 Alarms. For these applications, when an absolute CO_2 measurement is needed, accurate CO_2 sensor calibration is required. The CDS-2000 CO_2 sensor provides its own internal auto zeroing algorithm that has proved to be quite effective and limits the need for recalibration. For absolute measurements, CDS-2000 CO_2 sensors require periodic (annually) calibration with a calibration gas that contains a specific concentration of CO_2.

5. CO_2 Sensing Point Location

a. Selection of the CO_2 sensing locations should be as follows. The sampling tube (typically a 1/4 inch diameter plastic tube) is inserted into the duct in any convenient and easily accessible section of the ductwork. Note that, contrary to temperature sensing, the CO_2 concentration in mixed air is identical to the CO_2 concentration in the supply air. Therefore, there is never any need to sense CO_2 in the mixed air plenum where an averaging sensing probe would be required. Because the CO_2 concentration of an air stream is not affected by heating coils, cooling coils or humidifiers, the sensing point for the supply can be located downstream of the supply fan to ensure that the outdoor and return air streams are well mixed and have minimum stratification. The return air sensing point can be located in the return air duct, upstream or downstream of the return fan, using a tube of up to 100 feet in length.

b. The supply air sensing point is subject to the fastest changes in CO_2 concentration, as the linked dampers change position. When presented with choices regarding equipment location, mount the controller in a location that will minimize the length of the supply air sensing tube, using a tube of up to 30 feet, in length.

c. The outdoor air sensing point should be located in free air outside the building or, alternatively, in the outdoor air intake. If the outdoor air CO_2 sample is obtained from a location that is isolated from the building exhausts, the CO_2 Concentration Balance method will automatically compensate for air which short-cycles from the exhaust louvers to the outdoor air intake. Either location compensates for air which short-cycles from the fan room into the mixing plenum. By placing the outdoor air CO_2 sensing point in a location that is isolated from the building exhausts, this method allows calculation of the true fresh air portion of the outdoor air flow intake from the three CO_2 measurements and the supply air flow. The outdoor CO_2 sensing point, if placed in the outdoor air intake duct for

convenience reasons, should be placed far enough on the upstream side of the outdoor air damper so that its reading is not affected by a possible "backwash" of the mixed air at larger outdoor air damper openings. A good practical test is to check the outdoor air CO_2 sensing point reading while positioning the outdoor air damper from its fully closed to its fully open position and verify that the sensor reading does not change.

2.6 APPLICATION SPECIFIC CONTROLLERS - HVAC APPLICATIONS

A. Each Standalone DDC Controller shall be able to extend its performance and capacity through the use of remote Application Specific Controllers (ASCs).

B. Each ASC shall operate as a standalone controller capable of performing its specified control responsibilities independently of other controllers in the network. Each ASC shall be a microprocessor-based, multi-tasking, real-time digital control processor.

C. Each ASC shall have sufficient memory to support its own operating system and data bases including:

1. Control Processes
2. Energy Management Applications
3. Operator I/O (Portable Service Terminal)

D. The operator interface to any ASC point data or programs shall be through any network-resident PC workstation, or any PC or portable operator's terminal connected to any DDC panel in the network.

E. Application Specific Controllers shall directly support the temporary use of a portable service terminal. The capabilities of the portable service terminal shall include, but not be limited to, the following:

1. Display temperatures.
2. Display status.
3. Display setpoints.
4. Display control parameters.
5. Override binary output control.
6. Override analog setpoints.
7. Modification of gain and offset constants.

F. Powerfail Protection: All system setpoints, proportional bands, control algorithms, and any other programmable parameters shall be stored such that a power failure of any duration does not necessitate reprogramming the controller.

G. Surge and Transient Protection: Isolation shall be provided at all network terminations, as well as all field point terminations to suppress induced voltage transients consistent with IEEE Standard 587-1980. Isolation levels shall be sufficiently high as to allow all signal wiring to be run in the same conduit as high voltage wiring where acceptable by electrical code.

H. Powerfail Restart: In the event of the loss of normal power, there shall be an orderly shutdown of all standalone DDC panels to prevent the loss of database or operating system software. Non-volatile memory shall be incorporated for all critical controller configuration data, and battery back-up shall be provided to support the real-time clock and all volatile memory for a minimum of 72 hours.

1. Upon restoration of normal power, the DDC panel shall automatically resume full operation without manual intervention.

2. Should DDC panel memory be lost for any reason, the user shall have the capability of reloading the DDC panel via the local area network, via the local RS-2320 port, or via telephone line dial-in.

2.7 AHU CONTROLLERS

A. AHU controllers shall support all the necessary point inputs and outputs to perform the specified control sequences in a totally stand alone fashion.

B. AHU controllers shall have a library of control routines and program logic to perform the sequence of operation as shown on the plans.

C. Occupancy-Based Standby/Comfort Mode Control: Each AHU controller shall have a provision for occupancy sensing overrides. Based upon the contact status of either a manual wall switch or an occupancy sensing device, the AHU controller shall automatically select either standby or comfort mode to minimize the heating and cooling requirements while satisfying comfort conditions.

D. Continuous Zone Temperature Histories: Each AHU controller shall have the capability to automatically and continuously maintain a history of the associated zone temperature to allow users to quickly analyze space comfort and equipment performance for the past 24 hours. A minimum of two samples per hour shall be stored.

2.8 SEQUENCE OF OPERATION

A. See Mechanical plans.

2.9 SENSORS

A. Electronic Sensors: Vibration and corrosion resistant, for wall, immersion, or duct mounting as required.

1. Resistance Temperature Detectors: Platinum.

a. Accuracy: Plus or minus 0.2 percent at calibration point.

b. Wire: Twisted, shielded-pair cable.

c. Insertion Elements in Ducts: Use where not affected by temperature stratification or where ducts are smaller than 9 sq. ft.

d. Averaging Elements in Ducts: Use where ducts are larger than 9 sq. ft. or where prone to stratification, length as required.

e. Insertion Elements for Liquids: Brass socket with minimum insertion length of 2-1/2 inches.

f. Room Sensors: Discrete sensor.

g. Outside Air Sensors: Watertight inlet fitting, shielded from direct sunlight.

h. Duct and Outside Air Sensors: With element guard and mounting plate, range of 0 to 100 percent relative humidity.

B. Equipment Operation Sensors: As follows:

1. Status Input for Pumps: Differential-pressure switch piped across pump with adjustable pressure-differential range of 8 to 60 psi.

2. Status Inputs for Fans: Differential-pressure switch with adjustable range of 0 to 5 inches wg.

3. Status Inputs for Electric Motors: Current-sensing relay with current transformers, adjustable and set to 175 percent of rated motor current.

C. Humidity Sensors: Bulk polymer sensor element.

a. Accuracy: 5 percent full range with linear output.

b. Room Sensors: With locking cover matching room thermostats, span of 25 to 90 percent relative humidity.

c. Duct and Outside-Air Sensors: With element guard and mounting plate, range of 0 to 100 percent relative humidity.

D. Static-Pressure Transmitter: Nondirectional sensor with suitable range for expected input, and temperature compensated.

1. Accuracy: 2 percent of full scale with repeatability of 0.5 percent.

2. Output: 4 to 20 mA.

3. Building Static-Pressure Range: 0 to 0.25 inch wg (0 to 62 Pa).

4. Duct Static-Pressure Range: 0 to 5 inches wg (0 to 1243 Pa).

E. Pressure Transmitters: Direct acting for gas, liquid, or steam service; range suitable for system; proportional output 4 to 20 mA.

F. Digital-to-Pneumatic Transducers: Convert plus or minus 12-V dc pulse-width-modulation outputs, or continuous proportional current or voltage to 0 to 20 psig (0 to 138 kPa).

G. Pneumatic Valve/Damper Position Indication: Potentiometer mounted in enclosure with adjustable crank-arm assembly connected to damper to transmit 0 to 100 percent valve/damper travel.

H. Electronic Valve/Damper Position Indication: Visual scale indicating percent of travel and 2- to 10-V dc, feedback signal.

I. Water-Flow Switches: Pressure-flow switches of bellows-actuated mercury or snap-acting type, with appropriate scale range and differential adjustment, with stainless-steel or bronze paddle. For chilled-water applications, provide vaporproof type.

J. Occupancy Sensor: Passive infrared, with time delay, daylight sensor lockout, sensitivity control, and 180 degree field of view with vertical sensing adjustment, for flush mounting.

2.10 THERMOSTATS

A. Combination Thermostat and Fan Switches: Line-voltage thermostat with two-, three-, or four-position, push-button or lever-operated fan switch.

1. Label switches "FAN ON-OFF," "FAN HIGH-LOW-OFF," "FAN HIGH-MED-LOW-OFF." Provide unit for mounting on two-gang switch box.

B. Low-Voltage, On-Off Thermostats: NEMA DC 3, 24-V, bimetal-operated, mercury-switch type, with adjustable or fixed anticipation heater.

C. Line-Voltage, On-Off Thermostats: Bimetal-actuated, open contact or bellows-actuated, enclosed, snap-switch type, or equivalent solid-state type, with heat anticipator, integral manual on-off-auto selector switch.

1. Equip thermostats, which control electric heating loads directly, with off position on dial wired to break ungrounded conductors.

2. Dead Band: Maximum 2 deg F (1 deg C).

D. Remote-Bulb Thermostats: On-off or modulating type, liquid filled to compensate for changes in ambient temperature, with copper capillary and bulb, unless otherwise indicated.

1. Bulbs in water lines with separate wells of same material as bulb.

2. Bulbs in air ducts with flanges and shields.

3. Averaging Elements: Copper tubing with either single- or multiple-unit elements, extended to cover full width of duct or unit, adequately supported.

4. Scale settings and differential settings are clearly visible and adjustable from front of instrument.

5. On-Off Thermostat: With precision snap switches, with electrical ratings required by application.

6. Modulating Thermostats: Construct so complete potentiometer coil and wiper assembly is removable for inspection or replacement without disturbing calibration of instrument.

E. Room thermostat accessories include the following:

1. Insulating Bases: For thermostats located on exterior walls.

2. Thermostat Guards: Locking; heavy-duty, transparent plastic; mounted on separate base.

3. Adjusting Key: As required for calibration and cover screws.

4. Aspirating Boxes: For flush-mounted aspirating thermostats.

5. Set-Point Adjustment: 1/2-inch- (13-mm-) diameter, adjustment knob.

F. Immersion Thermostat: Remote-bulb or bimetal rod-and-tube type, proportioning action with adjustable throttling range and adjustable set point.

G. Airstream Thermostats: Two-pipe, fully proportional, single-temperature type, with adjustable set point in middle of range and adjustable throttling range, plug-in test fitting or permanent pressure gage, remote bulb, bimetal rod and tube, or averaging element.

H. Electric Low-Limit Duct Thermostat: Snap-acting, single-pole, single-throw, manual- or automatic-reset switch that trips if temperature sensed across any 12 inches (300 mm) of bulb length is equal to or below set point.

1. Bulb Length: Minimum 20 feet (6 m).

2. Quantity: One thermostat for every 20 sq. ft. (2 sq. m) of coil surface.

I. Electric High-Limit Duct Thermostat: Snap-acting, single-pole, single-throw, manual- or automatic-reset switch that trips if temperature sensed across any 12 inches (300 mm) of bulb length is equal to or above set point.

1. Bulb Length: Minimum 20 feet (6 m).

2. Quantity: One thermostat for every 20 sq. ft. (2 sq. m) of coil surface.

J. Heating/Cooling Valve-Top Thermostats: Proportional acting for proportional flow, molded-rubber diaphragm, remote-bulb liquid-filled element, direct and reverse acting at minimum shutoff pressure of 25 psig (172 kPa), and cast housing with position indicator and adjusting knob.

2.11 HUMIDISTATS

A. Duct-Mounted Humidistats: Electric insertion, 2-position type with adjustable 2 percent throttling range, 20 to 80 percent operating range, single- or double-pole contacts.

2.12 ACTUATORS

A. Electric Motors: Size to operate with sufficient reserve power to provide smooth modulating action or two-position action.

1. Permanent Split-Capacitor or Shaded Pole Type: Gear trains completely oil immersed and sealed. Equip spring-return motors with integral spiral-spring mechanism in housings designed for easy removal for service or adjustment of limit switches, auxiliary switches, or feedback potentiometer.

2. Nonspring-Return Motors for Valves Larger Than 2-1/2 Inches: Size for running torque of 150 inch-pounds and breakaway torque of 300 inch-pounds.

3. Spring-Return Motors for Valves Larger Than 2-1/2 Inches: Size for running and breakaway torque of 150 inch-pounds.

B. Pneumatic Valve Operators: Rolling-diaphragm, spring-loaded, piston type with spring range as required. Select operator for full shutoff at maximum pump differential pressure.

C. Pneumatic Damper Operators: Rolling-diaphragm, piston type with adjustable stops and spring return, sized to operate with sufficient reserve power to provide smooth modulating action or two-position action. Where actuators operate in sequence, provide pilot positioners.

1. Pilot Positioners: Starting point adjustable from 2 to 12 psi and operating span adjustable from 5 to 13 psi.

2.13 CONTROL VALVES

A. Control Valves: Factory fabricated, of type, body material, and pressure class indicated. Where type or body material is not indicated, make selection as determined by manufacturer for installation requirements and pressure class, based on maximum pressure and temperature rating of piping system.

B. Globe Valves: As follows:

1. Globe Valves NPS 2 Inches (DN50) and Smaller: Bronze body, bronze trim, rising stem, renewable composition disc, screwed ends with backseating capacity repackable under pressure.

2. Globe Valves NPS 2-1/2 Inches (DN65) and Larger: Iron body, bronze trim, rising stem, plug-type disc, flanged ends, renewable seat and disc.

3. Hydronic Systems: As follows:

a. Chilled Water Rating: Service at 125 psi WSP and 250 degrees F.

b. Hot Water: Service at 150 PSI WSP and 400 degrees F.

c. High Temperature Hot Water (HTHW): Carbon Steel, Class 600.

d. Internal Construction: Replaceable plugs and seats of stainless steel or brass.

1) Single-Seated Valves: Cage trim provides seating and guiding surfaces for plug on top and bottom of guided plugs.

2) Double-Seated Valves: Balanced plug; cage trim provides seating and guiding surfaces for plugs on top and bottom of guided plugs.

e. Sizing: 3 psi (cooling) 5 psi (heating) maximum pressure drop at design flow rate.

f. Flow Characteristics: 3-way valves have linear characteristics. Select operators to close valves against pump shutoff head.

g. High Temperature Hot Water: Class 600 or 800.0

C. Butterfly Pattern: Iron body, ductile iron (Nylon II coated) disc; resilient, EPDM seat for service to 250 degrees F lug ends; extended neck, 416 stainless steel stem.

1. Rating: Service at 125 psi WSP and 250 degrees F.

2. Sizing: 1 psi maximum pressure drop at design flow rate.

D. Terminal Unit Control Valves: Bronze body, bronze trim, two- or three-port as indicated, replaceable plugs and seats, union and threaded ends.

1. Rating: Class 125 for service at 125 psig (862 kPa) and 250 deg F (121 deg C) operating conditions.

2. Sizing: 3-psig (21-kPa) maximum pressure drop at design flow rate, to close against pump shutoff head.

3. Flow Characteristics: Two-way valves shall have equal percentage characteristics; three-way valves shall have linear characteristics.

E. Pressure Reducing Valve (PRV): 250-psig minimum rating. Pressure reducing valve shall automatically reduce a higher inlet pressure inlet pressure to a steady lower downstream pressure regardless of changing flow rate and/or varying inlet pressure. The pressure reducing valve shall be an accurate, pilot-operated regulator capable of holding downstream pressure to a pre-determined limit. The cover on the pilot control shall be sealed to prevent tampering. Pressure reducing valve shall be pre-set at factory.

1. Pressure Reducing Valve Material:

a. Body and Cover: Ductile iron, internally epoxy coated.

b. Disc Retainer and Diaphragm Washer: Cast iron.

c. Trim (Disc Guide, Seat and Cover Bearing): Stainless steel.

d. Disc: Buna-N rubber.

e. Stem, Nut and Spring: Stainless steel.

f. Diaphragm: Nylon reinforced Buna-N rubber.

2. Pilot System Material:

a. Pilot Control: Bronze ASTM B 62.

b. Trim: Stainless steel Type 303.

c. Rubber: Buna-N synthetic rubber.

3. Adjustment Range: 2 to 30 psi.

4. Accessories: Strainer, isolation valve.

5. Manufacturer and Model: Pressure reducing valves shall be manufactured by Cla-Val, Model 90-01 or equal."

2.14 DAMPERS

A. Dampers: AMCA-rated, parallel or opposed blade design; form frames from not less than 0.1084-inch galvanized steel with mounting holes for duct mounting; damper blades not less than 0.0635-inch galvanized steel, with maximum blade width of 8 inches.

1. Blades secured to 1/2-inch diameter, zinc-plated axles using zinc-plated hardware, with nylon blade bearings, blade-linkage hardware of zinc-plated steel and brass. Ends sealed against spring-stainless-steel blade bearings. Thrust bearings at each end of every blade.

2. Operating Temperature Range: From -40 to 200 degrees F.

3. For standard applications as indicated, (as selected by manufacturer's sizing techniques) with optional closed-cell neoprene edging.

2.15 AIR SUPPLY

A. Control and Instrumentation Tubing: Type K, seamless copper tubing complying with ASTM B 88 (ASTM B 88M) or Type ACR, copper tubing complying with ASTM B 280.

1. Fittings: Cast-bronze solder fittings complying with ASME B16.18; or wrought-copper solder fittings complying with ASME B16.22, except forged-brass compression-type fittings at connections to equipment.

2. Joining Method: Soldered or brazed.

B. Control and Instrumentation Tubing: Virgin-polyethylene, flame-retardant, nonmetallic tubing complying with ASTM D 2737 with flame-retardant harness for multiple tubing.

1. Fittings: Compression or push-on polyethylene fittings.

C. Tank: ASME storage tank with drain test cock, automatic moisture removal trap, tank relief valve, and rubber-cork vibration isolation mounting pads.

D. Duplex Air Compressor: Capacity to supply compressed air to temperature-control system. Minimum two (2) duplex air compressors, with air dryer and accessories shall be provided.

1. Adjustable electric contacts pressure control, set to start and stop both compressors at different pressures.

2. Electrical alternation set with motor starters and disconnect to operate compressors alternately or on time schedule.

E. Compressor Type: Reciprocating.

F. Size compressor and tank to operate compressor not more than 20 minutes during a 60-minute period.

G. Compressor Accessories: Low-resistance intake-air filter, and belt guards.

H. System Accessories: Air filter rated for 97 percent efficiency at rated airflow, and combination filter/pressure-reducing station or separate filter and pressure-reducing station.

I. Refrigerated Air Dryer: Self-contained, refrigerated air dryer complete with heat exchangers, moisture separator, internal wiring and piping, and with manual bypass valve.

1. Heat Exchangers: Air-to-refrigerant coils with centrifugal-type moisture separator and automatic trap assembly.
2. Refrigeration Unit: Hermetically sealed, operating to maintain dew point of 13 deg F (minus 11 deg C) at 20 psig (138 kPa), housed in steel cabinet with access door and panel.

3. Accessories: Air-inlet temperature gage, air-inlet pressure gage, on-off switch, high-temperature light, power-on light, refrigerant gage on back, air-outlet

temperature gage, air-outlet pressure gage, and with contacts for remote indication of power status and high-temperature alarm.

J. Pressure Gages: Black letters on white background, 2-1/2-inch (64-mm) diameter, flush or surface mounted, with front calibration screw to match sensor, in appropriate units.

K. Instrument Pressure Gages: Black letters on white background, 1-1/2-inch (38-mm) diameter, stem mounted, with suitable dial range.

L. Diaphragm Control and Instrument Valves: 1/4-inch (6-mm) forged-brass body with reinforced polytetrafluoroethylene diaphragm, stainless-steel spring, and color-coded phenolic handle.

M. Gage Cocks: Tee or level handle, bronze, rated for 125 psig (862 kPa).

N. Relays: For summing, reversing, amplifying, highest or lowest pressure selection, with adjustable input/output ratio.

O. Switches: With indicating plates, accessible adjustment, calibrated and marked.

P. Pressure Regulators: Zinc or aluminum castings with elastomeric diaphragm, balanced construction to automatically prevent pressure build-up, and producing flat reduced-pressure curve.

Q. Particle Filters: Zinc or aluminum castings with 97 percent filtration efficiency at rated airflow, quick-disconnect service devices, and aluminum or plastic bowl with metal guard and manual drain cock.

R. Combination Filter/Regulators: Zinc or aluminum castings with elastomeric diaphragm, balanced construction to automatically prevent pressure build-up, and producing flat reduced-pressure curve; with threaded pipe connections, quick-disconnect service devices, and aluminum or plastic bowl with metal guard and manual drain cock.

S. Airborne Oil Filter: Filtration efficiency of 99.9 percent for particles of 0.025 micrometer or larger particles of airborne lubricating oil.

T. Pressure Relief Valves: ASME rated and labeled.

1. High Pressure: Size for installed capacity.

2. Low Pressure: Size for installed capacity of pressure regulators and set at 20 percent above low pressure.

U. Pressure-Reducing Stations: Two parallel pressure regulators.

2.16 CONTROL CABLE

A. Electronic Cable for Control Wiring: Refer to Division 16 Section "Control/Signal Transmission Media."

2.17 AIR HANDLING UNIT CONTROL PANEL

A. Air Handling Units: Control panel for each air handling unit shall be furnished by the FMS supplier and field installed adjacent to air handling unit equipment.

2.18 DDC AIR FLOW MEASUREMENT EQUIPMENT

A. DDC Air Flow Measuring System

1. Provide Dybec Model D-91 DDC or equal, air flow measuring systems including microprocessor panels and air flow measuring sensor struts as specified.

2. Pitot tube arrays and differential pressure arrays are not acceptable.

3. DDC Air Flow Measuring System shall have velocity range from 45 ft/min to 6400 ft/min with duct measurement accuracy (including repeatability, zero offset, and temperature compensation) of plus or minus 2.5 percent.

B. DDC Processor Panel

1. Processor shall calculate duct air flow by independently measuring the flow over each thermistor/sensor and calculating the velocity of the air for each thermistor/sensor. Equipment which averages multiple thermistors is not acceptable.

2. DDC Air Flow Measuring Systems shall require no field calibration and shall allow field replacement of thermistors without calibration. Equipment which requires shipment to factory for recalibration is not acceptable.

3. In the event of a thermistor failure, the processor shall ignore the failed thermistor and continue to operate with the remaining thermistors. The microprocessor shall have diagnostics which can identify the failed thermistor.

4. Display: Processor panels measuring one or two ducts shall have two line display and panels measuring three or four ducts shall have four line display. Display shall be 16 characters/line LCD type and shall display all air flows and temperatures. Processor must also be able to display user-defined custom values such as measured delta cfm and delta cfm set point as specified at time of purchase.

5. Printer Port: Processor shall have serial printer port for hard copy system commissioning and for tenant confirmation of outdoor ventilation rates.

6. Communications Port: Processor panel shall have RS232 serial interface port for local computer or phone remote diagnostics.

7. Ambient Operating Conditions: 50 degrees F to 105 degrees F and less than 95 percent relative humidity.

8. Enclosure and Power: NEMA 1 24 VAC 5 amp fused input power.

9. Signal Outputs: 0-5 VDC.

C. Thermistor Sensor Struts

1. Manufacturer must provide documentation certifying that the thermistor meets military specifications for drift rates which do not exceed 0.1 degree F in five years at 140 degrees F.

2. Sensor Operating Range: -50 degrees to 120 degrees F.

3. Each sensor on the strut shall have integral flow straighteners both upstream and downstream of thermistors.

1. At least one strut in each duct shall have a solid state temperature sensor.

2. Sensor Struts: Sensor struts shall be mounted in duct by sheet metal contractor and wired by the temperature control contractor.

3. Manufacturer shall provide tagged struts with prewired cables (one cable/strut) for screw-in connections to respective processor panel.

D. Submittals: Submittals shall include all relevant data (all service bulletins) regarding setup for flow measuring system. Submittal shall include factory approved startup service. Submittal must include signed statement from manufacturer stating equipment recalibration is not necessary and if for any reason is required, manufacturer shall pay for all costs (material, labor, shipment) associate with the recalibration of equipment. Submittal must include detailed procedure for replacement of thermistor

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify that conditioned power supply is available to control units and operator workstation. Verify that field end devices, wiring, and pneumatic tubing are installed before proceeding with installation.

3.2 INSTALLATION

A. Install equipment as indicated to comply with manufacturer's written instructions.

B. Connect and configure equipment and software to achieve the sequence of operation specified on the plans.

C. Verify location of thermostats, and other exposed control sensors with plans and room details before installation. Locate 60 inches above floor.

1. Install averaging elements in ducts and plenums in crossing or zigzag pattern.

D. Install damper actuators on outside of duct in warm areas, not where exposed to outdoor temperatures.

E. Install labels and nameplates to identify control components according to Division 15 Sections specifying mechanical identification.

F. Install hydronic instrument wells, valves, and other accessories according to Division 15 Section "Hydronic Piping."

3.3 ELECTRICAL WIRING AND CONNECTIONS

A. Install raceways, boxes, and cabinets according to Division 16 Section "Raceways, Boxes, and Cabinets."

B. Install building wire and cable according to Division 16 Section "Wires and Cables."

C. Install automatic temperature control/direct digital control wiring as follows:

1. Install automatic temperature control/direct digital wiring in raceways, boxes, and cabinets according to Division 16, Section 16130, "Raceways, Boxes, and Cabinets."

2. Fasten flexible conductors, bridging cabinets and doors, neatly along hinge side; protect against abrasion. Tie and support conductors neatly.

3. Number-code or color-code conductors, except local individual room controls, for future identification and servicing of control system.

D. Connect electrical components to wiring systems and to ground as indicated and instructed by manufacturer. Tighten connectors and terminals, including screws and bolts, according to equipment manufacturer's published torque-tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals according to tightening requirements specified in UL 486A.

E. Connect manual reset limit controls independent of manual control switch positions. Automatic duct heater resets may be connected in interlock circuit of power controllers.

F. Motor Controllers: Monitor on/off status. Communication shall be as a feature of motor protection relay.

G. Lighting Control: Provide lighting control by panelboards powerlink modules wiring with Metasys Network. For details refer to Division 16, Section 16442, Paragraph 2.4, subparagraph C.

3.4 CONTROLS FOR ELECTRICAL SYSTEMS

All power monitoring/control modules are specified to be compatible with Johnson Controls N2 protocol for remote display and controls. The following electrical components shall be monitored and/or controlled by Metasystem Network provided by Johnson Controls.

A. 480V Switchgears: Provide monitoring of overcurrent, ground-fault conditions, and main circuit breaker trip status for Fire Cycle III pre-action at the substations. Use main circuit breaker dry contacts to wire for communication to Metasystem.

B. Standby Generator: Monitor on/off status of generator and generator circuit breaker.

C. Transfer Switches: Monitor on/off status of all the autotransfer switches.

D. Motor Controllers: Monitor on/off status. Communication shall be as a feature of motor protection relay. Comply with the requirements of this Section paragraph 2.6 and 2.7.

E. Lighting Control: Provide lighting control by panelboards powerlink modules wiring with Metasys Network.

F. UPS Status: Monitor on/off status of UPS units.

G. Fire Cycle III pre-action cabinets shall be monitored in substation, elevator machinery and all communications rooms.

3.5 COMMISSIONING

A. Manufacturer's Field Services: Provide the services of a factory-authorized service representative to start control systems.

B. Test and adjust controls and safeties.

C. Replace damaged or malfunctioning controls and equipment.

D. Start, test, and adjust control systems.

E. Demonstrate compliance with requirements.

F. Adjust, calibrate, and fine tune circuits and equipment to achieve sequence of operation specified herein and as shown on the plans.

3.6 FIELD QUALITY CONTROL

A. Pressure test control air piping at 30 psi or 1.5 times the operating pressure for 24 hours, with maximum 5 psi loss.

3.7 HVAC SYSTEM EVALUATION AND PRECOMMISSIONING VERIFICATION

A. Ensure that air handling units are operating properly before the application of outdoor air flow controls. If a retrofit application is involved, the equipment and controls must be evaluated to bring the system up to the intended operating level before applying this control strategy.

B. Perform a walk through inspection: Look for and correct unstable control loops by checking transducer and pilot positioner calibration as well as controller tuning.

C. Instability of any of the following existing control loops would degrade the operation of the Outdoor Air Flow Controller: Discharge air temperature/economizer control loop, supply fan static pressure control loop (which may in turn be affected by individual VAV box control loop instability) and space pressurization (volume matching) control loop.

D. Confirm that the mixed air damper actuators, linkages and controls are operable and capable of achieving the specified flow rates. Confirm that the outdoor air, return air and exhaust air dampers are controlled by the same signal and can close off without "excessive" leakage.

E Ensure that the variable frequency drives, inlet guide vanes or other equipment employed to modulate the capacity of the supply and return fans is operating and capable of achieving the specified flow modulation for the job.

F. Remove any mechanical or software "stops" that may be limiting the operation of the outdoor air, return air and exhaust air dampers.

G. Perform verification of new and existing equipment and controls with the following "sanity checks" at the extreme positions of the coupled outdoor air, return air and exhaust air dampers.

H. These checks, at fully closed and fully open outdoor air damper positions can, in addition to verification of the flow sensing accuracy, also be used for rough verification of accuracy of temperature and CO_2 sensing and for verification of proper placement of outdoor air temperature and CO_2 sensing points.

I. With the outdoor air damper fully closed (0 % position), the return (recirculating) air damper is fully open and the exhaust air damper is also fully closed. Under this condition, all return air is recirculated (with all separate building exhausts shutdown) and the supply air and return air flows should be equal. This should be verified at various supply flows. This method can be used as a quick check that verifies the supply air flow station accuracy against the return air flow station.

J. The outdoor air temperature and CO_2 sensing points must not be affected by changes in the outdoor air damper position.

K. When the outdoor air damper is fully open, the mixed air temperature should be equal to the outdoor air temperature and the supply air CO_2 should be equal to the outdoor air CO_2. If large differences are observed, the placement of sensing points and calibration of the sensors should be questioned.

L. When the outdoor air damper is fully closed, the mixed air temperature should be equal to the return air temperature and the supply air CO_2 should be equal to the return air CO_2. Again, if large differences are observed, the placement of the sensing points should be reconsidered. When the indirect method of outdoor air flow measurement is used for closed loop ventilation control, the CO_2 measurement reliability at relatively low outdoor air flows, with the outdoor air damper almost closed, is the most important.

M. Once the supply air flow station and CO_2 measurement are verified, another "sanity" check can be performed with the outdoor air damper fully open (100 % position). In this condition, the return air damper is fully closed and the outdoor air flow (calculated from CO_2 concentrations) should be equal to the supply air flow (measured by the flow station). This check should be performed at various supply flows and any difference between the two air flow measurements should be identified. If the outdoor air flow is

lower than the supply air flow, it could be caused by leaks of equipment room air or return air into the negatively pressurized mixed air plenum. The leaks can be traced with a powder gun and located. Sealing the leaks as well as possible to minimize the flow difference is essential to general system performance and energy efficiency as well as ventilation control strategy.

3.8 DEMONSTRATION AND TRAINING

A. The BMS/ATC contractors shall provide three copies of an operator's manual describing all operating and routine maintenance service procedures to be used with the temperature control and Facility Management Systems supplied. The Contractors shall instruct the MAA's designated representatives in these procedures during the start-up and test period.

B. Instructions to MAA Personnel: The Control Contractor shall include in his bid price the cost of providing the services of competent instructors to fully instruct designated personnel in the adjustment, operation, and maintenance, including pertinent safety requirements, of the equipment and systems specified. The training shall be oriented toward the installed system rather than being a general (canned) training course. Each instructor shall be thoroughly familiar with all aspects of the subject to be taught. The number of man-days of instruction furnished shall be specified below. All equipment and material required for classrooms training shall be provided by the Contractor.

C. Training Program: Each of the two training programs shall be accomplished in three phases for the time interval specified for each phase. A training day is defined as eight (8) hours of instruction including two 15-minute breaks and excluding lunchtime.

D. Phase I

1. This phase will be for a period of (3) days prior to the acceptance test period at a time mutually agreeable between the Contractor and the MAA. Operating personnel shall be trained in the functional operations of the installed system, the procedures employed for system operation and the maintenance of FMS equipment.

2. The first (2) days of training shall include:

   a. General FMS Architecture

   b. Operation of Computer and Peripherals

   c. Command Line Mnemonics

   d. Operation Control Functions

e. Graphics Generation

3. The third day of training shall include:

a. General Equipment Layout

b. Troubleshooting of FMS Components

c. Preventive Maintenance of FMS Components

d. Sensor Maintenance and Calibration

E. Phase II: This phase of training shall be conducted approximately four (4) weeks after system acceptance testing for a period of three (3) days. The first day of training shall be condensed review of the entire first phase subject material. The second and third days shall be based upon subject matter proposed by MAA personnel. One week prior to the date of the first Phase II training session, the MAA shall submit to each of the two Contractors a detailed list of subject matter which shall determine the content of the program (e.g., system software operational problems, software utilization, capability and usage, etc.).

F. Phase III:

1. Provide detailed training for two MAA's personnel for a minimum of five days (total 80 hours) at the Manufacturer's plant or training facility. Training must be in depth in the operation, maintenance, troubleshooting, and repair of the chillers.

2. Schedule training with MAA, through Engineer, with at least 60 days advance notice.

3.9 WARRANTEE

A. The control system herein specified shall be free from defects in workmanship and material under normal use and service. If within one (1) year from the date of acceptance by the Engineer, any of the equipment herein described is proved to be defective in workmanship or material, it will be adjusted, repaired, or replaced free of charge by the BAS Contractor.

3.10 MAA ACCEPTANCE

A. The FMS shall be considered acceptable to the MAA when the following conditions have been met.

1. Successful completion of the acceptance test.

2. Receipt of Operation and Maintenance Manuals.

3. Receipt of spare parts.

4. Correction of all punchlist items.

5. Receipt of all other documentation required, as noted below.

6. Phase I of Instructions to MAA's personnel as specified.

3.11 COMMISSIONING, TESTING, AND ACCEPTANCE

A. Perform a three-phase commissioning procedure consisting of field I/O calibration and commissioning, system commissioning, and integrated system program commissioning. Document all commissioning information on commissioning data sheets which shall be submitted prior to acceptance testing. Commissioning work which requires shutdown of system or deviation from normal function shall be performed when the operation of the system is not required. The commissioning must be coordinated with the MAA and construction manager to ensure systems are available when needed. Notify the operating personnel in writing of the testing schedule so that authorized personnel from the MAA and construction manager are present throughout the commissioning procedure.

1. Field I/O Calibration and Commissioning: Prior to system commissioning, verify that each control panel has been installed according to plans, specifications, and approved shop drawings. Test, calibrate, and bring on line each control sensor and device. Commissioning to include, but not be limited to:

   a. Sensor accuracy at 10, 50, and 90 percent of range.

   b. Sensor range.

   c. Verify analog limit and binary alarm reporting.

   d. Point value reporting.

   e. Binary alarm and switch settings.

   f. Actuator and positioner spring ranges.

   g. Fail safe operation on loss of control signal, electric power, network communications, etc.

   Record calibration and test data on commissioning data sheets. Sufficient space should be provided near each point name for sign off.

PART 4 - MEASUREMENT

4.1 METHOD OF MEASUREMENT

A. No separate measurement shall be made for work under this Specification Section.

PART 5 – PAYMENT

5.1 METHOD OF PAYMENT

A. No separate payment will be made for work under this Specification Section. The cost of the work, complete in place, described in this Specification Section shall be included in the respective Lump Sum Bids under Item 01010-1 "Building Construction."

B. Costs include all labor, material, services and equipment necessary to complete the work in every respect.

END OF SECTION 13975

SECTION 16430 - POWER MONITORS FOR LOW VOLTAGE SWITCHGEAR

PART 2 - PRODUCTS

2.1 COMPONENTS

A Multifunction Digital-Metering Monitor: All double-ended substations shall be equipped with a multifunction digital-metering monitor located at each secondary main circuit breaker. Metering monitor shall be sole-sourced exclusively from Square-D. There will be "No Exceptions Allowed". Metering monitor shall have as a minimum all capabilities of Square-D CM3350 circuit monitor. Metering monitor display and control unit shall be flush or semi-flush mounted in instrument component door. Metering monitor shall be fully compatible with Johnson Controls N2 protocol for monitoring and displaying basic electrical data.

END SECTION 16430

SECTION 16442 - PANELBOARDS

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: All Panelboards shall be sole-sourced exclusively from Square-D. There will be "No Exceptions Allowed".

2.2 MANUFACTURED UNITS

A. Enclosure Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.

B. Phase and Ground Bus Material: Hard-drawn copper, 98 percent conductivity.

C. Panel Short-Circuit Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals.

D. Branch Overcurrent Protective Devices:

1. All circuit breakers shall be bolt-on type, whenever possible, replaceable without disturbing adjacent units.

2. All 120/240 VAC rated circuit breakers shall have VISI-TRIP trip indicator.

E. <Insert other features as required for specific project>.

END OF SECTION 16442

SECTION 16714 –FLEXIBLE RESPONSE SYSTEM

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. The existing Flexible Response System is manufactured by Fire Lite Alarms, Inc., therefore modules shall be exclusively by Fire Lite Alarms, Inc. only. All other products required for system integration shall be submitted and approved by MAA with input from TENN security.

2.2 CONTROL PANEL

A. Provide monitoring modules and addressable control relay modules as described below for existing Fire Lite control panel MS-9200 for expansion.

2.3 MONITORING MODULE

Provide addressable monitoring module suitable for monitoring a normally open, dry contact device. Module shall be able to mount inside a single gang device box. Module shall have direct dial address entry (01-99).

Acceptable Product:
Fire-Lite Alarms, Incorporated, MMF301, Monitoring Module.

2.4 ADDRESSABLE CONTROL RELAY MODULE

Provide addressable control relay module with two independently addressed and controlled normally open relays. Model shall have direct dial address entry (01-99).

Acceptable Product:
Fire-Lite Alarms, Incorporated, CRF C304 Control Module

2.5 SECURITY STROBES

Strobe lights shall provide high Intensity flashes for fast premise identification, excellent visibility for the widest-angle coverage, 12V operating voltage and suitable for surface mounting. Red strobe light shall be Ademco Series SL1R or approved equal. Amber strobe light shall be approved equal.

Acceptable Product:
Amesco Series SL1A, Amber Strobe Light
Amesco Series SL1B, Blue Strobe Light

2.6 PIEZO HORN

Horn shall provide minimum 100 dB output at 175 mA or as recommended by manufacturer.

Acceptable Product:
Moose MPI-47 or approved equal Piezo Horn.

2.7 POWER SUPPLY

Power supply shall be a complete assembly of 16VA transformer (120V primary to 12V secondary), battery charger, 12V, 2.6AH sealed lead acid battery in NEMA 1 enclosure. It shall provide precision voltage regulation, transient protection and blowout protection for efficient operation of strobe lights, horns, panic button, footbar, etc. It shall activate devices during normal as well as emergency operation.
Acceptable Product:
Moose Product Inc. Series CH-12 or approved equal power supply.

2.8 FOOT BAR

Foot bar shall be 18 inches wide cast aluminum and operated by upward toe movement for security alarm with key re-settable indicator flag. It shall be provided with double pole double throw switch to activate audio and visual alarms.
Acceptable Product:
Ademco No. 266 or approved equal foot bar.

2.9 PANIC BUTTON

Panic button operation takes place when two large levers on either side of the switch are depressed simultaneously in order to activate alarm, and alarm signal cannot be activated if one lever is accidentally depressed. Panic button shall have key re-settable indicator flag and double pole double throw contacts to activate audio and visual alarms.
Acceptable Product:
Ademco Catalog No. 268 or approved equal panic button.

2.10 SILENCE KEY SWITCH

Silence key switch shall be provided with lock-mounted switch and key for silence operation. It shall be provided with double pole double throw contacts to activate audio and visual alarms.

Acceptable Product:
Ademco Catalog No. 269 or approved equal.

2.11 CONDUCTOR

Provide twisted shielded copper cables as recommended by manufacturer.

2.12 AUTOMATED EXTERNAL DEFIBRILLATORS

A. Defibrillator shall be 10.5 inched wide x 11.6 inches high x 4.0 inches deep, lightweight portable, with low maintenance requirements and long shelf life non-rechargeable lithium batteries. Biphasic Technology shall be used to deliver defibrillation truncated exponential with voltage and duration for patient impedance at 200 to 360 joules energy levels as recommended by the American Heart Association and International Guidelines Display of low battery alert service, shock count, CPR time and real time on two lines, 20 characters LCD on each line.

Acceptable Product:
Medtronic Physio-Control, Life Pack Series 500 Defibrillator.

B. Automated external defibrillator cabinets. Defibrillator cabinet shall be 12 inches wide x 16 inches high x 6 inches deep, with glass front door, magnetic contact, lead wires for monitoring module connection and disable alarm key in white epoxy finish. Provide BWI Fire Marshall approved sign above cabinet.

Acceptable Product:
Medtronic Physio control Series 3012604, Cabinet

END OF SECTION 16714

SECTION 16724 – CONTROLLED ACCESS SECURITY SYSTEM

PART 2 – PRODUCTS

2.1 MANUFACTURERS

The existing Controlled Access Security System is manufactured by General Electric Infographics; therefore, networked Intelligent Controllers, Card Readers and Remote Modules shall be exclusively by General Electric Infographics only. All other substituted products shall be submitted and approved by MAA with input from ADT. There will be "No Exceptions Allowed".

2.2 NETWORKED INTELLIGENT CONTROLLER (ACU)

A. The Networked Intelligent Controller (ACU) shall be a microprocessor-based device, which utilizes a 32-bit processor and a 32-bit bus structure. The controller shall have a minimum clock speed of 90 MHz, and shall be provided with at least 16 Mbytes of battery backed-up dynamic RAM. The controller shall feature a direct LAN/WAN connection to the controller bus structure in addition to two RS-232 or RS-485 connections, all of which shall be designed for use in communication with the existing server. The communication architecture of the ACU shall be such that in the event that the primary communication channel to the server is lost, the unit shall be capable of automatically switching to a secondary communication channel using one of the host RS-232 or RS-485 connections, and if required, shall be able to establish communications via dial-up modem.

B. The ACU shall be provided with a parallel printer port, which will enable it to print transaction data during loss of communication with the existing server. The ACU shall be capable of dynamically allocating its memory between database information and transaction history, which shall be stored if the controller has lost communication with the existing server. Such transaction history shall be automatically uploaded to the server once communication has been restored. The ACU shall be configured for local storage of no less than 100,000 cardholders. In its maximum configuration, the ACU shall be capable of storing 500,000 cardholders, and its memory utilization shall be such that if storing database information for 10,000 cardholders, it shall also be capable of storing one million transactions.

C. The ACU shall support the monitoring and control of 16 readers, with or without keypads. It shall also be provided with at least 12 five-state, fully supervised and fully configurable input points, and at least 12 fully configurable auxiliary output control relays mounted on the main circuit board.

D. Each controller must also be capable of expansion, by external Remote Input Modules (RIMs) and/or Remote Relay Modules (RRMs), to support a combination of up to 172

fully configurable five-state supervised input points or 156 output relays per ACU depending on configuration.

E. Each ACU shall be provided with a UL Listed uninterruptible power supply (UPS) mounted within the ACU enclosure. It shall provide sufficient battery backup to sustain complete operational effectiveness of all devices and equipment connected to the ACU including card readers Remote Reader Electronic (RRE) modules, electric locks, RIMs and RRMs for a minimum of four (4) hours of normal operation.

F. Each ACU shall utilize on-board self-diagnostic LEDs, removable terminal strips and a pop-in/pop-out circuit board.

G. Each ACU in addition to its on-board LAN/WAN connection shall support RS-232 and multi-drop RS-485 communication topologies. Provision of external LAN terminal server devices that are connected through serial communications to the ACU are not acceptable.

H. Each ACU shall support RS-485 bi-directional communication paths (dual multi-drop paths back to file server) with no additional hardware or firmware required.

I. Each ACU shall be supplied with all specified options available, including an enclosure with a tamper switch and lock.

J. Each ACU shall be capable of reporting the following alarm conditions to the existing ACAM file server:

1. Enclosure door tamper.
2. Primary power failure.
3. Low battery conditions.
4. Lost of communications.
5. All access control violations.

Acceptable Product:

GE Infographics System ACU2XL/16-E-2-UL-UPS-24V, Network Intelligent Controller.

2.3 RMS CARD READER/PINPAD

A. Reader shall be a single stage design to include a swipe/pass-through and the electronic interface to the ACU2 Controller. Each shall include a 32-character LCD display that allows the use of various text messages for user prompts or event notices.

B. LED lamps (red, yellow, green) shall visually display reader status with an internal audible annunciation providing response to keypad entries and door alarm conditions.

C. The readers can be configured for card with keypad.

D. The readers shall include four supervised alarm inputs that are user-configured for door contact, door release button and two general-purpose alarm points. The reader shall also have a solid state output that can be configured to operate the door strike.

E. The reader shall provide two single pole double throw relays. One relay can be used for door unlock. The other relay can be used for remote control functions.

Acceptable Product:

GE Infographics Systems Series RMS-2 Card Reader.

2.4 REMOTE INPUT MODULE

A. The Remote Input Module (RIM) shall be provided to support additional input points as required. The RIM shall support all industry standard alarm input devices.

B. Each RIM shall support 16 five-state supervised input points and two output relays. The status of each input point shall be indicated by a tri-state LED, and shall be available if required with an enclosure with a tamper switch through which these status LEDs can be viewed, and it shall be possible to append legends denoting the connection details of each input point on the outside of the enclosure. Each RIM shall be capable of being powered by the on-board UPS of an ACU or by a local 24 VDC UPS.

C. Each RIM shall utilize on-board self-diagnostic LEDs, industry standard terminal strips and a pop-in/pop-out circuit board.

D. Each RIM shall be supplied with all specified options available, including an enclosure with a tamper switch and lock. Quantity and location of remote input modules shall be as required for a physically complete and operational system. The RIM shall be Infographics Systems, no substitutions.

Acceptable Product:

GE Infographic RIM REND 1N0-RPL-E-2-RPL02, Remote Input Module.

2.5 REMOTE RELAY MODULE (RRM)

A. The Remote Relay Module (RRM) shall be provided to support additional output relays. The RRM shall utilize industry standard dry contact output relays.

B. Each RRM shall support eight SPST and eight DPDT output relays. Each RRM shall be capable of being powered by the on-board UPS of an ACU.

C. Each RRM shall utilize on-board self-diagnostic LEDs, and a pop-in/pop-out circuit board.

D. Each RRM shall be support 2 unsupervised inputs and 16 output relays. Each enclosure shall be provided with a tamper switch and lock. Quantity and location of RRMs shall be as specified in contract documents and drawings. The RRM shall be Infographics Systems, no substitutions.

Acceptable Product:

GE Infographic REND 1-RPL, Remote Relay Module.

2.6 DOOR RELEASE BUTTON

Release button shall be mounted in stainless steel green lit outlet. It shall be SP/ST rated for 10 amp, 24 VDC.

Acceptable Product:

Securitron No. PB2E, or approved equal, Door Release Button.

2.7 DOOR POSITION SWITCH

Door position switch shall be surface mount, SPDT, and accommodate wider break distance to minimize false alarm. Contact and magnet shall be 3.9" L x 0.6" W x 0.7" D to provide faster installation.

Acceptable Product:

Sentrol Series 1045, or approved equal, Door Position Switch.

2.8 EMERGENCY DOOR RELEASE BUTTON

Emergency button shall be mounted in custom made lexon cover junction box for emergency release. It shall be SP/DT to send "Door Release" alarm signal to ACU panel and locally unlock power to the electromagnetic lock.

Acceptable Product:

Securitron No. EEB2 or approved equal, Energy Door Release Button.

2.9 ELECTRICAL POWER and BACKUP

A. Normal System Power Supply: 120 V, 60 Hz from lockable disconnect device. System components shall be supplied with power through the ACU battery back-up and field located power supplies. Refer to the Contract Drawings for ACU and field power supply locations.

B. Power Source Transfer: When normal power is interrupted, system is automatically switched to back-up supply without degradation of critical system function or loss of signals or status data.

C. Field Power Supplies: Provide power supplies for supply of power to the electrical door hardware at locations detailed on the Contract Drawings. Power supplies shall be as recommended by the equipment manufacturer for devices being powered from supply. Power supplies shall provide four (4) hours of battery backup under full load of devices supported. Submit battery back-up calculations for each power supply to the Engineer for approval.

2.10 CONDUCTORS

A. Wire and cabling shall be as recommended by the manufacturer and all wire and cabling shall be installed in an enclosed conduit and raceway system.

B. After installation and before termination, all wiring and cabling shall be checked and tested to insure there are no grounds, opens or shorts on any conductors or shields.

C. Visually inspect wire for faulty insulation prior to installation. Protect cable ends at all times with acceptable end caps except during termination.

END OF SECTION 16724

SECTION 16740 – PUBLIC ADDRESS SYSTEM

PART 2 - PRODUCTS

2.1 MANUFACTURERS

The existing Public Address System is manufactured by Innovated Electronics Designs, Inc.; therefore, Announcement Control System, Ambient Analysis System, Testing and Monitoring System shall be exclusively by Innovated Electronics Design, Inc., only. All other substituted products shall be submitted and approved by MAA with input from WPS. There will be "No Exceptions Allowed."

2.2 ANNOUNCEMENT CONTROL SYSTEM (ACS)

A. Main Frame and Expansion Cards (ACS)

1. Main Frame

Mainframe shall consist of a modular mainframe with 16 ACS plug in cards without disconnecting system wiring. Mainframe provides digital interface and DC power connection to ACS plug in cards.

2. Microphone Interface Card

Microphone interface card addresses and decodes 8 microphone stations for microprocessor / CPU card. Microphone interface card buffers, isolates and routes audio signals through solid state switches to internal audio buses. Microphone interface card directs the audio signal from microphone stations to appropriate internal audio busses per ACS software configuration.

3. Central Processing Unit

CPU manages the all functions of ACS without need of external PC. CPU controls audio routing, relays, play back, and microphone stations. CPU also commutates with ACS PC.

4. Zone Output Card

Zone output card distributes the audio from the internal audio busses to the system zones per ACS software configuration. Zone output card allows software to select any signal from any one of the 8 internal audio busses to direct to any bus or zone output at any time. Zone output cards have two modes for background

music. One mode uses background music bus and send same signal to all zone outputs and other modes allows individual background music to each zone.

5. Relay Card

Relay Card activates relay for zone when it detects audio signal per ACS software configuration.

6. Hard Drive Card

Hard drive cards stores non-volatile programs, operating system data, control program, configuration files and permanent messages. Watchdog timer of hard drive card can refresh pulse to CPU and resets Announcement control system. Manual switch of hard drive card can reset announcement control system.

7. Digital Record/ Playback Card

Digital Record/ Playback card can play 8-recorded messages on 8 different audio channels simultaneously. Audio signals are digitized and store in DRAM. When messages are stored permanently, it transmits to hard drive card.

8. Rack Mounted Computer System

Rack mounted computer system consists of PC, monitor, keyboard and mouse drawer.

9. Power supply

Power supply provides 110 Watts, + 5 V DC output voltage with +/- 10 % output adjustment. Power supply has 25 A, 32 V (auto fuse) overload protection for + 5 VDC output circuits. Micro controller of power supplies allows main processor to switch the supply on and off by relay.

10. Power supply

Power supply provides 200 Watts, +/- 15 V DC output voltages with +/- 5 % output adjustment. Power supply has 10 a, 2 AG overload protection for +/- 15 VDC output circuits.

Micro controller of power supplies allows main processor to switch the supply on and off by relay. Power supply also allows the voltage adjustment by microprocessor.

Acceptable Products:

IED 500 M Main Frame
IED 500 C Microphone Interface Card
IED 500 CPU Central Processing Unit
IED 500 D Zone Output Card
IED 500 DR Relay Card
IED 500 P Hard Drive Card
IED 500 R Digital Record/ Playback Card
IED 590 R Rack Mounted Computer System
IED 405 L Power supply
IED 415 L Power supply

A. B. Microphone Stations

1. Limited Function Page 4 Button Stations – Limited function page stations shall have 4 zone group select buttons and ready/busy LEDs. Mounting configurations shall be horizontal or vertical orientation, flush or surface mount, desktop, or locking door enclosure. Microphone shall be handheld HFM_H series.

Acceptable Products:

IED 500 series microphone station with hardware

2. 2. Full Function Page 12 Button Stations – Full function page stations shall have a 12-button keypad for data entry, an LCD digital display and ready/busy LEDs. Mounting configurations shall be horizontal or vertical orientation, flush or surface mount, desktop, rack mount (with or without powered speaker), or locking door enclosure. Microphone options shall be handheld handset.

Acceptable Products:

IED 508 series microphone station with hardware

2.3 AMBIENT ANALYSIS SYSTEM (AAS)

A. Main Frame

1. Mainframe shall consist of a modular mainframe that holds 11 AAS plug in cards. Mainframe provides remote sensor interface and DC power connection to AAS plug in cards.

2. Central Processing Unit

CPU compares channel signals with sensor signal per AAS software and sends signals to each channel digital attenuator.

3. Power supply

Power supply provides 130 Watts, +31 VDC, +/- 15 V DC output voltage with +/- 10 % output adjustment. Micro controller of power supplies allows main processor to switch the supply on and off by relay.

4. Attenuator Card

Each Attenuator card channel controls the signal level of the program audio.

5. Remote Sensor

Sensors samples audio signal and sends to attenuation card to compare signal with channel signal by CPU.

Acceptable Products:

IED 540 M Main Frame
IED 540 CPU Central Processing Unit
IED 540P Power supply
IED 540 I Attenuator Card
IED 540 AC Attenuator Card
IED 540 IAC Attenuator Card
IED 540 S Remote Sensor

2.4 AUTOMATIC TEST AND MONITOR SYSTEM (ATMS):

A. ATMS Mainframe: The existing ATMS mainframe has spare points available for connection of points as indicated in the block diagram to the existing system.

1. The Contractor shall interface the additional equipment required into the existing Automatic Test and Monitor System. Programming shall follow the current methodology and also be completed by the Contractor.

2. Contractor shall provide equipment, as shown on contract documents, including interface cables as required.

Acceptable Products:

IED 596ML/H Audio Monitor/Test Switch Mainframe

B. Power Amplifiers

1. The power amplifiers shall be of a modular design using a slide in amplifier card installed in an existing mainframe. Each mainframe shall accommodate eight (8) amplifier cards. Card shall be 100-Watt dual-channel amplifier or 200-Watt single channel amplifier.

2. The amplifiers shall be of a high efficiency design to provide for long term operating efficiency. Minimum efficiency shall be 79 percent at full rated power.

   Acceptable Products:

   Dual 100 Watt 70-Volt Amplifier Cards: IED 6272L/ Single 200 Watt-70Volt Amplifiers w IED 6000 Series Frame and IED 596GS modules.

B. C. Equalization: The equalization system shall be modular and provide for up to twenty-two (22) processor-controlled four channel equalizers, a central processing unit (CPU), and available redundant power supplies.

1. Equalizers shall have nine (9) parametric or configurable bands.

2. Contractor shall provide interface cabling and software as required to interface this system with the existing ACS and Ethernet network.

   Acceptable Products:

   Four Channel Equalizer: IED 8044DSP Digital Signal Processing Card Main Frame IED 8001MF, IED 8001 CPU, IED 8102PS

C. D. Fiber Optic Interface:

1. Ethernet Network Interface shall be a 10/100 baseT Ethernet switch with a minimum of 6 ports. Cat #IED 903

2. The fiber optic transmission system shall be a network-based system capable of transmitting and receiving both data and professional audio signals over multimode fiber optic cabling. The system shall be 19" EIA/TIA standard rack mountable and shall have the following system features:

   a. Dynamically controlled routing and switching.

b. Scalable network
Acceptable Products:

BEC Technologies – OMNInet Series or equal Fiber Optic Transmission System.

3. System Rack Chassis: The system rack chassis shall have the following specifications.

   a. Redundant power supplies.

   b. 21 Slot back plane for hot swappable modules.
   Acceptable Products:
   BEC Technologies OCHSYS or equal rack.

4. Network Interface Module: The network interface module shall have the following specifications.

   a. 147.456MB/s effective rate

   b. Redundant network operation

   c. Hot swappable

   d. Non volatile memory for storage of system information

   e. Automatic detection and reporting of system level problems

   f. System power and data accuracy indicators

   g. Integrated network management system
   Acceptable Products:

   BEC Technologies FC101 or equal Network Interface Module.

5. Two Channel Slow Scan Data Input/Output (I/O) Module: The I/O module shall have the following specifications.

   a. Individual channel allocation

   b. Two channels per card

   c. I/O software configurable to RS232, RS422, and RS485

   d. Normal and fast transfer modes

   e. 84 sub-nets per fiber optic strand – 672 on fully loaded network

f. Hot swappable

Acceptable Product:

BEC Technologies SSD002 or equal Scan Module

6. 24 Bit Professional Audio Input Module: The audio input module shall have the following specifications.

   a. Four channel audio inputs

   b. Hot swappable

   c. Burr Brown INA103 low noise analog front end

   d. Phantom switching of individual mic preamps, 0 to +60dB gain control

   e. Dynamic Range: 116dB typical

   f. Frequency Response: 10Hz – 22 kHz +/- .1dB

   g. THD+N: 0.0002% typical

   h. Crosstalk: < 120dB

   i. Sample Rate: 48 kHz Fixed

   j. Oversampling: 64x

   k. Group Propagation Delay: 1.23mS

   l. Signal Indicators: Green = Signal Present > -60dB Reference FS

      Amber = Signal > -24dB Reference FS

      Red = Clip

   Acceptable Product:
   BEC Technologies ADA424 or equal audio input module.

7. 24 Bit Professional Audio Output Module: The audio output module shall have the following specifications.

   a. Four channel audio outputs

   b. Hot swappable

   c. Dynamic Range: 116dB typical

d. Frequency Response: 10Hz – 22 kHz +/- .1dB

e. THD+N: 0.0002% typical

f. Crosstalk: <108dB

g. Sample Rate: 48 kHz Fixed

h. Oversampling: 64x

i. Output Drive: > 50ohm Active Balance Line

j. Signal Indicators: Green = Signal Present > -60dB Reference FS

Amber = Signal > -24dB Reference FS

Red = Clip

Acceptable Product:
BEC Technologies DAA424 or equal Audio Output Module

8. Universal AC Input Power Supply Module: The power supply module shall have the following specifications.

a. Hot swappable

b. Redundant Operation

c. 90 – 264 VAC Input

d. 47 – 440 Hz Input Frequency

e. Output Power: 200 Watts Continuous, 220 Watts Peak

f. Output Voltages: +5 Volts Digital Supply

+12 Volts Analog Positive Supply

-12 Volts Analog Negative Supply

+48 Volts Phantom Power Supply

g. Input Surge Current: 25 Amps maximum, Cold Start

h. Operating Temperature: 0 – 50 degrees C

i. Approvals: UL, Ulc recognized and TUC Approved

Acceptable Product:
BEC Technologies PSA01 or equal Power Supply Module

D. E. Equipment Cabinet:

1. Equipment Cabinet shall be 83 1/8" high, 24 1/4" wide, 32 1/2" deep and have mounting rail spacing to support mounting of standard 19" EIA equipment.

2. Equipment Cabinet shall be provided with front vented and rear solid locking doors.

3. 3. Equipment Cabinet shall include copper grounding buss bar system.

4. Equipment cabinet shall be void of open spaces on the front the cabinet. Provide blank panels, vent panels and cabinet top panels as required for full cabinet build out.

Acceptable Products:
Middle Atlantic WRK Series or equal equipment cabinet.

E. F. Terminal Cabinet

Terminal Cabinets provided for the termination of system cables shall have minimum dimensions of 24"W X 36" H x 4" deep. Equipment enclosures shall be provided with locking doors (keyed as directed by BWI technical staff) and backboard for termination fabrication and cable routing.

Acceptable Products:
Hoffman Type 1 Enclosure Series or equal Terminal Cabinet.

F. G. Type 1 Loudspeaker Assembly: 4-inch, flush mounted speaker assembly in acoustic tile or bulkhead with grille, enclosure, mounting hardware and transformer.

1. Sensitivity shall be at least 88 dB average (1 Watt/1 Meter)

2. Frequency Response: 75 to 20 kHz

3. Transformer shall have 70 Volt primary and multiple taps and an 8-ohm secondary.

4. Transformer shall mount integrally to the loudspeaker.

5. Grille shall be a low profile.

6. Power handling: 25 Watts
Acceptable Products:

Atlas FAP42T or equal Type 1 speaker Assembly

H. Type 2 Loudspeaker Assembly: Assembly shall be a multiple driver speaker cabinet, mounted on corrugated ceilings, with grille, backbox and all mounting accessories.

1. Sensitivity shall be at least 94 dB SPL (1 Watt at 1 meter).

2. Frequencies Response: 62 to 20 kHz.

3. Power Handling: 500W continuous.

4. Transformer shall mount integrally to the loudspeaker.

5. Grille shall be a low profile, with finish to match surface to which it is mounted. Prior to ordering the grille the Contractor shall submit color/finish for architectural approval.

Acceptable Products:

EAW CP499 and support system or equal Type 2 speaker assembly.

G. I. Type 3 Loudspeaker Assembly: Assembly shall be dual 4" drivers and 1" dome tweeter, in surface mounted enclosure, mounting hardware and transformer.

1. Sensitivity shall be at least 85 dB Peak (1Watt/1Meter)

2. Frequency Response: 120 to 20 kHz

3. Transformer shall have 70 Volt primary and multiple taps.

4. Transformer shall mount integrally to the loudspeaker.

5. Grille shall be a round profile, with finish to match surrounding surface.

6. Power handling: 90 Watts

Acceptable Products:

TOA H-1 or equal speaker assembly.

J. Type 4 Loudspeaker Assembly: Assembly includes 8" woofer and 1" exit coil compression driver on a 90X60 Constant Directivity horn, mounting hardware and transformer. System shall attach to structure as required.

7. 1. Sensitivity shall be at least 95 dB Peak (1Watt/1Meter)

8. 2. Frequency Response: 89 to 18 kHz

3. Transformer shall have 70 Volt primary and multiple taps.

4. Transformer shall mount integrally to the loudspeaker.

5. Cabinet shall be finished to match surrounding surface.

6. CD horn shall be able to rotate in 90degree increments.

7. CD horn shall have optional 120x60 degree pattern available to fix cabinet.

8. Custom mounting hardware.

9. Power handling: 300 Watts

Acceptable Products:

EAW MK8196T or equal speaker assembly.

K. Type 5 Loudspeaker Assembly: Assembly includes weather resistant 2 way speaker with asymmetrical coverage.

10. 1. Sensitivity shall be at least 95 dB Peak (1Watt/1Meter)

11. 2. Frequency Response: 100 to 15 kHz

12. 3. Transformer shall have 70 Volt primary and multiple taps.

13. 4. Speaker pattern shall be 70 – 120 degrees horizontal by 75 degrees vertical.

14. 5. System shall have 2 – 8" low frequency drivers.

15. 6. System shall have 1 – 1" titanium driver for High frequencies.

16. 7. Cabinet shall be hand laminated fiberglass with gray gel coat and black powder coated grille.

17. 8. Custom mounting hardware.

18. 9. Power handling: 200 Watts

Acceptable Products:

Community WET2V8 or equal Type 6 speaker assembly.

L. Type 6 Loudspeaker Assembly: Flush mount acoustical ceiling speaker assembly shall include flush mount Backcan, 8" speaker with baffle and support hardware.

19. 1. Sensitivity shall be at least 95 dB (1Watt/1Meter)

20. 2. Frequency Response: 100 to 16 kHz

21. 3. Transformer shall have 70 Volt primary and multiple taps.

22. 4. Speaker pattern shall be 90 degrees conical.

23. 5. System shall have 10 ounce magnet dual cone speaker.

24. 6. Backcan shall be a flush mount enclosure with ½' and ¾' knockouts.

25. 7. Power handling: 15 Watts

Acceptable Products:
Atlas SD72W or equal speaker baffle assembly

Atlas EZ 96-8 or equal backcan/supports

H. M. Type 7 Loudspeaker Assembly: Assembly includes surface mount re-entrant horn.

1. Sensitivity shall be at least 105 dB (300-3000Hz. Band limited)

2. Frequency Response: 280 to 8 kHz

3. Transformer shall have 70 Volt primary and multiple taps.

4. Speaker pattern shall be 100 degrees by 60 degrees.

5. System shall have a compression driver.

6. Enclosure shall be a weather resistant surface mount horn assembly with weatherproof cable.

7. Power handling: 60 Watts

Acceptable Products:
Electrovoice Cobraflex III horn with 1829BT Convertible Driver or equal.

I. N. Type 8 Loudspeaker Assembly: Flush mount speaker assembly for gypsum ceiling shall include a 12" coaxial speaker with backcan, baffle and support hardware

1. Sensitivity shall be at least 99 dB (1Watt/1Meter)

2. Frequency Response: 58 to 15 kHz

3. Transformer shall have 70 Volt primary and multiple taps.

4. Speaker pattern shall be 90 degrees conical.

5. System shall have 12" low frequency driver.

6. System shall have 1 – 1" titanium compression driver for High frequencies.

7. Backcan shall be a flush mount square enclosure with ½' and ¾' knockouts with 4 cubic feet of volume minimum.

8. Power handling: 250 Watts

Acceptable Products:
Atlas 12CXT60 or equal speaker
Atlas Q4712 or equal backcan

Atlas 164-12A or equal baffle

J. O. Type 9 Loudspeaker Assembly: Assembly includes weather resistant surface mount speaker system for working side of aircraft general paging coverage.

1. Sensitivity shall be at least 98 dB (100-16,000Hz.)

2. Frequency Response: 90 to 16 kHz ± 5dB.

3. Transformer shall have 70 Volt primary and multiple taps.

4. Speaker pattern shall be 90 degrees horizontal by 40 degrees vertical.

5. System shall have 12" low frequency driver.

6. System shall have 1 – Kaladex driver for High frequencies.

7. Enclosure shall be finished in roto-molded gray polyethylene supplied with heavy duty bracket.

8. Power handling: 60 Watts

Acceptable Products:

Community R.5-94T or equal speaker assembly

K. P. System Wiring

1. Unless otherwise required, Contractor shall use the following cables, or approved equals:

2. Microphone and line-level audio cable in conduit or cable tray:

   a. Nominal Capacitance of 35 pF/ft

   b. Nominal Outside dimension of 0.118 inch

   c. 100% shield with Z- Fold shielding

   Acceptable Products:
   Belden 82761 or equal audio cable

3. Microphone and line-level audio cable for internal cabinet wiring:

   a. Nominal capacitance of 24 pF/ft

   b. Nominal outside dimension of 0.175 inch.

   c. 100% shield with Z-Fold

   Acceptable Products:
   Belden 8761 or equal audio cable.

4. Loudspeaker signal lines shall be sized to allow no greater than 5 percent loss from source to first speaker. Lines shall be twisted pair, Plenum jacketed with no shield.

   a. Minimum conductor strand count: 19

b. UM type CMR or CL3R

Acceptable Products:

Belden 6000UE series or equal.

L. Q. Audio Termination System

1. Provide wall mount termination located in terminal cabinet to connect incoming field microphone station lines.

2. Termination system shall provide:

a. Compression terminal blocks certified for stranded and solid wire.

b. Rigid mount terminals which can be replaced if damaged

c. Designation strips for contractor to provide label information on.

3. Provide as many units as necessary.

Acceptable Products:

Electrovert Kl1620PA or equal.

R. Speaker Terminal Strips

1. Provide speaker terminal strips to terminate incoming speaker field circuits to amplification equipment in terminal cabinets.

2. Provide track system with end stops and terminal blocks with screws for terminations.

Acceptable Products:

MP Flexi-Block System or equal.

END OF SECTION 16740

SECTION 16782 - CLOSED-CIRCUIT TELEVISION (CCTV) SYSTEM

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. The existing Closed Circuit Television System is manufactured by Philips Communication; therefore, Matrix Switches, digital recorders, camera, and power supplied shall be exclusively by Philips Communication only. All other products required for system integration shall be submitted and approved by MAA with input from ADT. There will be "No Exceptions Allowed."

2.2 GENERAL

A. Provide CCTV systems, of types, sizes, capacities and electrical characteristics indicated below, consisting of CCTV cameras, LCD monitors, video matrix switcher, keyboard controllers, signal equipment, camera enclosures, power supplies, and other components as required for complete installation. Except as otherwise indicated, provide manufacturer's standard CCTV system components as indicated by published product information, designed and constructed as recommended by manufacturer.

2.3 SATELLITE MATRIX SWITCHER

A. The Matrix System shall integrate the specified CCD cameras and peripheral products into a comprehensive extension of the existing MAA CCTV system. A built-in cable compensation circuit on every input channel shall provide high quality picture and control. The system's extensive program capability shall include versatile camera sequences, alarm mode, time/date event scheduling, password protection, operator's access level, priority and system partitioning, providing outstanding flexibility.

B. A keyboard controller shall be used for setup, camera control and video routing. The keyboard controller unit's 2-line character LCD display and function keys shall provide direct menu access to cameras.

C. The system shall have 80 inputs and 4 outputs as base configuration; by adding 16-channel video input modules, and/or 4-channel video output modules the system can be expanded to accommodate up to 256 cameras, 64 monitors and 32 keyboard controllers.

D. The system shall have the ability to integrate external devices such as computers, printers and alarm input devices. The built-in RS-232C port shall permit up and downloading of the system data for back-up and restore purposes with a PC. The system can be controlled and programmed through the RS-232C port, if a printer is connected,

the system set-up data can be printed and verified. The built-in diagnostic program shall help to identify a malfunction speedily for system maintenance and repair. The power source shall be 120VAC, 60Hz. The system shall be UL listed.

E. The system shall have a data connection via a fiber optic multiplexer specified elsewhere within this specification for communications with the existing matrix switcher. The Contractor shall be responsible for all required new and existing system programming for a functionally complete and operational system.
Acceptable Products:
Philips Model LTC 8800 System Matrix Switcher.

The Matrix shall be manufactured by Philips Model LTC 8800 System, no substitutions. The following parts, in quantities as required, shall be included in Matrix Switcher:
Philips LTC 8801/60 CCTV switching bay, CPU and power supply.
Philips LTC 8821/00 Video input module, 16-video inputs per card.
Philips LTC 8834/00 Video output module, 4-video outputs per card.
Philips KBD Universal Universal Digital Keyboard Controller.

2.4 DIGITAL VIDEO RECORDER

A. General: The digital video recorder (DVR) shall have the following general specifications:

1. Video Inputs - 16

2. Software - Windows 2000

B. The DVR shall provide full screen or selectable multi-screen displays of 2x2 (quad), 3x3, and 4x4 formats.

C. The recorder shall be capable of sequencing the 16 camera inputs as four quad displays.

D. The date/time, recorder name, and camera name shall be stored with each image recorded.

E. The recorder shall provide 16 video inputs with independently configurable frame rate settings (ips).

F. The recorder shall provide 16 video inputs with independently configurable frame rate settings (ips). Each recorder input for this project shall be configured for 3.75 ips. Recorded digital video shall be stored for a period of 30 days for all inputs.

G. The digital recorder shall be capable of recording at the following images per second (ips) rates:

1. Up to 120 ips (1 to 4 cameras) or up to 80 ips (5 to 16 cameras) with one compression card installed.

2. Up to 240 ips (1 to 8 cameras) or up to 160 ips (9 to 16 cameras) with two compression cards installed.

H. The recorder shall use temporal compression based on proprietary MJPEG and H.263 technology.

I. Image integrity shall be maintained using proprietary codec, time/date stamp, watermark authentication.

J. The recorder shall be capable of providing simultaneous recording and playback.

K. The recorder shall provide five independently configurable motion detection zones per camera.

L. The recorder shall provide a function to bookmark a specific time and date of a video file for easy retrieval at a later date.

M. The recorder shall provide pre and post alarm recording.

N. The recorder shall provide both local and remote pan/tilt/zoom control.

O. The system shall provide the following minimum TV Lines of Resolution (TVL) as related to the digital memory resolution:

1. 450TVL at 640H x 480V; 280TVL at 320H x 240V; 120TVL at 160H x 120V

P. The recorder shall include the following:

1. CDRW unit.

2. SCSI-2 interface connection to allow video archiving to a disk array.

3. 3.5 Floppy drive.

4. Inputs for sixteen (16) programmable, N/O, N/C dry alarm contacts.

5. Sixteen (16) programmable output relays.

6. 480 Gigabyte hard drive for storage of digital video.

Q. The recorder shall provide the capability to load a bitmap image of a facility, then drag and drop camera and alarm icons to create an overview of the installation thereby allowing an operator to click on the camera icons to view video from the selected camera.

R. The recorder shall be capable of recording single channel audio.

S. The recorder shall include remote viewer Graphical User Interface (GUI) software to allow simultaneous access via Ethernet to live and recorded video. This software shall also provide system configuration and pan/tilt control supporting up to sixteen (16) recorders. The Contractor shall configure this software and program the GUI for connection to an Ethernet system provided by others. Contractor work shall include physical connection of the recorders to the Ethernet switch and configuration of the software on a computer workstation provided by others.

T. The recorder shall have remote administrator configuration capability.

U. The recorder shall provide a POS database interface that allows search parameters for time, date, camera, merchandise, and cash amount of sale.

V. Electrical Specifications:

1. Video Input: 1Vp-p, composite video, 75 ohms.

2. Video Output: 1Vp-p,composite video 75 ohms.

3. Power supply: Switch selectable between 110 VAC, 60Hz and 220 VAC, 50Hz. 4. Audio: 1-channel (line in or mic. in, line out).

4. Connectors:

a. Video input: 16 BNC, non-looping

b. Video output: RCA (BNC converter supplied.

c. SCSI-2 HD-50 interface to disk array

d. RJ-45 10/100 Mb base-T Ethernet connection.

e. Audio: 1/8-inch mini phone jack.
Acceptable Product:
Philips Model DR16248 Digital Video Recorder.

2.5 QUAD VIDEO PROCESSOR

A. The quad video processor shall permit viewing of 4 cameras on a single LCD display.

B. The unit shall offer full time quad display and full screen display of video images.

C. The unit shall have 720 x 484 pixel resolution and 525 lines resolution.

D. The rear panel shall feature 4 loop through Auto Terminated BNC video inputs, 4 alarm

input connections, one BNC monitor output, one BNC record output, and a RS-232 remote callup 15-pin D input.

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

2.6 CLOSED-CIRCUIT TELEVISION CAMERAS

A. General: Provide CCTV color cameras, associated accessories and wiring for MAA surveillance. Cameras shall be connected to the existing MAA matrix switcher via fiber optic multiplexers installed under this project.

B. Fixed Color Cameras: Provide 1/3 inch format cameras using solid state, interline transfer, charge coupled device (CCD) image sensors. Cameras shall produce standard EIA video signals with composite output level of 1.0 v p-p and 75 ohms impedance. Output connectors shall be BNC types. All cameras shall feature no geometric distortion, immunity to electrical and magnetic fields. All cameras shall be provided as standard resolution for color as specified herein and indicated on plans.

1. Standard resolution for color cameras shall have the following features.

   a. The minimum scene illumination to obtain "usable video " shall be 2 lux at F 1.4 (0.2 foot-candle) based on scene illumination, 75 % reflectance factor, automatic gain control (AGC).

   b. Signal to noise ratio shall be 50 dB, minimum with AGC off.

   c. The camera shall incorporate back light compensation (BLC), aperture correction and auto tracing white balance (ATW).

   d. The camera shall conform with UL 544 and 1409 and radiation standards of FCC class B. Input power shall be 24 volt AC, 60 Hz.

   e. The camera shall accept C and CS mount lenses and shall be capable of functioning over a temperature range of -20° – 32° F. External dimensions of camera shall not exceed 2.65 inches wide x 2.56 inches x 4.81 inches length and weight shall not exceed 2 pounds. The housing shall be weatherproof metal case with top heater, blower and bottom mounting provision.
   Acceptable Product:
   Philips Model LTC 0450/21, Cameras.

C. Integrated high-speed dome color pan/tilt/zoom camera: Cameras shall be provided complete with all back boxes, mounting adapters, and hardware required to install camera in location shown on the Contract Drawings.

1. Integrated dome pan/tilt/zoom camera shall be suitable for in-ceiling mount, pendant mount, or wall mount as required for the camera location and meet the following specifications:

   a. 99 Presets

   b. 0.5° preset accuracy

   c. Proportional Pan and Tilt

   d. Privacy Masking

   e. Guard Tour

   f. Image sensor:

      1) Sensor shall incorporate integral infrared cutoff filter.

      2) Image sensor shall be a color 1/4-inch interline transfer CCD.

      3) Sensor shall be free of blemishes as defined by EIA-330, and shall not have dead pixels.

      4) Sensor shall have at least 768 horizontal pixels and 494 vertical pixels.

2. Resolution: Camera shall have at least 470 lines of horizontal resolution. Resolution shall not vary over the life of the camera.

3. Signal-to-noise ratio: At least 50 dB unweighted with no gain.

4. Sensitivity:

   a. Slow shutter off: 0.025 fc/0.25 lux.

   b. Slow shutter on: 0.0016 fc/0.016 lux.

5. Automatic Circuits: The camera shall have:

   a. Automatic white clip.

   b. Automatic white balance.

   c. Automatic gain control.

d. Electronic light control (electronic shutter speed).

e. Auto-iris drive.

6. Lens:

   a. Lens shall be equipped with an auto-iris mechanism.

   b. Lens shall be an 18 times optical (4.1mm - 73.8mm) and 12 times digital zoom with an aperture range of f/1.4 to f/3.0.

7. Dome pan/tilt drive:

   a. Shall be supplied as part of the integrated assembly.

   b. Dome shall have continuous 360° pan capability.

   c. Pan speed rate shall be variable from 0.1-120° per second (manual operation).

   d. Shall have variable-rate, proportional pan and tilt speed that shall decrease the pan and tilt speed in proportion to the zoom focal length.

   e. Presets position speed rate shall be 360° per second, +/- 0.50° accuracy.

   f. Dome bubble shall be smoked gray color or clear as approved by the Engineer.

   g. Dome drive shall have auto flip functionality and have quick disconnect for mechanical and electrical connections.

   h. Domes for outdoor use shall be rated as follows:

      1) NEMA 4X.

      2) Humidity: 0% to 90% relative, non-condensing.

      3) Operating Temperature Range: -40°F to +122°F

8. Mount shall be furnished complete with all interface cards, receiver/drivers, translator cards, cables and appurtenances so they are fully functional and compatible with the existing switcher and pan/tilt control system.

9. Contractor shall consult with the Engineer on color of pendants and exposed hardware and submit samples to the Engineer for approval.
   Acceptable Product:

Philips G3 Autodome Bu ENV Euvito Dome Series.

D. Vari-focal lenses: Provide 1/3-inch format auto iris vari-focal lens with the following operational features.

1. Focal length: 2.8 -6 mm, 3.5 - 8 mm, and 5 - 50 mm. As required for each specific camera location.

2. Iris Range - F1.2 - close

3. Focus Range: 1 foot to infinity

4. Weight: .18 lbs

5. Lens mount: CS

6. Angle of view: Wide 88.7° x 69.2°
Tele 44.2° x 34.0°

7. Iris Type: Automatic
Acceptable Product:
Philips Models LTC-3364/20, LTC-3364/31, and LTC-3374/20 lenses, no substitutions.

E. Indoor Housing for Fixed Camera: Provide indoor housing for fixed or suspended ceilings with following features.

1. Maximum camera/ lens size: 8" L x 4" W x 4" H.

2. Dome: .13-inch thick polycarbonate.

3. Mounting: suspended ceiling mount.
Acceptable Product:
Philips Model LTC 9370/00, Camera.

F. Camera Power Supply: Provide 120/24 VAC, 60 HZ camera power supply with the following characteristics:

1. Camera outputs: 4, 8, and 16.

2. Voltage input: 120 VAC, 60 Hz.

3. Voltage outputs: 24 VAC.

4. Current Output: Maximum current available for each terminal pair is 1.85 AC.

5. Controls and indicators Power LED and on/off switch inside cabinet.

6. Connectors: Screw terminals.

7. Construction/finish: Beige metal case.

8. Dimensions: approximately 11.25 " W x 3.5 " D x 11.25.
Acceptable Product:
Philips Model LTC 540X/60 Series, Power Supply where X equals the number of outputs as required per number of cameras fed."

2.7 9-INCH COLOR MONITOR

A. The 9-inch color monitor shall be mounted in a 19-inch vertical cabinet located within the MDF Room A206.
Acceptable Product:
Philips Model LTC 2810/90, 9-inch color monitor.

2.8 42-INCH LDC MONITOR

A. General:

1. Video displays shall be provisioned with UL, CE or ETL labeling indicating compliance with recognized standards.

2. Suitable manufacturers of LCD video screens include: Eternal Graphics, NEC, Philips, or approved equal.

B. Display Characteristics:

1. Minimum Active Area: 41.4" for 42-inch units.

2. Aspect ratio: 16:9.6

3. Resolution: WVGA (1280 x 768)

4. Horizontal Viewing Angle: 170°

5. Vertical Viewing Angle: 170°

6. Brightness: 450 Cd/m^2

7. Color Range: 16.7 Million colors

8. Contrast Ratio: 600:1

C. Physical Parameters & Special Features:

1. Unit Dimensions (WxHxD): 36.5"x23.2"x3.95"

2. Backlight Half-Life: 50,000 Hours

3. Power Consumption: 110-120VAC/50-60Hz, 240 Watt

4. Unit Weight: 53 lbs.

5. Ambient Temperature/Humidity: warranted operational range + 32°F to +95° F and 20 to 80% relative humidity (non-condensing)

D. Signal & Control Features for Video Displays

1. RS-232 Video Display Remote Control

2. Infra-Red Remote Control

3. Video Signal Input:

a) Data: VGA (640x480), WXGA (1280x768), DVI-I

b) Video: Composite Video (NTSC, PAL, SECAM), S-Video (NTSC, PAL)

2.9 DIGITAL FIBER OPTIC VIDEO MULTIPLEXER AND DATA TRANSCEIVER

A. Provide digital fiber optic video/data multiplexers as required. Multiplexer shall allow transmission of 4 channels of high resolution, real-time color video, as well as bi-directional data simultaneously on one optical fiber. The unit shall employ 8-bit digital encoding for transmission of these signals. The multiplexer shall consist of a video transmitter/data transceiver, and a video receiver/data transceiver. The multiplexer shall allow bi-directional transmission of Manchester Encoding, Bi-Phase, RS-232, RS-422 or RS-485 (2 or 4 wire) data protocols. No in-field electrical or optical adjustments or in-line attenuators shall be required. All units shall be available in both rack mount and surface mount versions. The units shall have solid-state limiters on all power lines, which shall provide for automatic reset. All rack mount units shall have an internal DC power supply. A short circuit in one unit shall not affect operation of other units powered from the common power supply. The rack mount units shall be hot swappable with no risk of damage to other units or rack during replacement. The unit shall be UL listed. Operating temperature shall be –40°C to +74°C for all units.
Acceptable Products:
IFS model VT7420DRDT-R3. The video transmitter/data transceiver rack mount rack mount.
IFS model VR7420DRDT-R3. The video receiver/data transceiver rack mount.

B. 19" Rack Mount Panel – Provide IFS R3 card cages, no substitutions with the following characteristics:

1. Input Voltage: 115 VAC (line cord)

2. Power supply (to plug-ins): 20 VAC @ 2.8A

3. # Slots/Spacing: 14 slots available, with internal power supply.

4. Size (In.) (W x H x D): 19.0 x 5.2 x 7

5. Fusing: 1A slow blow (Rack Power supply) (Plug-in modules individually fused)

2.10 ETHERNET SWITCH

A. The Contractor shall provide Ethernet switches to support the transmission of digital video between the remote DVRs and the existing DVR workstation as specified herein and detailed on the contract drawings. This includes provision of the proper quantities of media ports. The Ethernet switches shall be intelligent, layer 2 and SNMP manageable. Provide all intra-rack cabling, connectors and transceivers required for operating the system.

B. Ethernet switches shall be compatible with the existing MAA/BWI CISCO network: Rack mount 24 port 100BaseTX switch, with redundant Power supply unit and fiber optic GBIC uplinks.

C. Coordinate with MAA IT/Network representative for, IP address, network management and redundancy scheme.

Acceptable Product:
Cisco 2950G-EI Ethernet Switch.

2.11 19-INCH EQUIPMENT CABINET

A. Provide 19-inch equipment cabinets as specified in Section 16741 - Premise Wiring and Distribution Systems.

2.12 SIGNAL TRANSMISSION COMPONENTS

A. CCTV camera cable: Cellular-polyethylene dielectric, bare copper double braided shield with 95 percent minimum shielding factor, No. 18 AWG stranded copper conductor and PVC jacket, RG-6U.

B. CCTV coaxial cable Connectors: Type BNC, 75 ohms.

C. CCTV coaxial cable splitter: Type BNC, 75 ohms.

D. CCTV camera covert operations outlets: Recessed, Type BNC, 75 ohms.

Fiber Optic Patch Cords: Provide all required fiber optic patch cords. Patch cords shall be as specified in Section 16741.

END OF SECTION 16782

ITEM L-109 MODIFICATIONS AND ADDITIONS TO AIRFIELD LIGHTING CONTROL SYSTEM

EQUIPMENT AND MATERIALS

109-2.1 COMPUTERIZED AIRFIELD LIGHTING CONTROL SYSTEM (CALCS) MODIFICATIONS, ADJUSTMENTS, AND CALIBRATION. Modify the existing computerized airfield lighting control system (CALCS) so that the display reflects new Lighting Circuits. Add new components to control and monitor new regulators and adjust the existing (CALCS) equipment as required including additional wiring and conduits. Provide all necessary wire and conduit to accommodate new components necessary to provide a working system. The Contractor shall sub-contract Siemens Airfield Solutions (SAS) to modify the existing computer system software and screen graphics to reflect the changes required by this contract. All screen graphic and software changes shall be submitted to the Engineer for approval prior to installation. Work under this contract shall not void any existing warranties on the existing system. After all lights are installed and all other electrical modifications have been made, recalibrate all lighting circuits which have had load changes. This will require field work to verify that lighting fixtures are properly operating (or recording outages). It is the Contractor's responsibility to restore the computerized lighting control system at the Air Traffic Control Tower, Electrical Vault or Portable Personal Computers, and any other existing airfield monitoring locations to full calibration and operation reflecting all changes at the end of the project.

Materials for changes to the CALCS shall be in all ways matched to and compatible with the existing system component parts.

All new components shall be compatible with the existing SAS CALCS system installed in 2000. Contact SAS at 860-408-9546 for system details.

a. TESTING AND COMMISSIONING

1. The Contractor in cooperation with SAS shall prepare and submit a proposed testing and commissioning procedure for the CALCS. Prepare these documents listing the testing and commissioning procedures and expected test results. As a minimum, tests shall include:

(a) Point-to-point wiring continuity tests.

(b) Insulation and grounding tests.

(c) Fiber-optic network communications tests. Include in Pay Item Section 16134.

(d) Verification of all remote control functions for each controllable element.

(e) Touch-screen monitor operations, screen display sections, command select acknowledgement, and action confirmed representations, alarm indications.

(f) AEMS computer tests.

b. WARRANTY. Provide a written guarantee that the CALCS equipment and components supplied and installed are guaranteed against defects and malfunction for a period of 12 months from date of completion of commissioning.

109-2.2 INDIVIDUAL LAMP CONTROL AND MONITORING SYSTEM

a. Addressable Device

The lighting series circuits shall be used as the transmission backbone or infrastructure of a communication command and information network. Addressable devices shall provide the interfacing between the controlled and monitored elements (lamps, signs, etc.) and the rest of the system. To allow communication to a controllable element in the field, via the lighting series circuit, the only required airfield hardware installation is to plug an addressable device into the secondary circuit of the relevant FAA L-830 isolation transformer. The addressable device shall be enclosed in a permanently sealed watertight epoxy case and suitable for installation in L-867 or L-868 size B light base. No additional wires shall be required between the field elements and the electrical vault. No bypasses or filters shall be required in the field.

The addressable device shall be designed to control and monitor individual airfield elevated or inpavement lighting fixtures and to receive signals from sensors and detectors. The addressable device shall be able to function properly on circuits powered by various CCR styles and different manufacturers. The device shall be capable of functioning properly on constant current series circuits having various wave shapes, load variations and high noise levels.

The addressable device shall be a microprocessor-based unit and consist of:

1. Master. The Master shall be able to communicate with remote units via series circuit and shall have an interface with the existing CALCS. The Master shall have lightning protection equal to that on the output of the CCR. Input power for Master shall be 120 VAC, 60 HZ.

2. Remote. The remote shall provide the following data:

(a) ON/OFF switching and flashing of elements (lights, signs, stop-bar, segments of lights, runway guard light, etc.).

(b) Collection of signals from airplane position sensors and their transmission via the lighting series circuit.

(c) Detection of burnt out lamps.

(d) Short-circuiting of isolation transformer in case of lamp failure.

(e) Watchdog timer to provide a fail-safe mode.

109-3 COMPUTERIZED AIRFIELD LIGHTING CONTROL EQUIPMENT - GENERAL

a. Control and Monitoring Equipment

1. The control and monitoring equipment shall be of a distributed nature and shall not be a PLC based. The IU (Interface Unit) units shall be installed locally at each Constant Current Regulator (CCR), which requires control and/or monitoring within the airfield lighting electrical vault(s).

2. Each new CCR shall be connected to an IU.

3. The IU shall be a microprocessor based module that includes all of the communication, control commands, input/output interface and failsafe functionality.

4. The IU shall be connected to both existing networks associated with the Redundant Communications Network (RCN) via quick disconnects.

5. The IU can communicate back to the Vault computer via either of the networks.

6. Removal of any IU unit(s) from the vault network shall not affect the operations of the CALCS system.

7. The IU shall be a universal device that can be used on any type of CCR from any manufacturer.

8. Each IU shall be identical and have interchangeable components.

9. The IU unit shall be optically isolated from the airfield series circuit via a quick disconnect.

b. Existing Redundant Vault Control and Monitoring Network

1. A Redundant Communication Network (RCN) using two (2) existing independent communication networks in the electrical vault(s).

2. The existing RCN has two (2) cables each consisting of two (2), 24AWG, shielded twisted pairs with a common (drain wire) meeting EIA RS-422 applications (Belden™ No. 9842 or equivalent).

3. The network shall be used to control and monitor all the CCR(s).

4. Each CCR shall be interfaced to an IU.

5. Any malfunction in one network shall not affect the operation of the system.

6. Any malfunction in one of the IU communication ports, transfers communication to the remaining port without affecting system functions.

c. Overview of Operation

1. Each IU unit shall have a unique factory set address and a field programmable communication address.

2. The IU receives commands via the existing RCN, executes those commands, and transfers back the status of the element to the existing vault computer.

3. The IU shall perform the following functions:

(a) Brightness setting control of the CCR(s) or ON/OFF control as required by the controlled element.

(b) CCR output voltage and current monitoring.

(c) CCR status monitoring (i.e., remote/local, loss of input power).

(d) Monitor all requirements per FAA L-827 monitoring requirements (See Monitoring section).

(e) Perform all failsafe functions.

(f) Communication via both networks to the vault computer.

(g) Self-diagnostic function to monitor for proper operation.

(h) Locally store all data and parameters specific to the controlled CCR.

d. Subcomponents: Each IU unit shall consist of the following six components:

1. Input/Output Module

(a) Interface for all control and monitoring connections.

(b) Distribution bus for interfacing internal boards.

(c) Easy access, quick disconnect terminal blocks.

2. Processor Module

(a) Interface for redundant communication network.

(b) Easy access, quick disconnect terminal block connections for RCN.

(c) Receives and transmits data to the vault computer.

(d) Interface for insulation resistance monitoring.

(e) Quick disconnect connection for interface to the Insulation Resistance Monitoring Module.

3. Monitoring Module

(a) Interface for current and voltage monitoring.

(b) Quick disconnect connections for interface to the Voltage and Current Sensor Module.

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

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

4. Display Module

(a) The following LED's shall be installed as a minimum on the IU's and provide the following information:

(1) Running status: LED indicator display of IU status.

(2) Brightness Step: LED display indicating the commanded step of the CCR.

(3) Remote/Local: LED display indicating the status of the remote local switch of the CCR.

(4) Primary Power: LED display indicating the status of the input power to the CCR.

(a) Over Current Shutdown: LED display indicating over current shutdown of the CCR.

(b) Open Circuit Shutdown: LED display indicating open circuit shutdown of the CCR.

(c) Channel A: LED display indicating the status of existing channel A of the existing redundant communication network.

(d) Channel B: LED display indicating the status of existing channel B of the existing redundant communication network.

(5) Current and Voltage Module (CVM)

(a) Collects current and voltage samples.

(b) Transmits current and voltage samples to the Monitoring Board.

(c) Interfaces to the output of the CCR.

(d) Shall be isolated from the series circuit via a quick disconnect interface.

(e) Quick disconnect connections for interface to the Monitoring Board.

(6) Insulation Resistance Monitoring Module (IRMM)

(a) Collects insulation resistance samples.

(b) Transmits insulation resistance samples to the Processor Board.

(c) Interfaces to the output of the CCR.

(d) Shall be isolated from the series circuit via a quick disconnect interface.

(e) Quick disconnect connection for interface to the Processor Board.

e. Control and Feedback Interface

1. The IU unit shall have the following interface points available:

(a) Control: Five mechanical latching output points (expandable to 16). These control points shall also be self-monitored and provide back-indication to the Vault computer verifying proper execution of control command.

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

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

(d) Insulation Resistance Monitoring: Two digital interface.

f. Monitoring

(1) The IU unit shall provide full FAA L-827 monitoring per FAA AC 150/5345-10 (current edition).

(2) The IU shall include the monitoring board and provide the following information for each CCR:

(a) Loss of input power to the CCR.

(b) CCR shutdown by open-circuit/over-current protective devices.

(c) Drop of more than 10 percent in the CCR VA load.

(d) Failure of the CCR to deliver the selected output current.

(e) The number of burnt-out lamps in each series circuit.

(f) Remote/local status of the CCR.

(g) Actual CCR output current.

(h) Actual CCR output voltage.

(i) Actual CCR output load (wattage).

(3) The Monitor and Control Equipment (MCE) will also monitor the control relays that are interfaced to the control equipment.

(a) Each relay output is fed to a discrete digital input on the IU device.

(b) Each digital input is monitored for proper execution by the IU device.

(c) This type of contact monitoring provides positive back indication that the correct control commands have been executed by the IU device.

5. The system shall include software for calibrating the following measurements:

(a) The number of burnt-out lamps in the series circuit.

(b) Actual CCR output current.

(c) Actual CCR output voltage.

(d) Actual CCR output load (wattage).

g. Programming

1. Each IU unit shall have a unique factory set address and specific parameters, which are field-programmable. Downloading of the IU's parameters shall be done from the existing electrical vault computer.

2. The control system shall continuously scan all the IU units and detect any malfunctioning units as well as inconsistency between the commanded brightness step and the actual brightness step.

3. Each IU unit shall transmit internal diagnostic information to the control system and provide detailed information regarding its operating status. Any malfunction can easily be isolated to the exact location through the use of troubleshooting and diagnostic screens available at the vault computer.

4. A computer when connected to the IU port, shall be able to perform the following functions:

(a) Monitor the commands being received at the MCE unit.

(b) Perform ON/OFF and brightness step switching of the CCR.

(c) Monitor the communications status of the Redundant Communication network.

(d) Read all the status information of the CCR (i.e., Remote/Local).

(e) Read the current, voltage and wattage of the CCR.

(f) Monitor all the information received at that location.

(g) Perform/transmit any control operation that the MCE is capable of.

(h) Configure and test the MCE at that location.

h. Interface Device Reliability: The MCE device shall have an actual minimum calculated Mean Time Between Failure (MTFB) of 150,000 hours.

i. Communication

1. Each IU unit shall support a data communication rate of up to 115.2 kbaud.

2. The communication protocol shall include adequate security to prevent unauthorized access to the network.

j. Failsafe

1. Each IU unit shall provide a self-contained failsafe feature that shall perform the following functions:

(a) Ensure default operation of the airport lighting, even if the entire airport lighting control system is not functioning.

(b) Display the commands sent by the existing computer to the CCR's and/or to the other controllable items.

(c) Self-monitor the IU outputs and verifies proper commands are executed.

(d) Adaptable to each CCR regardless of internal or external control voltage.

(e) Permits maintenance of portions of the control system, without changing the operational status of the lighting system.

2. The failsafe mode of each IU unit shall be defined per the requirements of the airport. The failsafe modes are as follows:

(a) Active Failsafe Mode: This mode shall be executed as follows:

(1) If the CCR was switched ON before the failure, it shall remain ON at the same brightness level.

(2) If the CCR was switched OFF before the failure, it shall switch ON to a pre-determined brightness level.

(b) Passive Failsafe Mode: This mode shall be executed as follows:

(1) If the CCR was switched ON before the failure, it shall remain ON at the same brightness level.

(2) If the CCR was switched OFF before the failure, it shall remain OFF.

3. Technical Specifications

(a) The failsafe system shall operate independently of the computer, providing failsafe interfacing to the CCR and/or other controllable elements.

(b) The failsafe system shall be based on electromechanical latching relays with the following characteristics:

(1) Maximum Switching Voltage: 240 VAC, 125 VDC.

(2) Nominal Switching Capacity: 8A/250 VAC, 5A/30 VDC.

(3) Rated Current (Resistive): 5A.

(4) Operational Life: Mechanical 5 x 10^7, Electrical 10^5.

(5) Protection: IP67 (protection against ingress of dust and water in harmful quantities).

(6) Approval: UL and CSA.

4. Mode of Operation

(a) The commands executed by the IU to switch the CCR and/or controllable element shall be momentary commands.

(b) The control commands shall be mechanically latched upon execution.

(c) Failure of the IU and/or loss of communication to the network shall not change the status of the airport lighting.

(d) The active failsafe mode shall be triggered by the internal watchdog of the IU unit upon detection of a failure within the IU unit or with the control system. The watchdog shall activate the failsafe and switch any controllable items that are OFF to their predetermined state.

(e) IU Unit shall be manufactured by ADBA Siemens Company.

109-2.4 INSULATION RESISTANCE MONITORING SYSTEM

a. General

1. The insulation resistance monitoring system (IRMS) shall be an integral component of the IU unit.

2. The IRMS shall be capable of automatically or manually monitoring and reporting the insulation resistance value of the series circuit cabling (one IRMS per circuit).

3. The IRMS shall be capable of measuring the cable leakage current and display the actual insulation resistance.

4. The IRMS shall be capable of measuring from 20k Ohms up to 1000M Ohms.

5. The IRMS DC test voltage shall have an automatic range of 500 and 1000 volts with current limiting to 5 milliamperes.

6. The IRMS system shall be capable of taking resistance readings on circuits that are energized or de-energized. This will allow the system to be used as a troubleshooting tool for assisting in locating circuit faults.

7. The IRMS system shall provide database record keeping that allows for graphical trend analysis of the insulation resistance readings.

b. Overview of Operation

1. The IRMS shall operate while the circuit is energized or de-energized and allow for automatic or manual readings during either condition. This shall allow for a more flexible troubleshooting tool for maintenance personnel versus systems that only operate while the circuit is energized.

2. The IRMS shall have a self-calibration feature that performs checks on the hardware to verify proper operation prior to taking measurements.

3. The IRMS shall be flexible, user programmable and allow for all of the following variables to be programmed by the user at any computer location:

(a) Start Time 1: This represents the first time of the day in which the IRMS is to take the first automatic reading of the series circuit.

(b) Start Time 2: This represents the second time of the day in which the IRMS is to take the first automatic reading of the series circuit

(c) Period: This specifies how often the circuit is measured. The period selection shall be made from an options list that includes the following choices: 1 hour, 8 hours, daily, weekly (once a week), biweekly (every 2 weeks), Monthly (once a month) or any variation defined by the operator

(d) Charge Time: This is the amount of time, in seconds, that the IRMS shall charge the circuit before taking a reading. The charge time shall be a number from 15 to 900 seconds. Charge time adjustments allow for greater flexibility in the IRMS system and provide readings that are more accurate for those circuits that are older and/or are longer runs.

(e) Warning Limit: This is a limit value, in Ohms, at which point a resistance warning shall be generated. If a resistance reading is below this value, the warning shall be sent to the event database. When the value goes above this level, the warning shall be marked as cleared in the event database. This number can be any value between 20k Ohm and 1G Ohm.

(f) Alarm Limit: This is a limit value, in Ohms, at which point a resistance alarm shall be generated. If a resistance reading is below this value, the alarm shall be sent to the event database. When the value goes above this level, the alarm shall be marked as cleared in the event database. This number can be any value between 20k Ohm and 1G Ohm.

4. All user programmable variables shall be able to be changed at any specified computer within the CALCS system.

5. The IRMS data for all of the series circuits shall be viewable from any specified computer within the CALCS system.

6. All the IRMS data shall be viewable in real-time or historical at any specified computer location. The IRMS information shall be available at all times and shall not require any special transferring of data between the IRMS system and the control system since the IRMS shall be an integral component of the CALCS.

END OF ITEM L-109

APPENDIX F

MARTIN STATE AIRPORT SURVEY CONTROL MANUAL

MARTIN STATE AIRPORT

BWI BALTIMORE/WASHINGTON INTERNATIONAL Thurgood Marshall AIRPORT

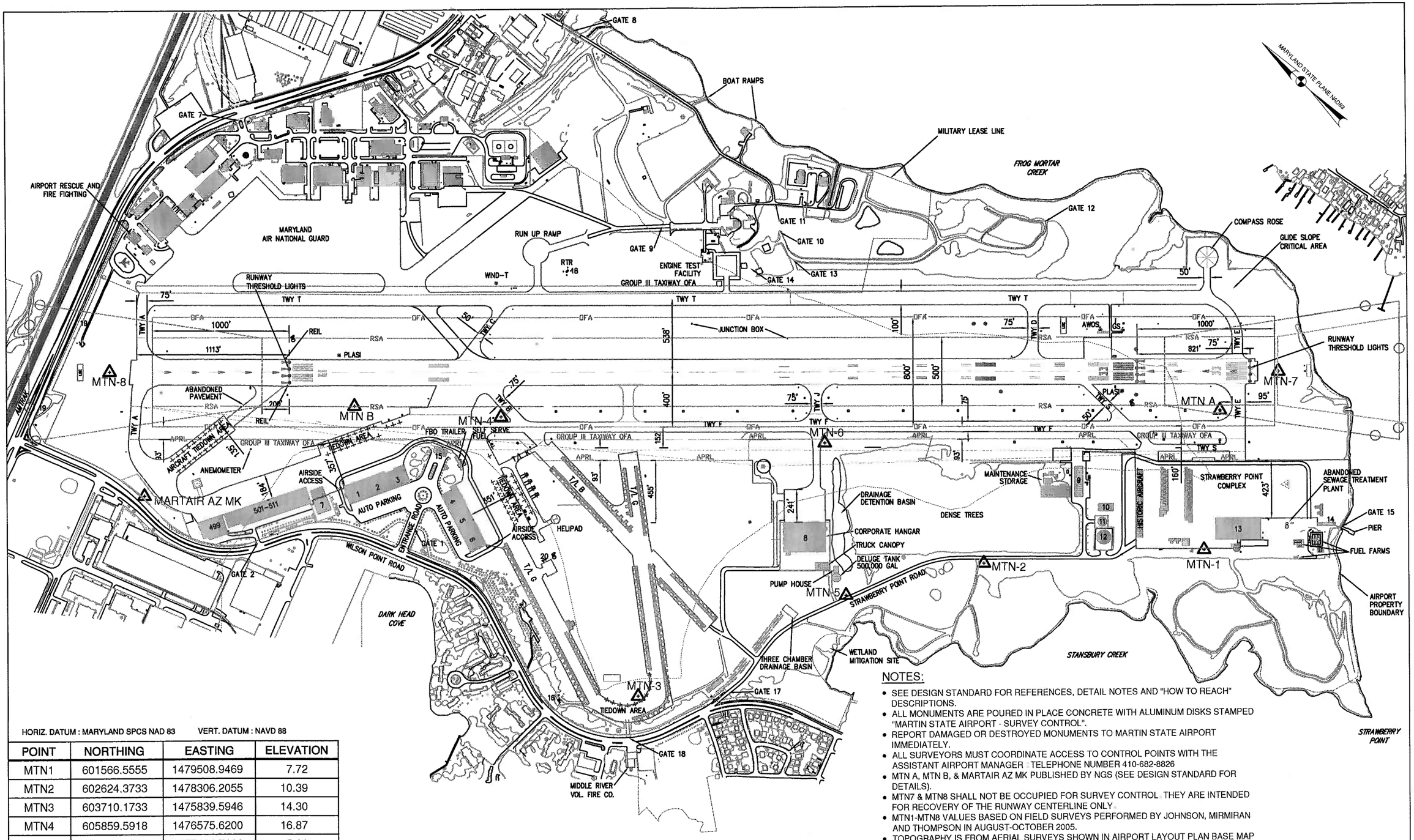
MARTIN STATE AIRPORT

Survey Control Manual

November 11, 2005

Important Note:

All Surveys Performed at Martin State Airport after November 11, 2005 are to Utilize this Manual and must be tied to the Martin State Airport Survey Control Network.



HORIZ. DATUM : MARYLAND SPCS NAD 83 VERT. DATUM : NAVD 88

POINT	NORTHING	EASTING	ELEVATION
MTN1	601566.5555	1479508.9469	7.72
MTN2	602624.3733	1478306.2055	10.39
MTN3	603710.1733	1475839.5946	14.30
MTN4	605859.5918	1476575.6200	16.87
MTN5	603164.6275	1477431.7132	5.92
MTN6	604064.3021	1478107.5955	12.90

UNITS : U.S. SURVEY FEET

NOTES:

- SEE DESIGN STANDARD FOR REFERENCES, DETAIL NOTES AND "HOW TO REACH" DESCRIPTIONS.
- ALL MONUMENTS ARE POURED IN PLACE CONCRETE WITH ALUMINUM DISKS STAMPED "MARTIN STATE AIRPORT - SURVEY CONTROL".
- REPORT DAMAGED OR DESTROYED MONUMENTS TO MARTIN STATE AIRPORT IMMEDIATELY.
- ALL SURVEYORS MUST COORDINATE ACCESS TO CONTROL POINTS WITH THE ASSISTANT AIRPORT MANAGER TELEPHONE NUMBER 410-682-8826
- MTN A, MTN B, & MARTAIR AZ MK PUBLISHED BY NGS (SEE DESIGN STANDARD FOR DETAILS).
- MTN7 & MTN8 SHALL NOT BE OCCUPIED FOR SURVEY CONTROL. THEY ARE INTENDED FOR RECOVERY OF THE RUNWAY CENTERLINE ONLY.
- MTN1-MTN8 VALUES BASED ON FIELD SURVEYS PERFORMED BY JOHNSON, MIRMIRAN AND THOMPSON IN AUGUST-OCTOBER 2005.
- TOPOGRAPHY IS FROM AERIAL SURVEYS SHOWN IN AIRPORT LAYOUT PLAN BASE MAP DRAWING.

CONSULTANTS

DESIGNED:
DRAWN BY: BRH
CHECKED: DKS
APPROVED: DAL

REVISION NO.	REVISION DATE	REVISION DESCRIPTION

MARTIN STATE AIRPORT
MARYLAND DEPARTMENT OF TRANSPORTATION
MARYLAND AVIATION ADMINISTRATION
OFFICE OF PLANNING AND ENGINEERING

PROJECT TITLE:

SHEET TITLE: SURVEY CONTROL

CONTRACT NO.

SCALE: NOT TO SCALE

DATE:

SHEET NO.

MARTIN STATE AIRPORT (MTN) - SURVEY CONTROL DATA

NAME OF STATION: MTN-1 | **DATE ESTABLISHED:** August 2005

MARYLAND STATE PLANE COORDINATES (NAD 83):

NORTHING (Y):	601566.5555 US ft.	183357.853 m
EASTING (X):	1479508.9469 US ft.	450955.229 m
ORTHOMETRIC HEIGHT (NAVD 88):	7.72 US ft.	2.353 m
CONVERGENCE ANGLE:	0°22'15.1"	
SCALE FACTOR:	0.99997943	
COMBINED SCALE FACTOR:	0.99998425	

GEOGRAPHIC COORDINATES (NAD 83):

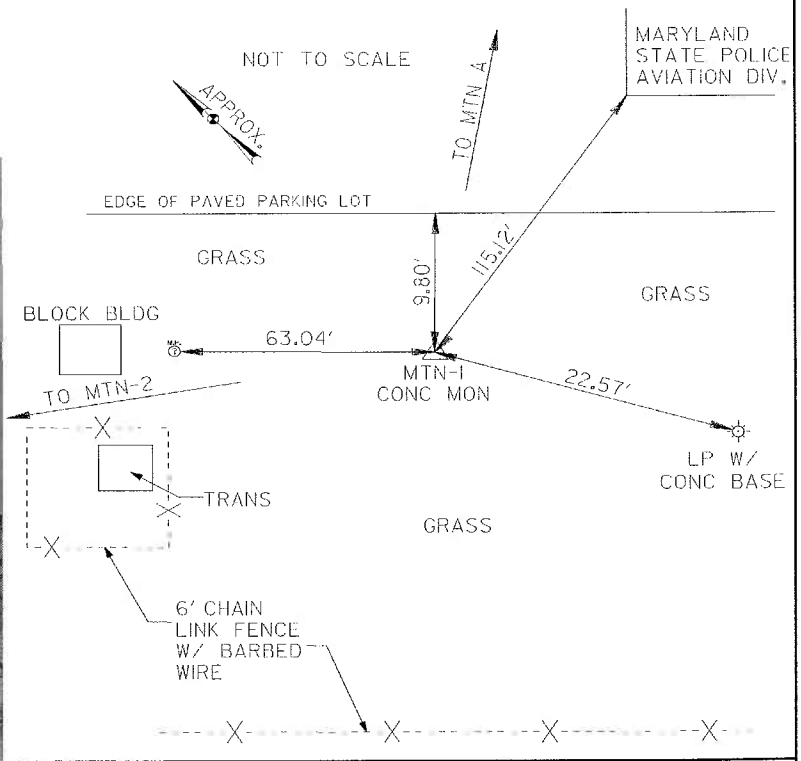
LATITUDE:	39°19'01.04312" (N)	
LONGITUDE:	76°24'32.83307" (W)	
ELLIPSOID HT:	-100.628 US ft.	-30.671 m

AVAILABLE CONVENTIONAL BACKSIGHT POINTS (FIELD DATA):

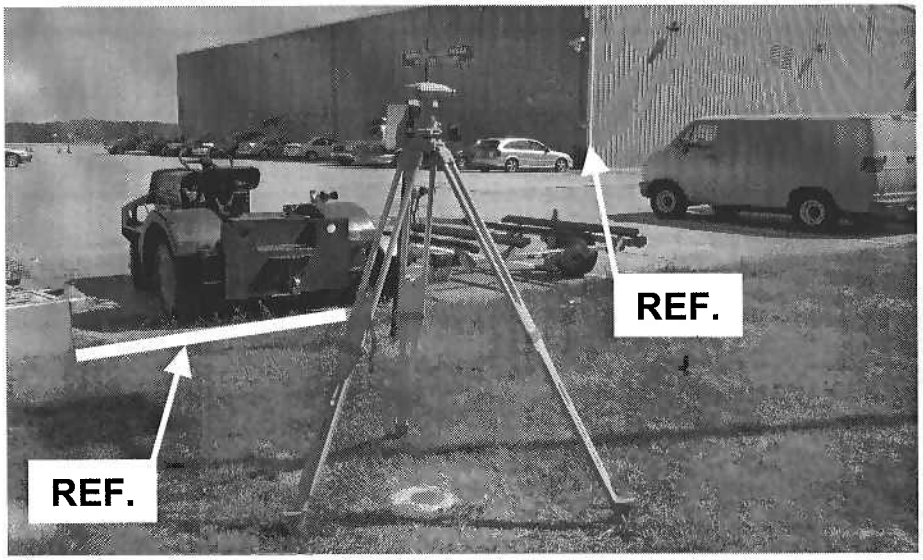
POINT	AZIMUTH	DISTANCE (US FT.)	DISTANCE (m)
MTN A	51° 15' 50"	1027.33	313.131
MTN-2	311° 19' 55"	1601.77	488.220

STATION DESCRIPTION:

To reach the monument from the traffic circle at MTN airport in front of the air traffic control tower, proceed S to Airside Access point by Hangars 4-6. After passing through the fence, proceed NE to the second Stop sign. Turn right and proceed SE past private plane hangars. Road will curve to the left, bearing North. At the intersection of T/L B and T/L G, turn right and proceed SE to Yield sign. Continue to Stop sign at Strawberry Point Road. Turn left on Strawberry Point Road. Continue past the entrance road to the maintenance shop and the salt dome. Road will turn to the left (North), passing along the back side of the historic aircraft display. Turn right (east) at the end of the road, continue to turn right, heading South along the front of the historic aircraft display. Monument is SW of the SW corner of the Strawberry Point Complex Maryland State Police hangar. Monument is 9.80' SW of the SW edge of paved parking lot, 63.04' SE of manhole in concrete, 22.57' NE of light pole with concrete base.



SURVEYED BY: JMT ENGINEERING — **SPARKS, MARYLAND**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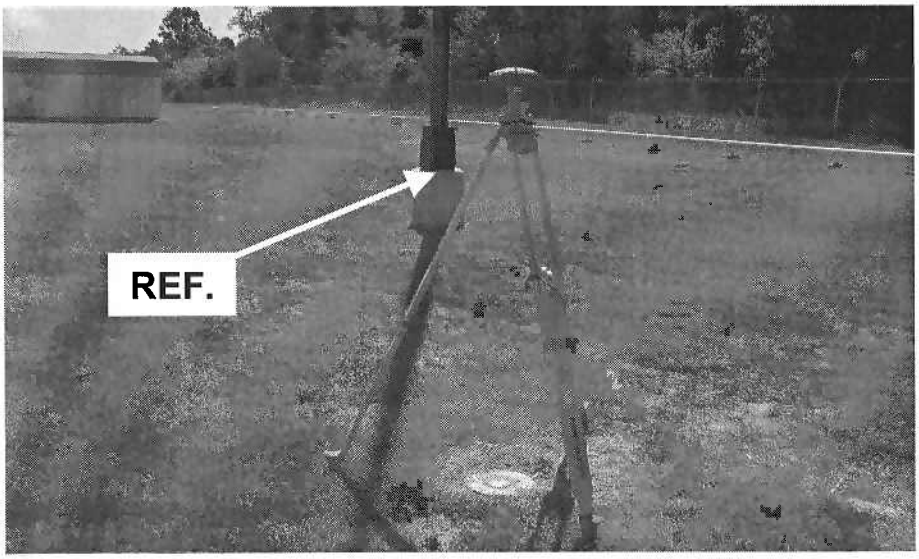
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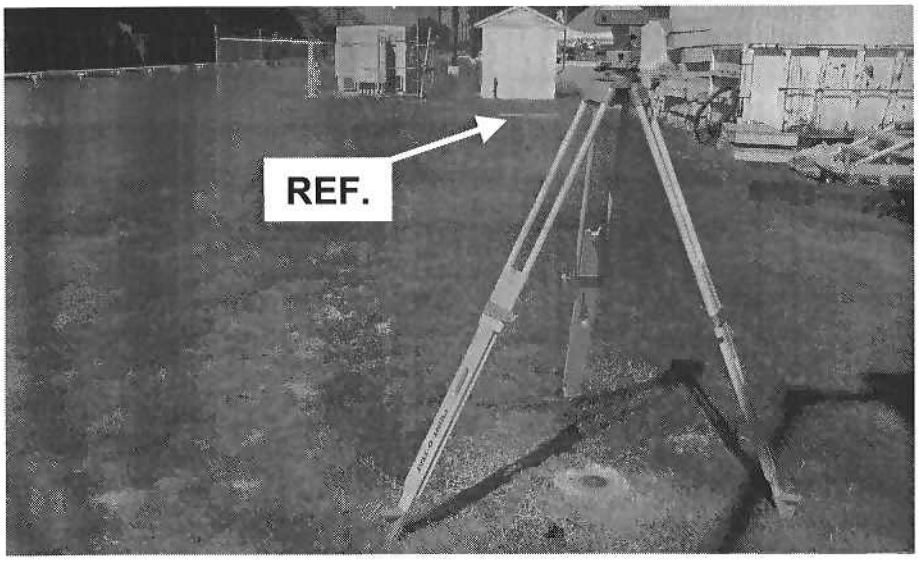
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MARTIN STATE AIRPORT (MTN) - SURVEY CONTROL DATA

NAME OF STATION: MTN-2 | **DATE ESTABLISHED:** August 2005

MARYLAND STATE PLANE COORDINATES (NAD 83):

NORTHING (Y):	602624.3733 US ft.	183680.276 m
EASTING (X):	1478306.2055 US ft.	450588.633 m
ORTHOMETRIC HEIGHT (NAVD 88):	10.39 US ft.	3.167 m
CONVERGENCE ANGLE:	0°22'05.5"	
SCALE FACTOR:	0.99997983	
COMBINED SCALE FACTOR:	0.99998451	

GEOGRAPHIC COORDINATES (NAD 83):

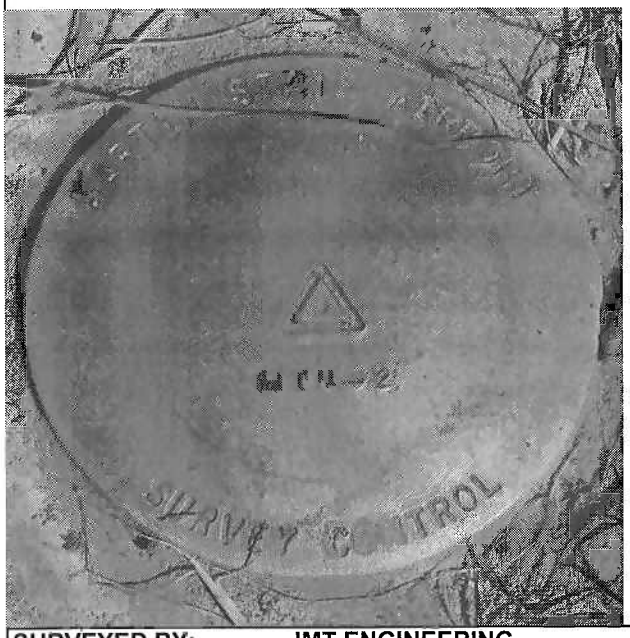
LATITUDE:	39°19'11.57473" (N)	
LONGITUDE:	76°24'48.05001" (W)	
ELLIPSOID HT:	-97.95 US ft.	-29.854 m

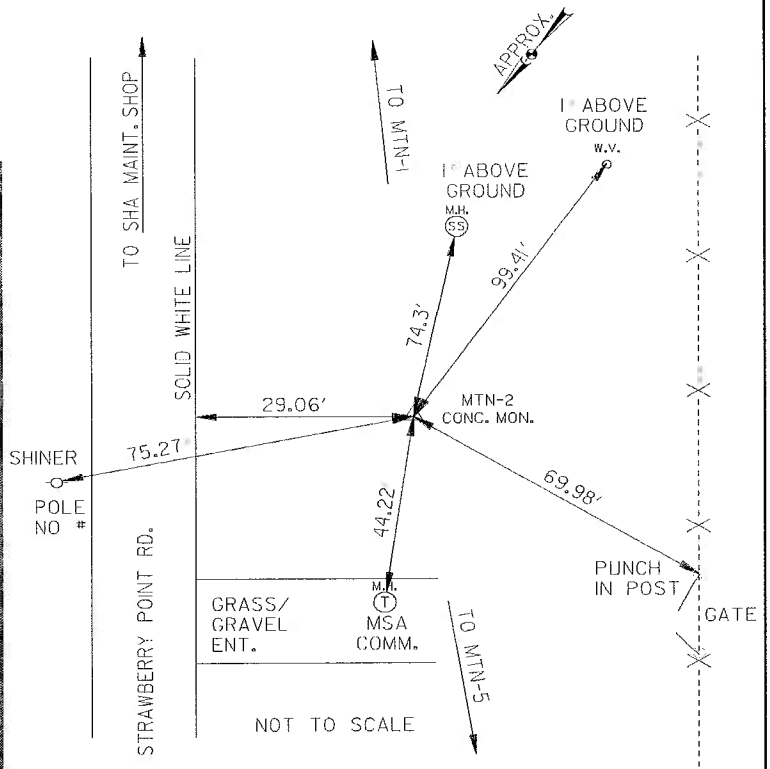
AVAILABLE CONVENTIONAL BACKSIGHT POINTS (FIELD DATA):

POINT	AZIMUTH	DISTANCE (US FT.)	DISTANCE (m)
MTN-1	131° 19' 55"	1601.78	488.224
MTN-5	301° 42' 27"	1027.94	313.317

STATION DESCRIPTION:

To reach the monument from the traffic circle at MTN airport in front of the air traffic control tower, proceed S to Airside Access point by Hangars 4-6. After passing through the fence, proceed NE to the second Stop sign. Turn right and proceed SE past private plane hangars. Road will curve to the left, bearing North. At the intersection of T/L B and T/L G, turn right and proceed SE to Yield sign. Continue to Stop sign at Strawberry Point Road. Turn left on Strawberry Point Road. Proceed 1874 feet (0.35 mi.). Continue past the pump house and water tank to a gravel/grass lane and the station on the right. Monument is located 29.06' SW of SW edge of Strawberry Point Road, 74.3' N of Sanitary Sewer manhole 1' above ground, 99.41' N of water valve 1' above ground, 69.98' E of punch mark in southern gate post, 44.22' S of communications manhole in grass/gravel drive, 75.27' SW of nail and shiner in pole with no number.





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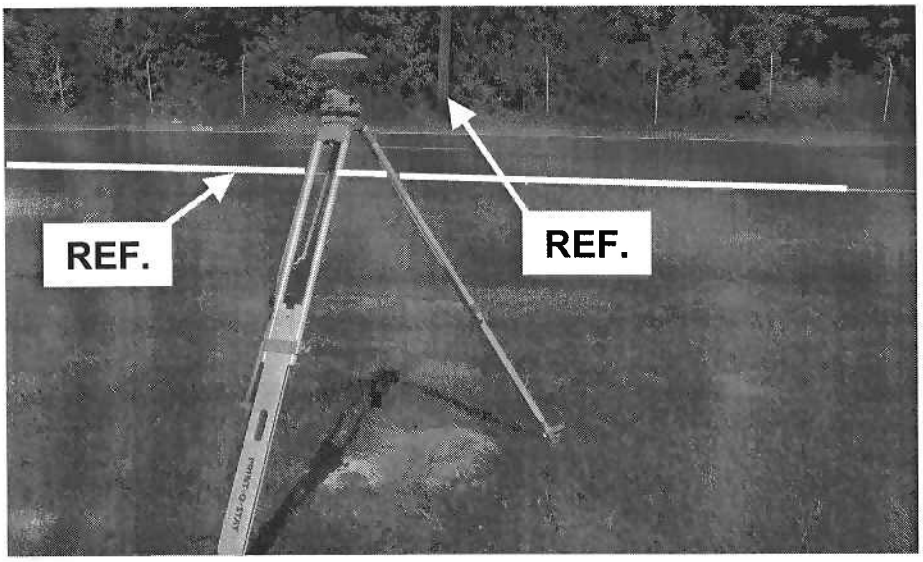
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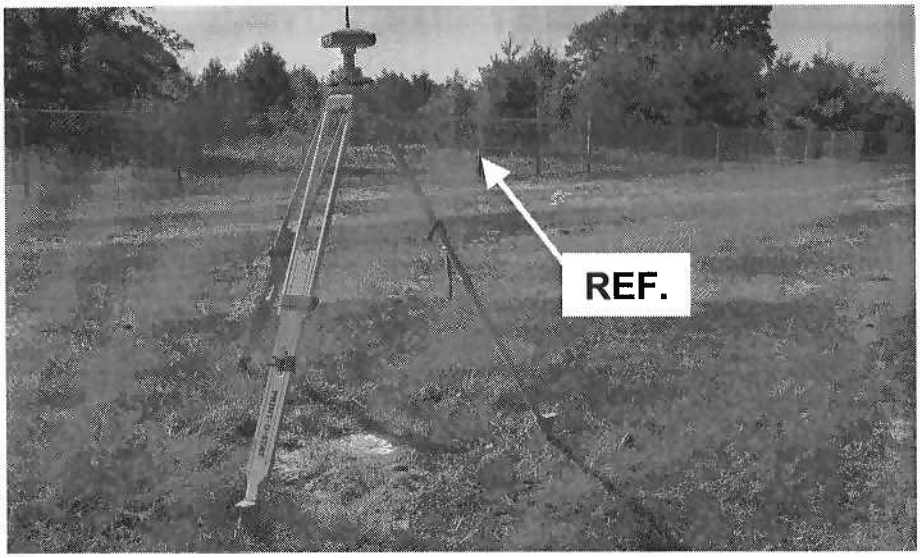
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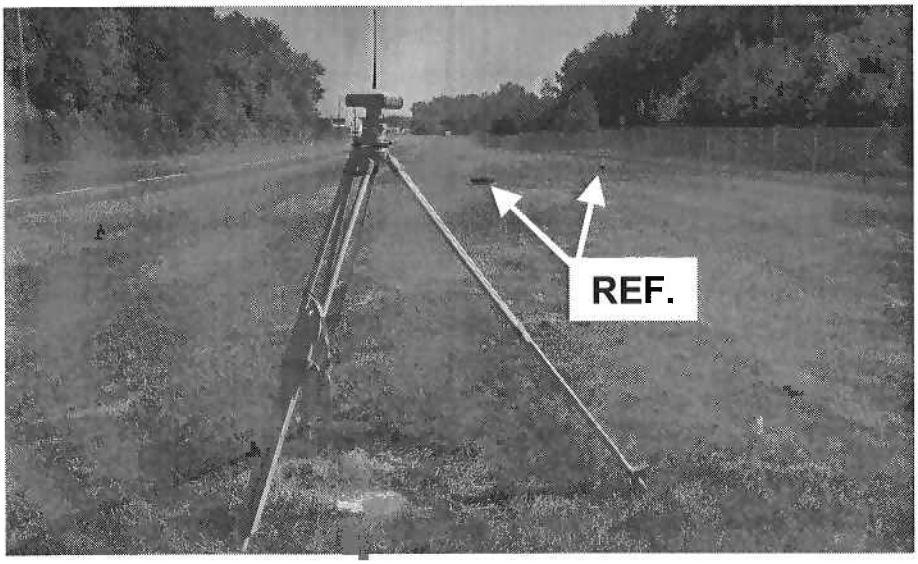
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MARTIN STATE AIRPORT (MTN) - SURVEY CONTROL DATA

NAME OF STATION: MTN-3 | **DATE ESTABLISHED:** August 2005

MARYLAND STATE PLANE COORDINATES (NAD 83):

NORTHING (Y):	603710.1733 US ft.	184011.229 m
EASTING (X):	1475839.5946 US ft.	449836.808 m
ORTHOMETRIC HEIGHT (NAVD 88):	14.30 US ft.	4.359 m
CONVERGENCE ANGLE:	0°21'45.9"	
SCALE FACTOR:	0.99998024	
COMBINED SCALE FACTOR:	0.99998473	

GEOGRAPHIC COORDINATES (NAD 83):

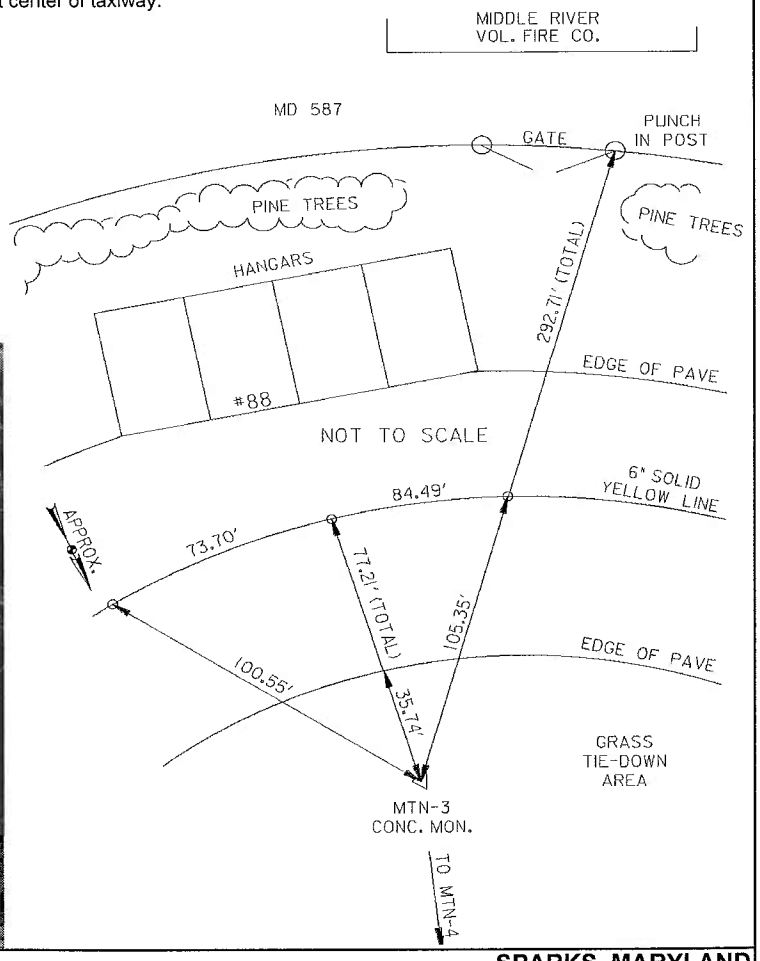
LATITUDE:	39°19'22.46174" (N)	
LONGITUDE:	76°25'19.34850" (W)	
ELLIPSOID HT:	-93.995 US ft.	-28.650 m

AVAILABLE CONVENTIONAL BACKSIGHT POINTS (FIELD DATA):

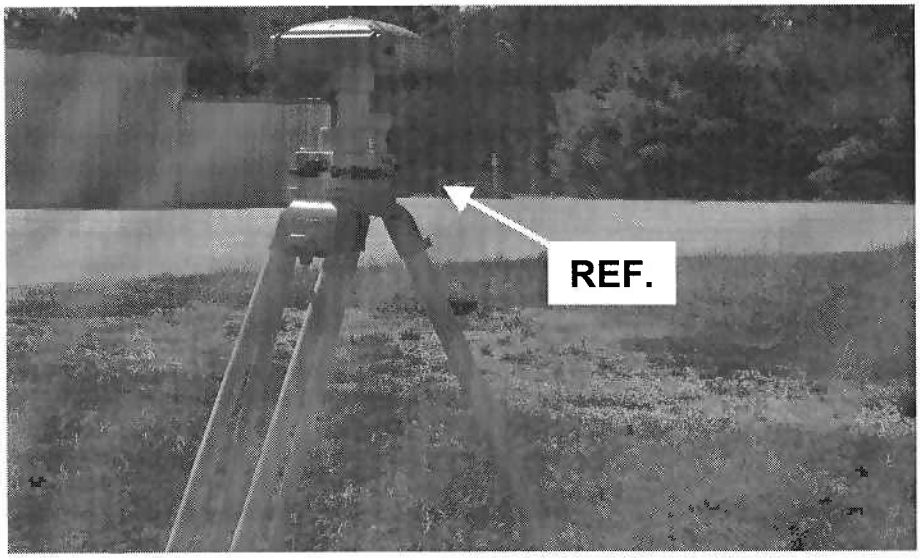
POINT	AZIMUTH	DISTANCE (US FT.)	DISTANCE (m)
MTN-4	18° 54' 10"	2272.00	692.507

STATION DESCRIPTION:

To reach the monument from the traffic circle at MTN airport in front of the air traffic control tower, proceed S to Airside Access point by Hangars 4-6. After passing through the fence, proceed NE to the second Stop sign. Turn right and proceed SE past private plane hangars. Where the road curves to the left, the station is on the left between aircraft tiedowns. Monument is 292.71' NE of punch mark in western gate post to MD 587, 105.35' NE of MAG Nail on same line, set in solid yellow line at center of taxiway, 77.21' N of MAG Nail set in solid yellow line at center of taxiway in line with Hanger #88, 35.74' N of N edge of taxiway on same line, 100.55' NW of MAG Nail set in solid yellow line at center of taxiway.



SURVEYED BY: JMT ENGINEERING — **SPARKS, MARYLAND**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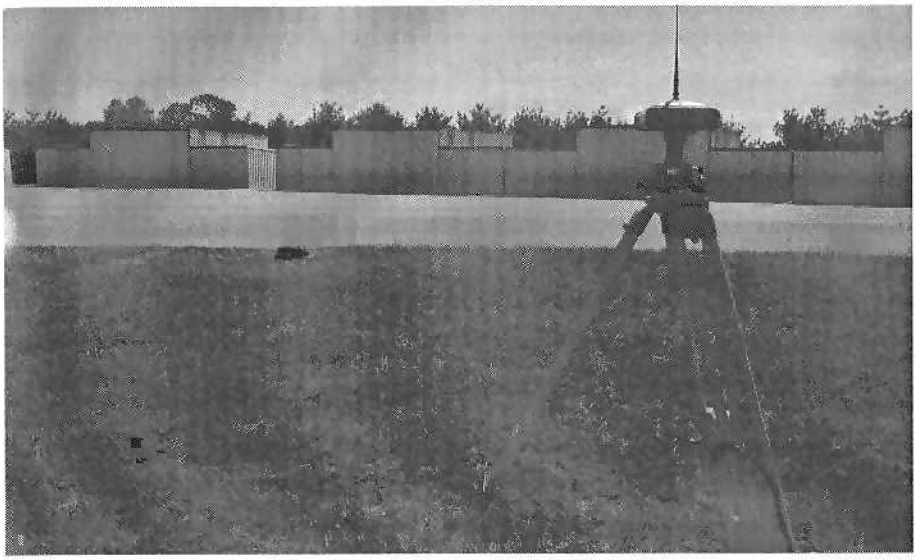


MARTIN STATE AIRPORT (MTN) - SURVEY CONTROL DATA

NAME OF STATION: MTN-4 | **DATE ESTABLISHED:** August 2005

MARYLAND STATE PLANE COORDINATES (NAD 83):

NORTHING (Y):	605859.5918 US ft.	184666.373 m
EASTING (X):	1476575.6200 US ft.	450061.149 m
ORTHOMETRIC HEIGHT (NAVD 88):	16.87 US ft.	5.142 m
CONVERGENCE ANGLE:	0°21'51.9"	
SCALE FACTOR:	0.99998104	
COMBINED SCALE FACTOR:	0.99998542	

GEOGRAPHIC COORDINATES (NAD 83):

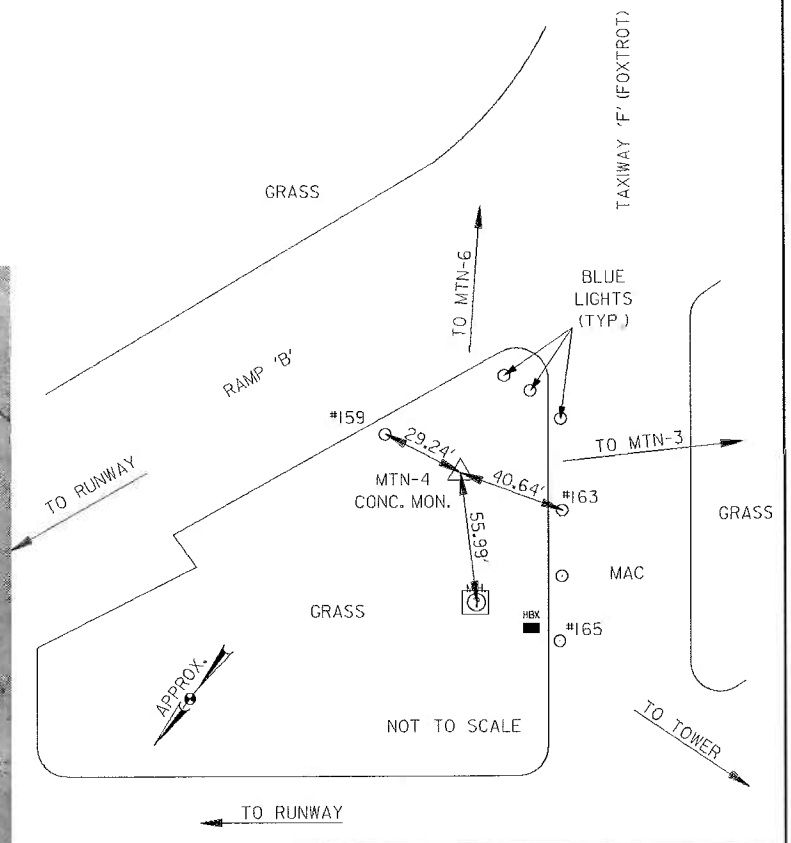
LATITUDE:	39°19'43.65932" (N)	
LONGITUDE:	76°25'09.80871" (W)	
ELLIPSOID HT:	-91.422 US ft.	-27.865 m

AVAILABLE CONVENTIONAL BACKSIGHT POINTS (FIELD DATA):

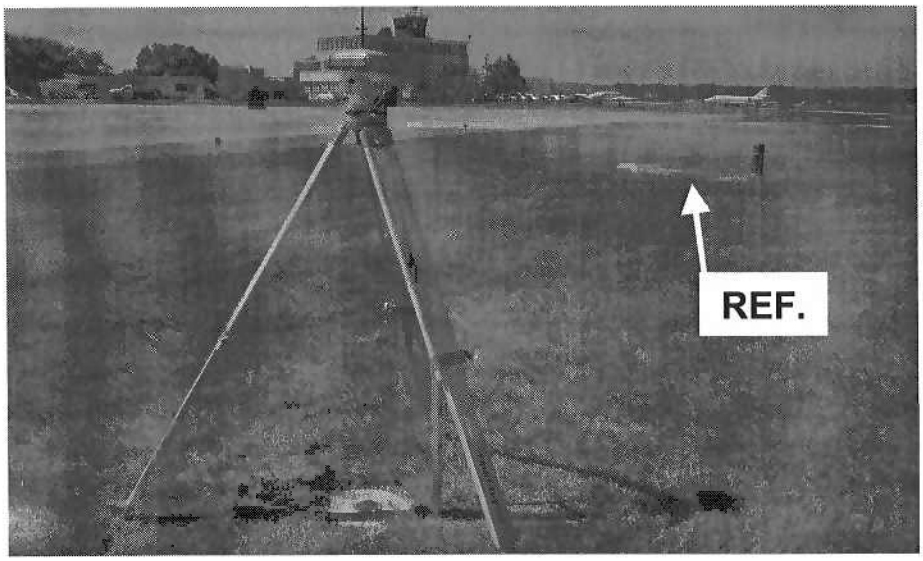
POINT	AZIMUTH	DISTANCE (US FT.)	DISTANCE (m)
MTN B	318° 58' 21"	1076.78	328.203
MTN-3	198° 54' 10"	2271.98	692.499
MTN-6	139° 31 29"	2360.13	719.369
MTN A	134° 20' 41"	5222.32	1591.765
MARTAIR AZ MK	302° 12' 00"	2675.15	815.387

STATION DESCRIPTION:

To reach the monument from the traffic circle at MTN airport in front of the air traffic control tower, proceed S to Airside Access point by Hangars 4-6. After passing through the fence, proceed NE to the second Stop sign.Turn left and pass in front of the helicopter hangar. Proceed to small triangular grass island next to Taxiway B in front of the air-traffic control tower and station on the right. Permission must be granted from Tower Control to cross Taxiway 'F' on foot (must park and walk out to MTN-4). Monument is 29.24' SW of ground light #159, 40.64' NE of ground light #163, and 55.99' from center of manhole in concrete.



SURVEYED BY: JMT ENGINEERING — **SPARKS, MARYLAND**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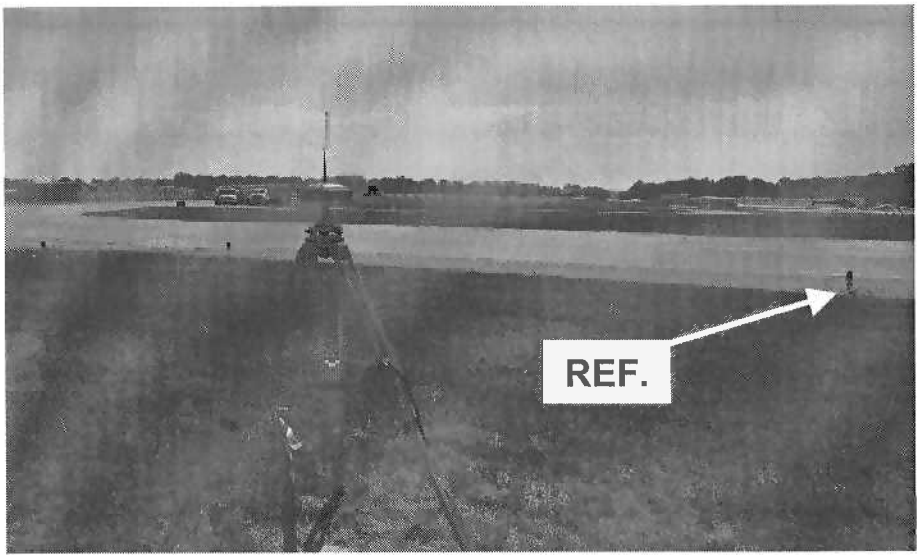
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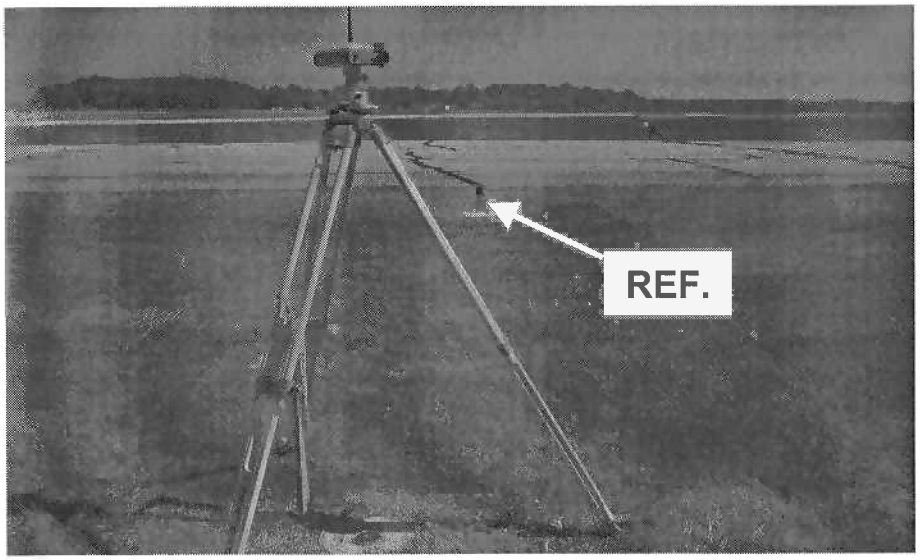
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MARTIN STATE AIRPORT (MTN) - SURVEY CONTROL DATA

NAME OF STATION: MTN-5 | **DATE ESTABLISHED:** August 2005

MARYLAND STATE PLANE COORDINATES (NAD 83):

NORTHING (Y):	603164.6275 US ft.	183844.946 m
EASTING (X):	1477431.7132 US ft.	450322.087 m
ORTHOMETRIC HEIGHT (NAVD 88)	5.92 US ft.	1.804 m
CONVERGENCE ANGLE:	0°21'58.6"	
SCALE FACTOR:	0.99998003	
COMBINED SCALE FACTOR:	0.99998493	

GEOGRAPHIC COORDINATES (NAD 83):

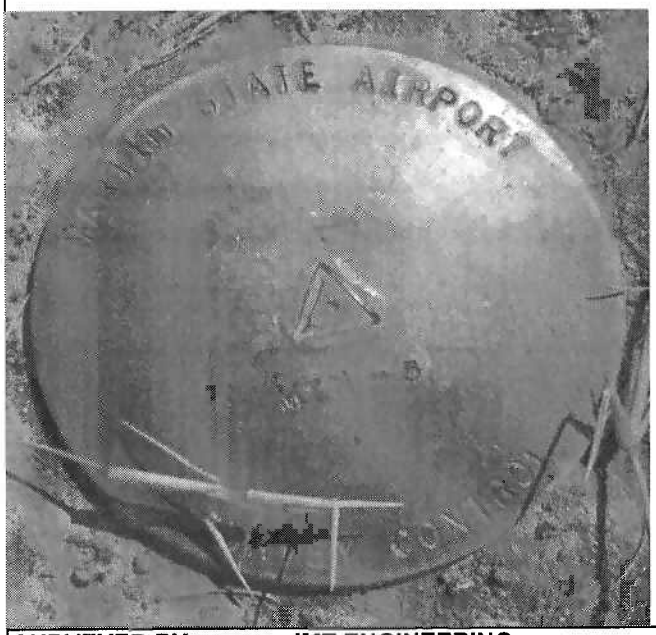
LATITUDE:	39°19'16.96973" (N)	
LONGITUDE:	76°24'59.13338" (W)	
ELLIPSOID HT:	-102.401 US ft.	-31.212 m

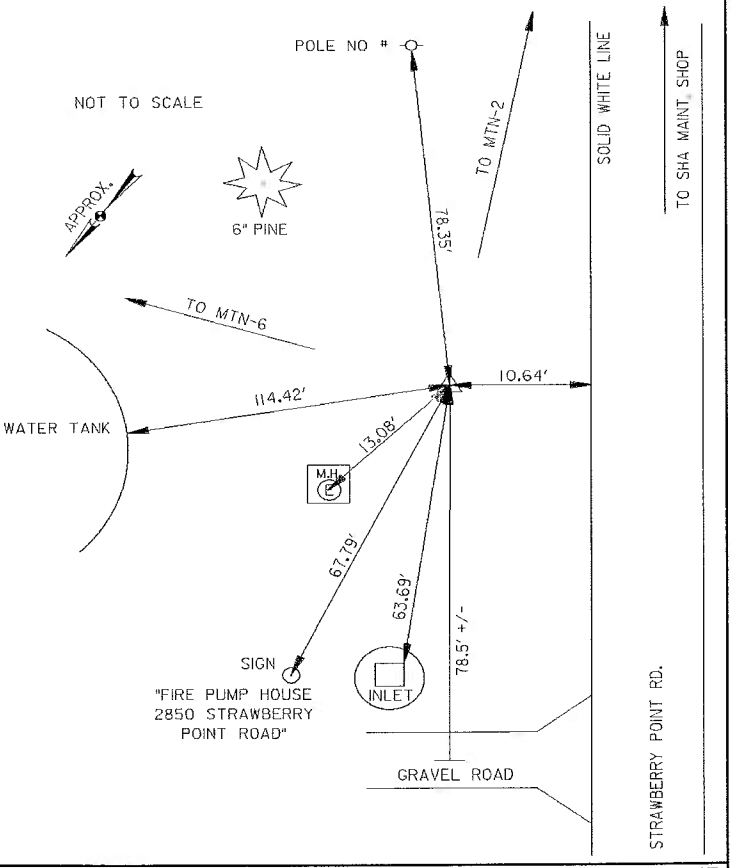
AVAILABLE CONVENTIONAL BACKSIGHT POINTS (FIELD DATA):

POINT	AZIMUTH	DISTANCE (US FT.)	DISTANCE (m)
MTN-6	36° 54' 57"	1125.30	342.991
MTN-2	121° 42' 27"	1027.93	313.314

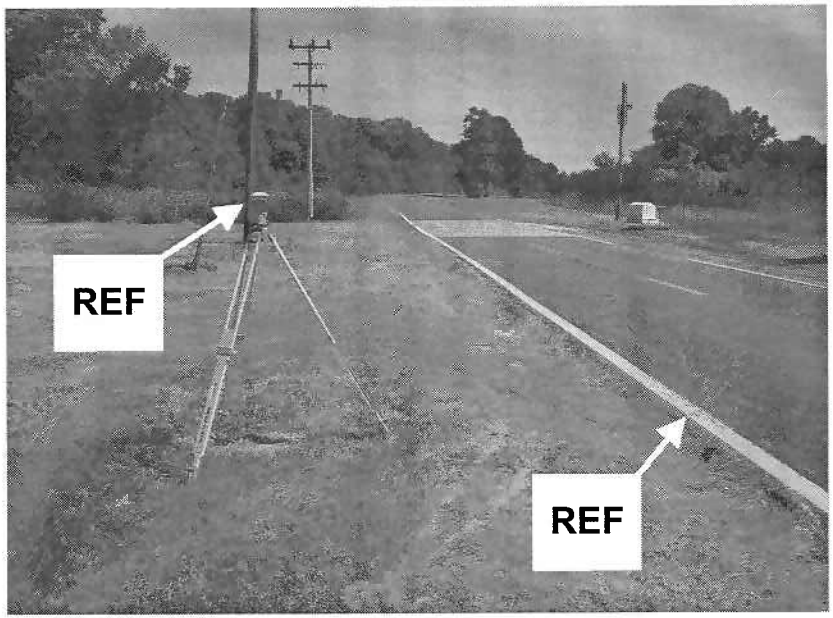
STATION DESCRIPTION:

To reach the monument from the traffic circle at MTN airport in front of the air traffic control tower, proceed S to Airside Access point by Hangars 4-6. After passing through the fence, proceed NE to the second Stop sign. Turn right and proceed SE past private plane hangars. Road will curve to the left, bearing North. At the intersection of T/L B and T/L G, turn right and proceed SE to Yield sign. Continue to Stop sign at Strawberry Point Road. Turn left on Strawberry Point Road. Proceed 819 feet (0.16 mi.) to station the left. Station is located approximately 78.5 feet past the centerline of gravel/grass road (entrance to fire pump house/water tank). Monument is 63.69' SE of drop inlet in concrete near edge of gravel road, 67.79' SE of sign (Fire Pump House 2850 Strawberry Point Road), 114.42' S of face of water tower, 78.35' NW of guy pole with no number, and 10.64' NE of NE edge of Strawberry Point Road.





SURVEYED BY: JMT ENGINEERING — **SPARKS, MARYLAND**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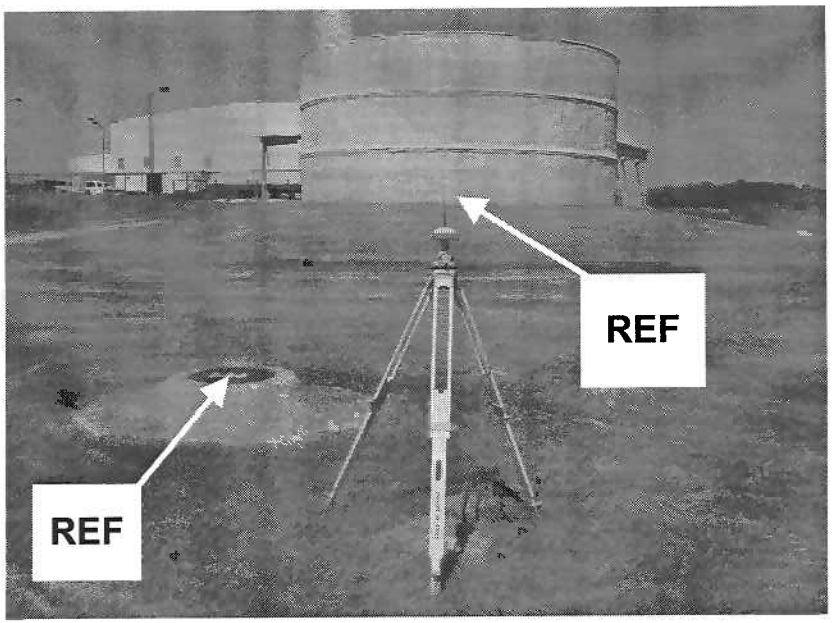
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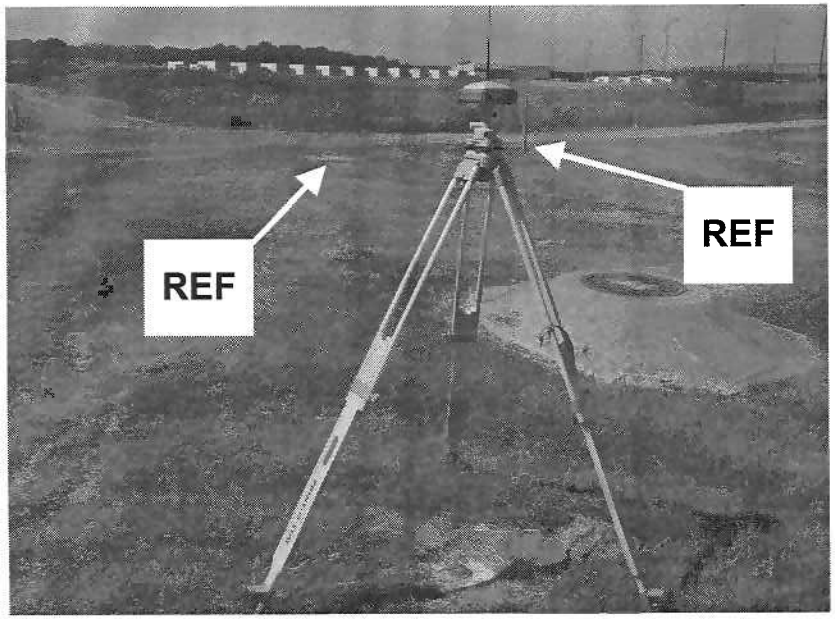
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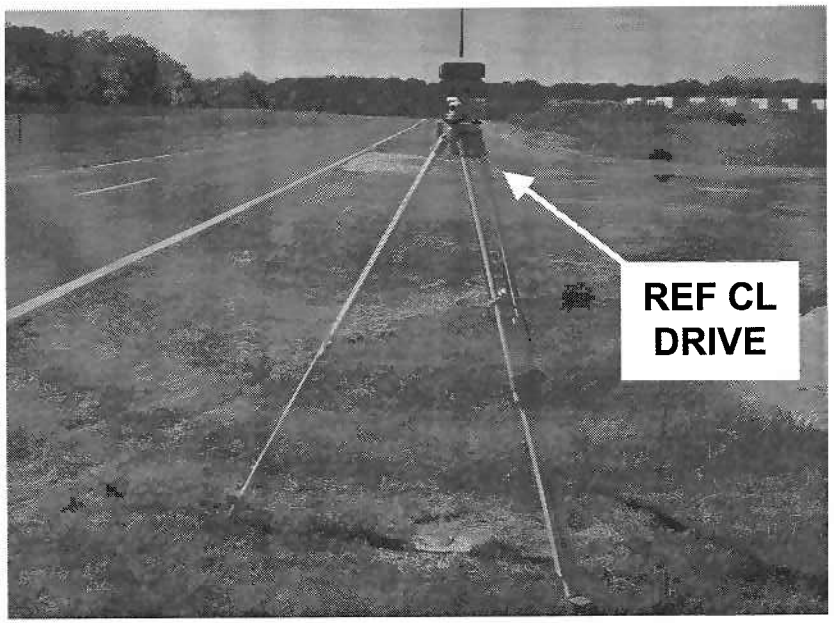
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DRIVE

MARTIN STATE AIRPORT (MTN) - SURVEY CONTROL DATA

NAME OF STATION: MTN-6 | **DATE ESTABLISHED:** August 2005

MARYLAND STATE PLANE COORDINATES (NAD 83):

NORTHING (Y):	604064.3021 US ft.	184119.168 m
EASTING (X):	1478107.5955 US ft.	450528.096 m
ORTHOMETRIC HEIGHT (NAVD 88)	12.90 US ft.	3.932 m
CONVERGENCE ANGLE:	0°22'04.0"	
SCALE FACTOR:	0.99998036	
COMBINED SCALE FACTOR:	0.99998493	

GEOGRAPHIC COORDINATES (NAD 83):

LATITUDE:	39°19'25.81887" (N)	
LONGITUDE:	76°24'50.45958" (W)	
ELLIPSOID HT:	-95.427 US ft.	-29.086 m

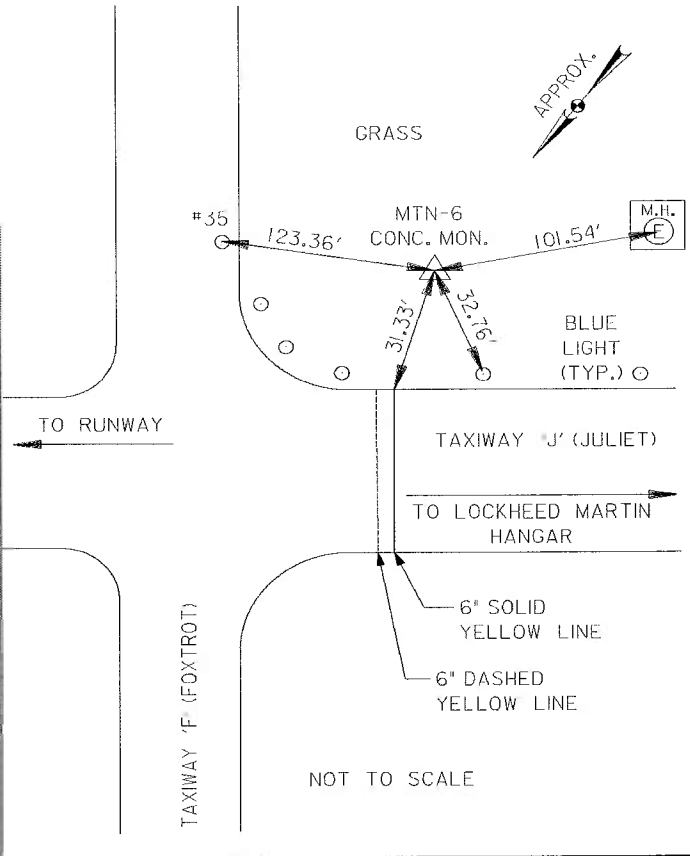
AVAILABLE CONVENTIONAL BACKSIGHT POINTS (FIELD DATA):

POINT	AZIMUTH	DISTANCE (US FT.)	DISTANCE (m)
MTN A	130° 06' 04"	2879.72	877.740
MTN-5	216° 54' 57"	1125.29	342.989
MTN-4	319° 31' 29"	2360.15	719.375
MTN-B	319° 21' 07"	3436.89	1047.566

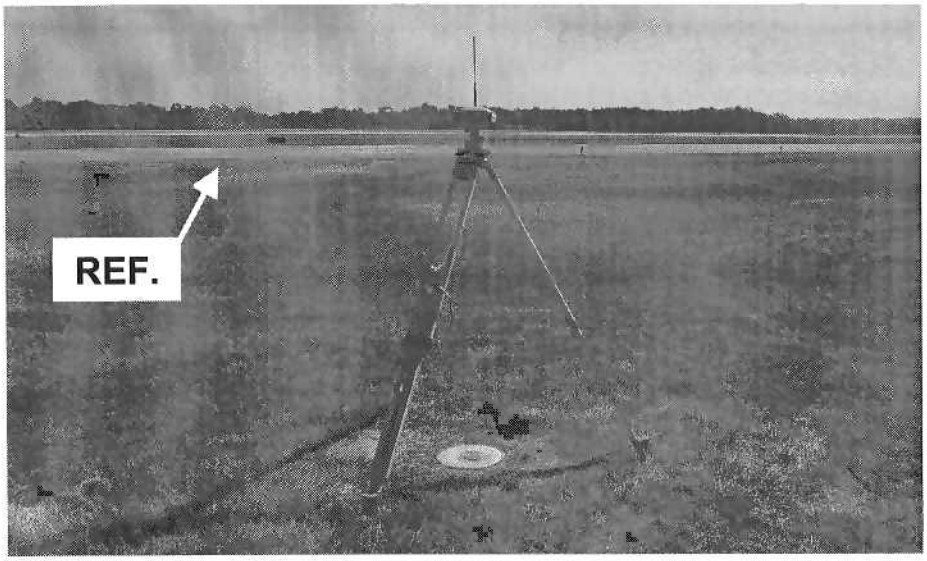
STATION DESCRIPTION:

To reach the monument from the traffic circle at MTN airport in front of the air traffic control tower, proceed S to Airside Access point by Hangars 4-6. After passing through the fence, proceed NE to the second Stop sign. Turn right and proceed SE past private plane hangars. Road will curve to the left, bearing North. At the intersection of T/L B and T/L G, turn right and proceed SE to Yield sign. Continue to Stop sign at Strawberry Point Road. Turn left on Strawberry Point Road. Continue to the pump house and water tank on the left. Turn left into gravel lane. Park at pump house. Walk along fence and wetlands area to Taxiway F and the station on the right. Station is near the intersection of Taxiway F, Taxiway J, and the entrance road to Lockheed Martin's hangar/facility. Monument is 123.36' W of taxiway light #35, 101.54' NE of center of electric manhole 0.5' above ground, 32.76' SE of ground way light with no number, 31.33' S of S end 6" solid yellow line on Taxiway 'J'.

***Monument is outside the APRL. Access to this monument by way of Taxiway "F" requires airport tower permission.**



SURVEYED BY: JMT ENGINEERING — **SPARKS, MARYLAND**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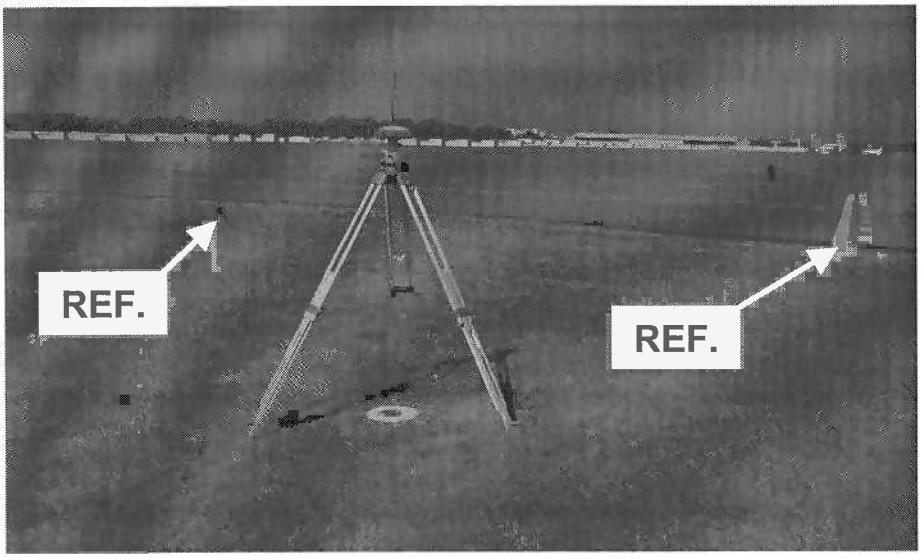
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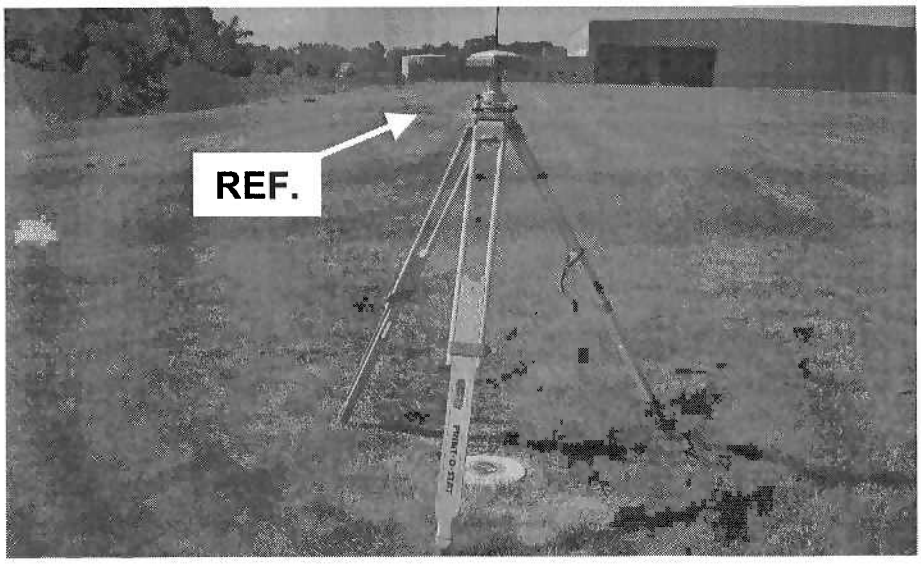
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MARTIN STATE AIRPORT (MTN) - SURVEY CONTROL DATA

NAME OF STATION: MTN-7 | **DATE ESTABLISHED:** August 2005

MARYLAND STATE PLANE COORDINATES (NAD 83):

NORTHING (Y):	US ft.	m
EASTING (X):	US ft.	m
ORTHOMETRIC HEIGHT (NAVD 88):	US ft.	m
CONVERGENCE ANGLE:		
SCALE FACTOR:		
COMBINED SCALE FACTOR:		

GEOGRAPHIC COORDINATES (NAD 83):

LATITUDE:	(N)	
LONGITUDE:	(W)	
ELLIPSOID HT:	US ft.	m

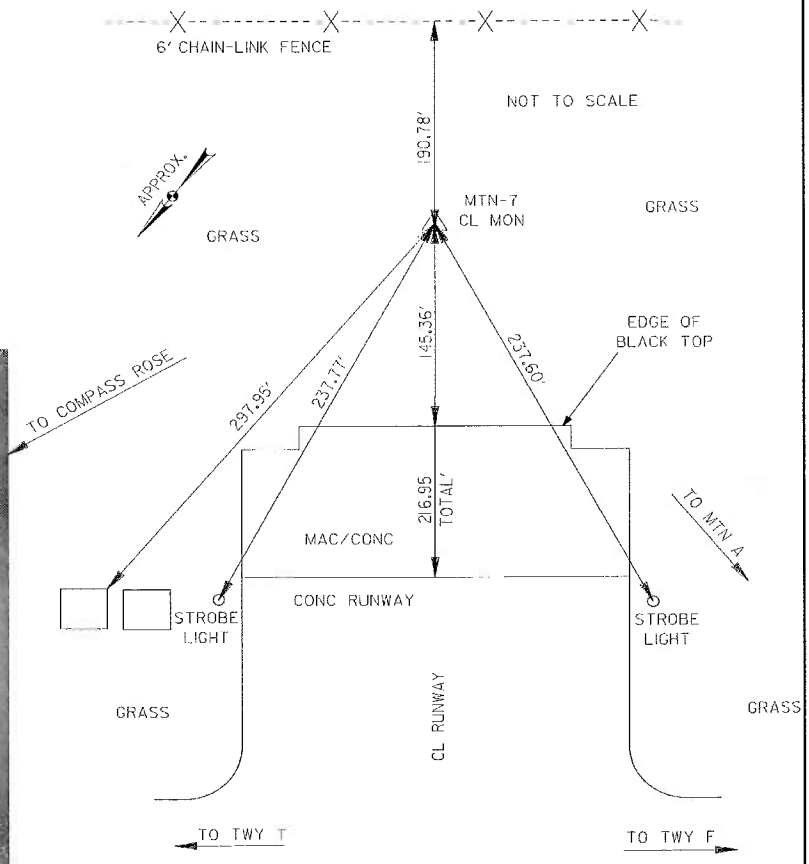
AVAILABLE CONVENTIONAL BACKSIGHT POINTS (FIELD DATA):

POINT	AZIMUTH	DISTANCE (US FT.)	DISTANCE (m)

STATION DESCRIPTION:

***SHALL NOT BE OCCUPIED FOR SURVEY CONTROL. THIS POINT IS INTENDED FOR RECOVERY OF THE RUNWAY CENTERLINE ONLY**

AT THE 33 END OF THE RUNWAY



SURVEYED BY: JMT ENGINEERING — **SPARKS, MARYLAND**

MARTIN STATE AIRPORT (MTN) - SURVEY CONTROL DATA

NAME OF STATION: MTN-8 | **DATE ESTABLISHED:** August 2005

MARYLAND STATE PLANE COORDINATES (NAD 83):

NORTHING (Y):	US ft.	m
EASTING (X):	US ft.	m
ORTHOMETRIC HEIGHT (NAVD 88)	US ft.	m
CONVERGENCE ANGLE:		
SCALE FACTOR:		
COMBINED SCALE FACTOR:		

GEOGRAPHIC COORDINATES (NAD 83):

LATITUDE:	(N)	
LONGITUDE:	(W)	
ELLIPSOID HT:	US ft.	m

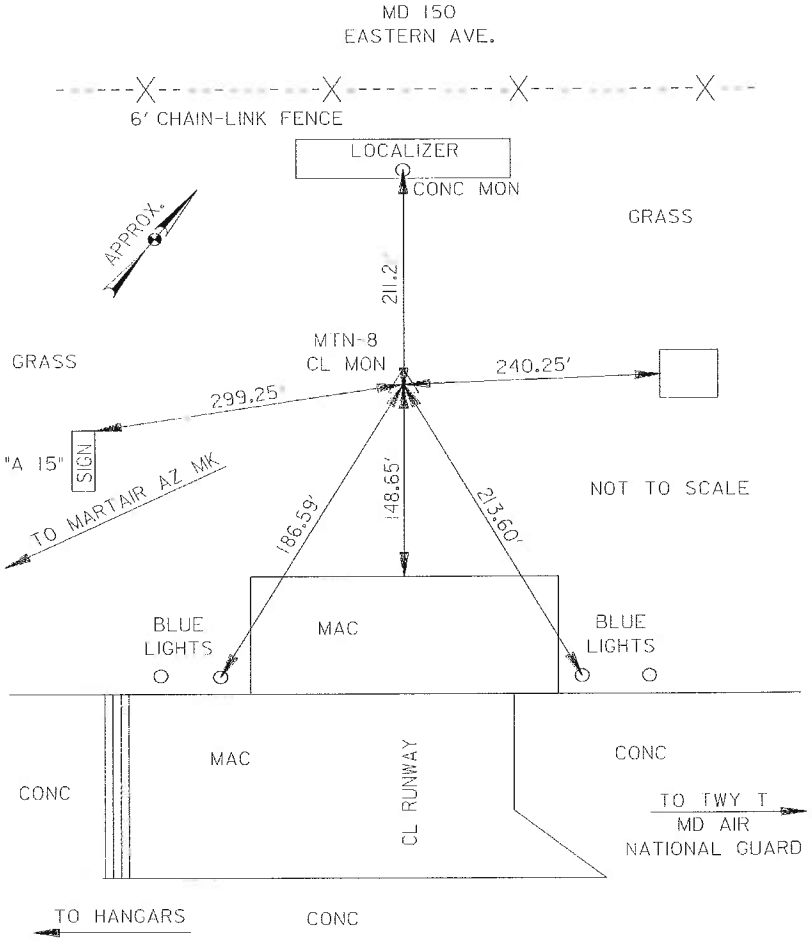
AVAILABLE CONVENTIONAL BACKSIGHT POINTS (FIELD DATA):

POINT	AZIMUTH	DISTANCE (US FT.)	DISTANCE (m)

STATION DESCRIPTION:

***SHALL NOT BE OCCUPIED FOR SURVEY CONTROL. THIS POINT IS INTENDED FOR RECOVERY OF THE RUNWAY CENTERLINE ONLY**

AT THE 15 END OF THE RUNWAY



SURVEYED BY: JMT ENGINEERING — **SPARKS, MARYLAND**

MARTIN STATE AIRPORT (MTN) - SURVEY CONTROL DATA

NAME OF STATION: MARTAIR AZ MK
NGS PID: JV6476
DATE ESTABLISHED: 1985

MARYLAND STATE PLANE COORDINATES (NAD 83):

NORTHING (Y):	607285.0956 US ft.	185100.8676 m
EASTING (X):	1474311.9473 US ft.	449371.18 m
ORTHOMETRIC HEIGHT (NAVD 88):	20.71 US ft.	6.311 m
CONVERGENCE ANGLE:	0°21'33.9"	
SCALE FACTOR:	0.99998159	
COMBINED SCALE FACTOR:	0.99998578	

GEOGRAPHIC COORDINATES (NAD 83):

LATITUDE:	39 19 57.88957 (N)	
LONGITUDE:	076 25 38.50226 (W)	
ELLIPSOID HT:	-87.54 US ft.	-26.681 m

AVAILABLE CONVENTIONAL BACKSIGHT POINTS (FIELD DATA):

POINT	AZIMUTH	DISTANCE (US FT.)	DISTANCE (m)
MTN B	111° 29' 52"	1673.275	510.015
MTN-4	122° 12' 00"	2675.150	815.387

STATION DESCRIPTION:

SEE NGS DATASHEETS ATTACHED

HORZ ORDER - B
VERT ORDER - THIRD
ELLP ORDER - FOURTH CLASS II

SURVEYED BY: JMT ENGINEERING — SPARKS, MARYLAND

DATASHEETS

1 National Geodetic Survey, Retrieval Date = NOVEMBER 8, 2005
JV6476 **********
JV6476 PACS - This is a Primary Airport Control Station.
JV6476 DESIGNATION - MARTAIR AZ MK
JV6476 PID - JV6476
JV6476 STATE/COUNTY- MD/BALTIMORE
JV6476 USGS QUAD - MIDDLE RIVER (1985)
JV6476
JV6476 *CURRENT SURVEY CONTROL
JV6476 _____
JV6476* NAD 83(1991)- 39 19 57.88957(N) 076 25 38.50226(W) ADJUSTED
JV6476* NAVD 88 - 6.311 (meters) 20.71 (feet) ADJUSTED
JV6476 _____
JV6476 X - 1,159,303.234 (meters) COMP
JV6476 Y - -4,802,017.867 (meters) COMP
JV6476 Z - 4,020,941.106 (meters) COMP
JV6476 LAPLACE CORR- -2.64 (seconds) DEFLEC99
JV6476 ELLIP HEIGHT- -26.67 (meters) (08/09/02) GPS OBS
JV6476 GEOID HEIGHT- -32.99 (meters) GEOID03
JV6476 DYNAMIC HT - 6.308 (meters) 20.70 (feet) COMP
JV6476 MODELED GRAV- 980,107.4 (mgal) NAVD 88
JV6476
JV6476 HORZ ORDER - B
JV6476 VERT ORDER - THIRD
JV6476 ELLP ORDER - FOURTH CLASS II
JV6476
JV6476.This mark is at Martin State Airport (MTN)
JV6476
JV6476.The horizontal coordinates were established by GPS observations
JV6476.and adjusted by the National Geodetic Survey in March 1998.
JV6476
JV6476.The orthometric height was determined by differential leveling
JV6476.and adjusted by the National Geodetic Survey in February 1998.
JV6476
JV6476.The X, Y, and Z were computed from the position and the ellipsoidal ht.
JV6476
JV6476.The Laplace correction was computed from DEFLEC99 derived deflections.
JV6476
JV6476.The ellipsoidal height was determined by GPS observations
JV6476.and is referenced to NAD 83.
JV6476
JV6476.The geoid height was determined by GEOID03.
JV6476
JV6476.The dynamic height is computed by dividing the NAVD 88
JV6476.geopotential number by the normal gravity value computed on the
JV6476.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
JV6476.degrees latitude (g = 980.6199 gals.).
JV6476
JV6476.The modeled gravity was interpolated from observed gravity values.
JV6476
JV6476; North East Units Scale Factor Converg.

```
JV6476;SPC MD     -  185,100.867  449,371.180  MT  0.99998159   +0 21 33.9
JV6476;SPC MD     -  607,285.09  1,474,311.95  sFT  0.99998159   +0 21 33.9
JV6476;UTM  18    - 4,354,674.286  376,980.708  MT  0.99978633   -0 54 17.3
JV6476
JV6476!          -  Elev Factor  x  Scale Factor =  Combined Factor
JV6476!SPC MD     -  1.00000418  x  0.99998159  =  0.99998577
JV6476!UTM  18    -  1.00000418  x  0.99978633  =  0.99979051
JV6476
JV6476:             Primary Azimuth Mark                Grid Az
JV6476:SPC MD     -  MARTAIR                           111 32 54.8
JV6476:UTM  18    -  MARTAIR                           112 48 46.0
JV6476
JV6476|-----------------------------------------------------------------------|
JV6476| PID    Reference Object                Distance      Geod. Az  |
JV6476|                                        dddmmss.s |
JV6476| JV6144 MARTAIR                         496.478 METERS 1115428.7 |
JV6476|-----------------------------------------------------------------------|
JV6476
JV6476                    SUPERSEDED SURVEY CONTROL
JV6476
JV6476  ELLIP H (03/24/98)  -26.61   (m)                  GP(      ) 4 1
JV6476  NAD 83(1991)-  39 19 57.88953(N)   076 25 38.50223(W) AD(      ) B
JV6476  ELLIP H (11/22/95)  -26.61   (m)                  GP(      ) 1 1
JV6476  NAD 83(1991)-  39 19 57.88854(N)   076 25 38.50294(W) AD(      ) 1
JV6476  ELLIP H (01/27/92)  -26.53   (m)                  GP(      ) 4 1
JV6476  NAD 83(1986)-  39 19 57.88372(N)   076 25 38.51118(W) AD(      ) 1
JV6476  NAD 27     -  39 19 57.49393(N)   076 25 39.65548(W) AD(      ) 1
JV6476  NAVD 88 (03/24/98)   6.31   (m)          20.7    (f) LEVELING    3
JV6476  NGVD 29 (11/20/87)   6.3    (m)          21.     (f) GPS OBS
JV6476
JV6476.Superseded values are not recommended for survey control.
JV6476.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
JV6476.See file dsdata.txt to determine how the superseded data were derived.
JV6476
JV6476_U.S. NATIONAL GRID SPATIAL ADDRESS: 18SUJ7698154674(NAD 83)
JV6476_MARKER: DZ = AZIMUTH MARK DISK
JV6476_SETTING: 7 = SET IN TOP OF CONCRETE MONUMENT
JV6476_SP_SET: SET IN TOP OF CONCRETE MONUMENT
JV6476_STAMPING: MARTAIR 1985
JV6476_MARK LOGO: NGS
JV6476_MAGNETIC: N = NO MAGNETIC MATERIAL
JV6476_STABILITY: C = MAY HOLD, BUT OF TYPE COMMONLY SUBJECT TO
JV6476+STABILITY: SURFACE MOTION
JV6476_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
JV6476+SATELLITE: SATELLITE OBSERVATIONS - October 01, 2002
JV6476
JV6476  HISTORY    - Date     Condition       Report By
JV6476  HISTORY    - 1985     MONUMENTED      NGS
JV6476  HISTORY    - 19860123 GOOD
JV6476  HISTORY    - 19911107 GOOD            NGS
JV6476  HISTORY    - 19940902 GOOD            NGS
JV6476  HISTORY    - 19950201 GOOD            MCCRON
JV6476  HISTORY    - 19961010 GOOD            NGS
```

JV6476 HISTORY - 19970620 GOOD DMW
JV6476 HISTORY - 19980928 GOOD DMW
JV6476 HISTORY - 19990902 GOOD MDSHA
JV6476 HISTORY - 20020929 GOOD JCLS
JV6476 HISTORY - 20021001 GOOD JCLS
JV6476
JV6476 STATION DESCRIPTION
JV6476
JV6476'DESCRIBED BY NATIONAL GEODETIC SURVEY 1985 (RGP)
JV6476'THE STATION IS LOCATED ABOUT 16 KM (10 MI) EAST FROM THE APPROXIMATE
JV6476'CENTER OF BALTIMORE, 5-1/2 KM (3-1/2 MI) SOUTH FROM WHITE MARSH
JV6476'AND 1 KM (1/2 MI) EAST FROM THE APPROXIMATE CENTER OF MIDDLE
JV6476'RIVER.
JV6476'
JV6476'OWNERSHIP--STATE OWNED PROPERTY.
JV6476'
JV6476'NO TO REACH NECESSARY.
JV6476'
JV6476'THE STATION SURFACE MARK IS A STANDARD NGS AZIMUTH MARK DISK
JV6476'STAMPED--MARTAIR--1985 SET IN THE TOP OF A 25 CM (10 INCH)
JV6476'ROUND CONCRETE POST WHICH IS FLUSH WITH THE SURFACE. THE SUB
JV6476'SURFACE DISK IS IDENTICAL TO THE SURFACE MARK AND IT IS SET IN
JV6476'A MASS OF CONCRETE 114 CM (45 INCHES) BELOW THE SURFACE.
JV6476'
JV6476'THE MARK IS LOCATED 67.9 METERS (222.9 FT) EAST FROM THE EAST
JV6476'CORNER OF THE MIDDLE RIVER POST OFFICE, 16.7 METERS (54.7 FT) EAST
JV6476'NORTHEAST FROM THE NORTHEAST CURB OF THE STATE HIGHWAY 587,
JV6476'23.0 METERS (75.6 FT) SOUTHWEST FROM THE EDGE OF A TAXI STRIP AND
JV6476'0.5 METER (1.8 FT) SOUTHEAST FROM A CARSONITE WITNESS POST.
JV6476
JV6476 STATION RECOVERY (1986)
JV6476
JV6476'RECOVERED 1986
JV6476'RECOVERED IN GOOD CONDITION.
JV6476
JV6476 STATION RECOVERY (1991)
JV6476
JV6476'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1991
JV6476'THE STATION IS LOCATED AT THE NW END OF THE INNER TAXIWAY NEAR THE
JV6476'INTERSECTION WITH TAXIWAY A WEST. THE STATION IS 45 FT (13.7 M) SW OF
JV6476'THE CENTERLINE EXTENSION OF THE RAMP AREA TO THE EAST, 74.9 FT (22.8
JV6476'M) WEST OF THE WEST EDGE OF THE TAXIWAY, 135 FT (41.1 M) SW OF THE NW
JV6476'CORNER OF ASPHALT, 180.4 FT (55.0 M) NW OF THE W CORNER OF A SIGN A,
JV6476'AND 18.5 FT (5.6 M) EAST OF A FENCE. THE STATION IS A STANDARD NGS
JV6476'DISK SET IN THE TOP OF A CONCRETE POST FLUSH WITH THE GROUND STAMPED
JV6476'MARTAIR 1985.
JV6476
JV6476 STATION RECOVERY (1994)
JV6476
JV6476'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1994 (RAH)
JV6476'RECOVERED IN GOOD CONDITION.
JV6476'
JV6476'CONTACT MR. JAKE WEST, AIRPORT MANAGER, MARTIN STATE AIRPORT, BOX 20,

JV6476'701 WILSON POINT ROAD, BALTIMORE, MD 21220, PHONE (410) 682-8810.
JV6476'
JV6476'TO REACH THE STATION FROM THE CONTROL TOWER, GO NORTHWESTERLY FOR
JV6476'0.42 KM (0.25 MI) ALONG AN APRON AND TAXIWAY TO THE STATION ON THE RIGHT.
JV6476'
JV6476'THE STATION IS LOCATED 55.0 M (180.4 FT) NORTHEAST OF THE WEST CORNER
JV6476'OF A SIGN A, 41.1 M (134.8 FT) SOUTHWEST OF THE NORTHWEST CORNER OF
JV6476'ASPHALT PAVEMENT, 22.8 M (74.8 FT) WEST IF THE WEST EDGE OF THE
JV6476'TAXIWAY, 5.6 M (18.4 FT) EAST OF A CHAIN LINK FENCE, AND THE MONUMENT
JV6476'IS FLUSH WITH THE GROUND.
JV6476'
JV6476'DESCRIBED BY KLF.
JV6476
JV6476 STATION RECOVERY (1995)
JV6476
JV6476'RECOVERY NOTE BY J R MCCRONE JR INCORPORATED 1995 (HAS)
JV6476'RECOVERED AS DESCRIBED.
JV6476
JV6476 STATION RECOVERY (1996)
JV6476
JV6476'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1996 (AJL)
JV6476'RECOVERED AS DESCRIBED.
JV6476
JV6476 STATION RECOVERY (1997)
JV6476
JV6476'RECOVERY NOTE BY DAFT MCCUNE WALKER INCORPORATED 1997 (DMM)
JV6476'RECOVERED AS DESCRIBED.
JV6476
JV6476 STATION RECOVERY (1998)
JV6476
JV6476'RECOVERY NOTE BY DAFT MCCUNE WALKER INCORPORATED 1998 (JMS)
JV6476'RECOVERED IN GOOD CONDITION.
JV6476
JV6476 STATION RECOVERY (1999)
JV6476
JV6476'RECOVERY NOTE BY MARYLAND DOT HIGHWAY ADMINISTRATION 1999 (DMM)
JV6476'RECOVERED AS DESCRIBED
JV6476
JV6476 STATION RECOVERY (2002)
JV6476
JV6476'RECOVERY NOTE BY JOHN CHANCE LAND SURVEYS INC 2002 (MRY)
JV6476'RECOVERED IN GOOD CONDITION.
JV6476
JV6476 STATION RECOVERY (2002)
JV6476
JV6476'RECOVERY NOTE BY JOHN CHANCE LAND SURVEYS INC 2002
JV6476'RECOVERED IN GOOD CONDITION.

*** retrieval complete.
Elapsed Time = 00:00:00

MARTIN STATE AIRPORT (MTN) - SURVEY CONTROL DATA

NAME OF STATION: MTN A
NGS PID: AA9279
DATE ESTABLISHED: 1989

MARYLAND STATE PLANE COORDINATES (NAD 83):

NORTHING (Y):	602209.3862 US ft.	183553.788 m
EASTING (X):	1480310.2956 US ft.	451199.481 m
ORTHOMETRIC HEIGHT (NAVD 88):	5.4 US ft.	1.64 m
CONVERGENCE ANGLE:	0°22'21.5"	
SCALE FACTOR:	0.99997967	
COMBINED SCALE FACTOR:	0.99998459	

GEOGRAPHIC COORDINATES (NAD 83):

LATITUDE:	39 19 07.34515 (N)	
LONGITUDE:	076 24 22.58368 (W)	
ELLIPSOID HT:	-102.92 US ft.	-31.370 m

AVAILABLE CONVENTIONAL BACKSIGHT POINTS (FIELD DATA):

POINT	AZIMUTH	DISTANCE (US FT.)	DISTANCE (m)
MTN B	315° 08' 07"	6296.22	1919.092
MTN-6	310° 06' 04"	2879.73	877.743
MTN-4	314° 20' 41"	5222.33	1591.769
MTN-1	231° 15' 50"	1027.35	313.137

STATION DESCRIPTION:

SEE NGS DATASHEETS ATTACHED

HORZ ORDER - FIRST
ELLP ORDER - FOURTH CLASS II

SURVEYED BY: JMT ENGINEERING — SPARKS, MARYLAND

DATASHEETS

1 National Geodetic Survey, Retrieval Date = NOVEMBER 8, 2005
AA9279 **********
AA9279 SACS - This is a Secondary Airport Control Station.
AA9279 DESIGNATION - MTN A
AA9279 PID - AA9279
AA9279 STATE/COUNTY- MD/BALTIMORE
AA9279 USGS QUAD - MIDDLE RIVER (1985)
AA9279
AA9279 *CURRENT SURVEY CONTROL
AA9279 ---
AA9279* NAD 83(1991)- 39 19 07.34515(N) 076 24 22.58368(W) ADJUSTED
AA9279* NAVD 88 - 1.64 (meters) 5.4 (feet) GPS OBS
AA9279 ---
AA9279 X - 1,161,301.923 (meters) COMP
AA9279 Y - -4,802,547.463 (meters) COMP
AA9279 Z - 4,019,732.347 (meters) COMP
AA9279 LAPLACE CORR- -2.19 (seconds) DEFLEC99
AA9279 ELLIP HEIGHT- -31.37 (meters) (08/19/02) GPS OBS
AA9279 GEOID HEIGHT- -33.03 (meters) GEOID03
AA9279
AA9279 HORZ ORDER - FIRST
AA9279 ELLP ORDER - FOURTH CLASS II
AA9279
AA9279.This mark is at Martin State Airport (MTN)
AA9279
AA9279.The horizontal coordinates were established by GPS observations
AA9279.and adjusted by the National Geodetic Survey in April 1998.
AA9279
AA9279.The orthometric height was determined by GPS observations and a
AA9279.high-resolution geoid model.
AA9279
AA9279.GPS derived orthometric heights for airport stations designated as
AA9279.PACS or SACS are published to 2 decimal places. This maintains
AA9279.centimeter relative accuracy between the PACS and SACS. It does
AA9279.not indicate centimeter accuracy relative to other marks which are
AA9279.part of the NAVD 88 network.
AA9279
AA9279.The X, Y, and Z were computed from the position and the ellipsoidal ht.
AA9279
AA9279.The Laplace correction was computed from DEFLEC99 derived deflections.
AA9279
AA9279.The ellipsoidal height was determined by GPS observations
AA9279.and is referenced to NAD 83.
AA9279
AA9279.The geoid height was determined by GEOID03.
AA9279
AA9279; North East Units Scale Factor Converg.
AA9279;SPC MD - 183,553.788 451,199.481 MT 0.99997967 +0 22 21.5
AA9279;SPC MD - 602,209.39 1,480,310.30 sFT 0.99997967 +0 22 21.5
AA9279;UTM 18 - 4,353,087.565 378,774.082 MT 0.99978094 -0 53 28.2
AA9279

AA9279! - Elev Factor x Scale Factor = Combined Factor
AA9279!SPC MD - 1.00000492 x 0.99997967 = 0.99998459
AA9279!UTM 18 - 1.00000492 x 0.99978094 = 0.99978586
AA9279
AA9279 SUPERSEDED SURVEY CONTROL
AA9279
AA9279 ELLIP H (04/02/98) -31.31 (m) GP( ) 4 2
AA9279 NAD 83(1991)- 39 19 07.34511(N) 076 24 22.58365(W) AD( ) 1
AA9279 ELLIP H (11/30/95) -31.31 (m) GP( ) 4 2
AA9279
AA9279.Superseded values are not recommended for survey control.
AA9279.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
AA9279.See file dsdata.txt to determine how the superseded data were derived.
AA9279
AA9279_U.S. NATIONAL GRID SPATIAL ADDRESS: 18SUJ7877453088(NAD 83)
AA9279_MARKER: DD = SURVEY DISK
AA9279_SETTING: 30 = SET IN A LIGHT STRUCTURE
AA9279_SP_SET: SET IN A LIGHT STRUCTURE
AA9279_STAMPING: MTN A 1989
AA9279_MARK LOGO: NOS
AA9279_MAGNETIC: O = OTHER; SEE DESCRIPTION
AA9279_STABILITY: C = MAY HOLD, BUT OF TYPE COMMONLY SUBJECT TO
AA9279+STABILITY: SURFACE MOTION
AA9279_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
AA9279+SATELLITE: SATELLITE OBSERVATIONS - September 02, 1999
AA9279
AA9279 HISTORY - Date Condition Report By
AA9279 HISTORY - 1989 MONUMENTED NOS
AA9279 HISTORY - 19911107 GOOD NOS
AA9279 HISTORY - 19940902 GOOD NGS
AA9279 HISTORY - 19961010 GOOD NGS
AA9279 HISTORY - 19990902 GOOD MDSHA
AA9279
AA9279 STATION DESCRIPTION
AA9279
AA9279'DESCRIBED BY NATIONAL OCEAN SERVICE 1991
AA9279'THE STATION IS LOCATED AT THE MARTIN STATE AIRPORT SOUTHWEST OF RUNWAY
AA9279'END 32, AND NORTH OF THE PARALLEL TAXIWAY. THE STATION IS A STANDARD
AA9279'NOS DISK SET IN THE NE CORNER OF THE INNER CONCRETE SECTION OF A STORM
AA9279'DRAIN. THE STATION IS 126.6 FT (38.6 M) NW OF THE CENTERLINE OF A
AA9279'TAXIWAY, 70.7 FT (21.5 M) NNE OF TAXIWAY LIGHT 81, 118.0 FT (36.0 M)
AA9279'NE OF THE CENTERLINE OF THE PARALLEL TAXIWAY, AND 55.5 FT (16.9 M) SE
AA9279'OF THE SE CORNER OF A SIGN E. THE DISK IS STAMPED MTN A 1989.
AA9279
AA9279 STATION RECOVERY (1994)
AA9279
AA9279'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1994 (RAH)
AA9279'THE STATION IS LOCATED ABOUT 6.4 KM (3.95 MI) SOUTH-SOUTHEAST OF WHITE
AA9279'MARSH, 5.3 KM (3.30 MI) NORTHEAST OF ESSEX, AND 4.8 KM (3.00 MI)
AA9279'SOUTHWEST OF CHASE, NEAR THE NORTHEAST CORNEROF THE INNER CONCRETE
AA9279'SECTION OF A STORM DRAIN NEAR THE SOUTHEAST END OF THE ACTIVE RUNWAY
AA9279'14-32. OWNERSHIP- STATE OF MARYLAND. CONTACT MR. JAKE WEST, AIRPORT
AA9279'MANAGER, MARTIN STATE AIRPORT, BOX 20, 701 WILSON POINT ROAD,

AA9279'BALTIMORE, MD 21220, PHONE (410) 682-8810.
AA9279'
AA9279'TO REACH THE STATION FROM THE CONTROL TOWER, GO SOUTHEAST FOR 1.12 KM
AA9279'(0.70 MI) ALONG AN APRON AND THE SOUTHERN PARALLEL TAXIWAY TO RUNWAY
AA9279'14-32 AND THE STATION ON THE LEFT.
AA9279'
AA9279'THE STATION IS LOCATED 38.6 M (126.6 FT) NORTHWEST OF THE CENTERLINE
AA9279'OF A CONNECTING TAXIWAY, 36.0 M (118.1 FT) NORTHEAST OF THE PARALLEL
AA9279'TAXIWAY, 21.5 M (70.5 FT) NORTH-NORTHEAST OF A TAXIWAY LIGHT NUMBER
AA9279'81, AND 16.9 M (55.4 FT) SOUTHEAST OF THE SOUTHEAST CORNER OF A SIGN
AA9279'E.
AA9279'
AA9279'DESCRIBED BY KLF.
AA9279
AA9279 STATION RECOVERY (1996)
AA9279
AA9279'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1996 (AJL)
AA9279'RECOVERED AS DESCRIBED.
AA9279
AA9279 STATION RECOVERY (1999)
AA9279
AA9279'RECOVERY NOTE BY MARYLAND DOT HIGHWAY ADMINISTRATION 1999 (DMM)
AA9279'RECOVERED AS DESCRIBED

*** retrieval complete.
Elapsed Time = 00:00:00

MARTIN STATE AIRPORT (MTN) - SURVEY CONTROL DATA

NAME OF STATION: MTN B
NGS PID: AI4374
DATE ESTABLISHED: 1998

MARYLAND STATE PLANE COORDINATES (NAD 83):

NORTHING (Y):	606671.9075 US ft.	184913.9672 m
EASTING (X):	1475868.8004 US ft.	449845.7101 m
ORTHOMETRIC HEIGHT (NAVD 88):	16.8 US ft.	5.12 m
CONVERGENCE ANGLE:	0°21'46.3"	
SCALE FACTOR:	0.99998135	
COMBINED SCALE FACTOR:	0.99998573	

GEOGRAPHIC COORDINATES (NAD 83):

LATITUDE:	39 19 51.73216 (N)	
LONGITUDE:	076 25 18.73818 (W)	
ELLIPSOID HT:	-91.417 US ft.	-27.864 m

AVAILABLE CONVENTIONAL BACKSIGHT POINTS (FIELD DATA):

POINT	AZIMUTH	DISTANCE (US FT.)	DISTANCE (m)
MARTAIR AZ MK	291° 29' 52"	1673.30	510.023
MTN-4	138° 58' 21"	1076.79	328.206
MTN-6	139° 21' 07"	3436.91	1047.572
MTN A	135° 08' 07"	6296.23	1919.095

STATION DESCRIPTION:

SEE NGS DATASHEETS ATTACHED

HORZ ORDER - FIRST
ELLP ORDER - FOURTH CLASS I

SURVEYED BY: JMT ENGINEERING — **SPARKS, MARYLAND**

DATASHEETS

1 National Geodetic Survey, Retrieval Date = NOVEMBER 8, 2005
AI4374 **********
AI4374 SACS - This is a Secondary Airport Control Station.
AI4374 DESIGNATION - MTN B
AI4374 PID - AI4374
AI4374 STATE/COUNTY- MD/BALTIMORE
AI4374 USGS QUAD - MIDDLE RIVER (1985)
AI4374
AI4374 *CURRENT SURVEY CONTROL
AI4374 ---
AI4374* NAD 83(1991)- 39 19 51.73216(N) 076 25 18.73818(W) ADJUSTED
AI4374* NAVD 88 - 5.12 (meters) 16.8 (feet) GPS OBS
AI4374 ---
AI4374 X - 1,159,791.391 (meters) COMP
AI4374 Y - -4,802,022.850 (meters) COMP
AI4374 Z - 4,020,793.468 (meters) COMP
AI4374 LAPLACE CORR- -2.55 (seconds) DEFLEC99
AI4374 ELLIP HEIGHT- -27.87 (meters) (10/28/02) GPS OBS
AI4374 GEOID HEIGHT- -33.00 (meters) GEOID03
AI4374
AI4374 HORZ ORDER - FIRST
AI4374 ELLP ORDER - FOURTH CLASS I
AI4374
AI4374.This mark is at Martin State Airport (MTN)
AI4374
AI4374.The horizontal coordinates were established by GPS observations
AI4374.and adjusted by the National Geodetic Survey in March 2000.
AI4374
AI4374.The orthometric height was determined by GPS observations and a
AI4374.high-resolution geoid model.
AI4374
AI4374.GPS derived orthometric heights for airport stations designated as
AI4374.PACS or SACS are published to 2 decimal places. This maintains
AI4374.centimeter relative accuracy between the PACS and SACS. It does
AI4374.not indicate centimeter accuracy relative to other marks which are
AI4374.part of the NAVD 88 network.
AI4374
AI4374.The X, Y, and Z were computed from the position and the ellipsoidal ht.
AI4374
AI4374.The Laplace correction was computed from DEFLEC99 derived deflections.
AI4374
AI4374.The ellipsoidal height was determined by GPS observations
AI4374.and is referenced to NAD 83.
AI4374
AI4374.The geoid height was determined by GEOID03.
AI4374
AI4374; North East Units Scale Factor Converg.
AI4374;SPC MD - 184,913.967 449,845.710 MT 0.99998135 +0 21 46.3
AI4374;SPC MD - 606,671.91 1,475,868.80 sFT 0.99998135 +0 21 46.3
AI4374;UTM 18 - 4,354,477.001 377,450.907 MT 0.99978491 -0 54 04.7
AI4374

AI4374! - Elev Factor x Scale Factor = Combined Factor
AI4374!SPC MD - 1.00000437 x 0.99998135 = 0.99998572
AI4374!UTM 18 - 1.00000437 x 0.99978491 = 0.99978928
AI4374
AI4374 SUPERSEDED SURVEY CONTROL
AI4374
AI4374 ELLIP H (03/31/00) -27.86 (m) GP( ) 4 1
AI4374
AI4374.Superseded values are not recommended for survey control.
AI4374.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
AI4374.See file dsdata.txt to determine how the superseded data were derived.
AI4374
AI4374_U.S. NATIONAL GRID SPATIAL ADDRESS: 18SUJ7745154477(NAD 83)
AI4374_MARKER: DD = SURVEY DISK
AI4374_SETTING: 7 = SET IN TOP OF CONCRETE MONUMENT
AI4374_SP_SET: SET IN TOP OF CONCRETE MONUMENT
AI4374_STAMPING: MTN B 1998
AI4374_MARK LOGO: MDSHA
AI4374_MAGNETIC: N = NO MAGNETIC MATERIAL
AI4374_STABILITY: C = MAY HOLD, BUT OF TYPE COMMONLY SUBJECT TO
AI4374+STABILITY: SURFACE MOTION
AI4374_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
AI4374+SATELLITE: SATELLITE OBSERVATIONS - 1998
AI4374
AI4374 HISTORY - Date Condition Report By
AI4374 HISTORY - 1998 MONUMENTED MDSHA
AI4374
AI4374 STATION DESCRIPTION
AI4374
AI4374'DESCRIBED BY MARYLAND DOT HIGHWAY ADMINISTRATION 1998 (DMM)
AI4374'STATION IS LOCATED ON THE MARTIN STATE AIRPORT BETWEEN RUNWAY 15-33
AI4374'AND AN AIRCRAFT TIE-DOWN AREA NEAR HANGAR 2. IT IS 199.8 FT (60.9 M)
AI4374'SSW OF RUNWAY LIGHT 2, 169.2 FT (51.6 M) NE OF THE NE EDGE OF THE
AI4374'TIE-DOWN AREA, 156.0 FT (47.5 M) SW OF THE SW EDGE OF THE RUNWAY,
AI4374'152.7 FT (46.5 M) W OF RUNWAY LIGHT 3, 35.5 FT (10.8 M) N OF A
AI4374'DRAINAGE INLET AND 2.7 FT (0.8 M) SW OF A CARSONITE WITNESS POST.
AI4374'MONUMENT IS A MARYLAND STATE HIGHWAY ADMINISTRATION DISK SET IN THE
AI4374'TOP OF A 12 IN ROUND CONCRETE POST WHICH IS FLUSH WITH THE GROUND.

*** retrieval complete.
Elapsed Time = 00:00:00

APPENDIX G

RESTROOM DESIGN STANDARDS

MARTIN STATE AIRPORT

BWI BALTIMORE/WASHINGTON INTERNATIONAL Thurgood Marshall AIRPORT

TABLE OF CONTENTS

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.

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

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 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

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

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.

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.

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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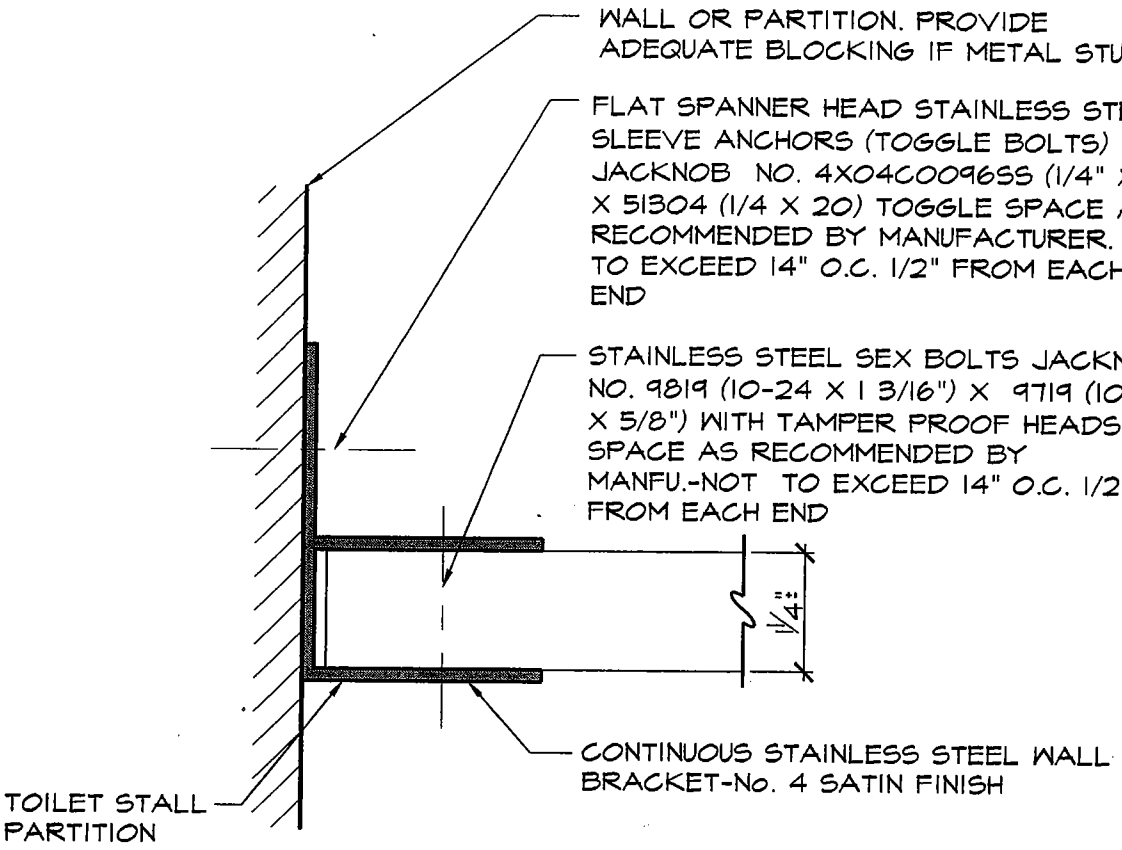
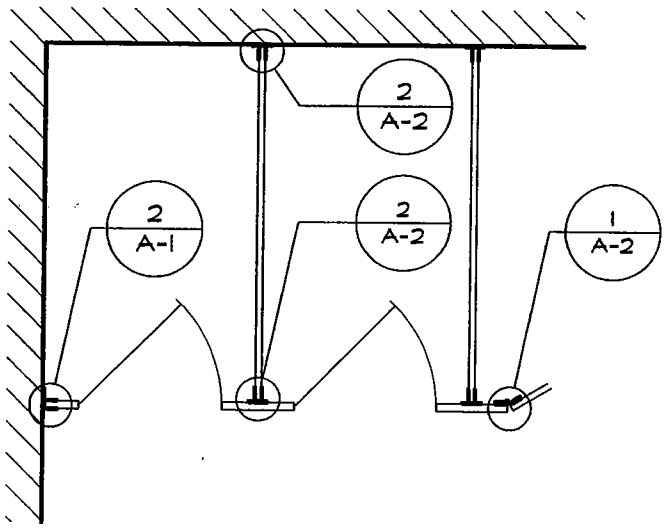
APPENDIX A – DESIGN STANDARD EXHIBITS



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

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

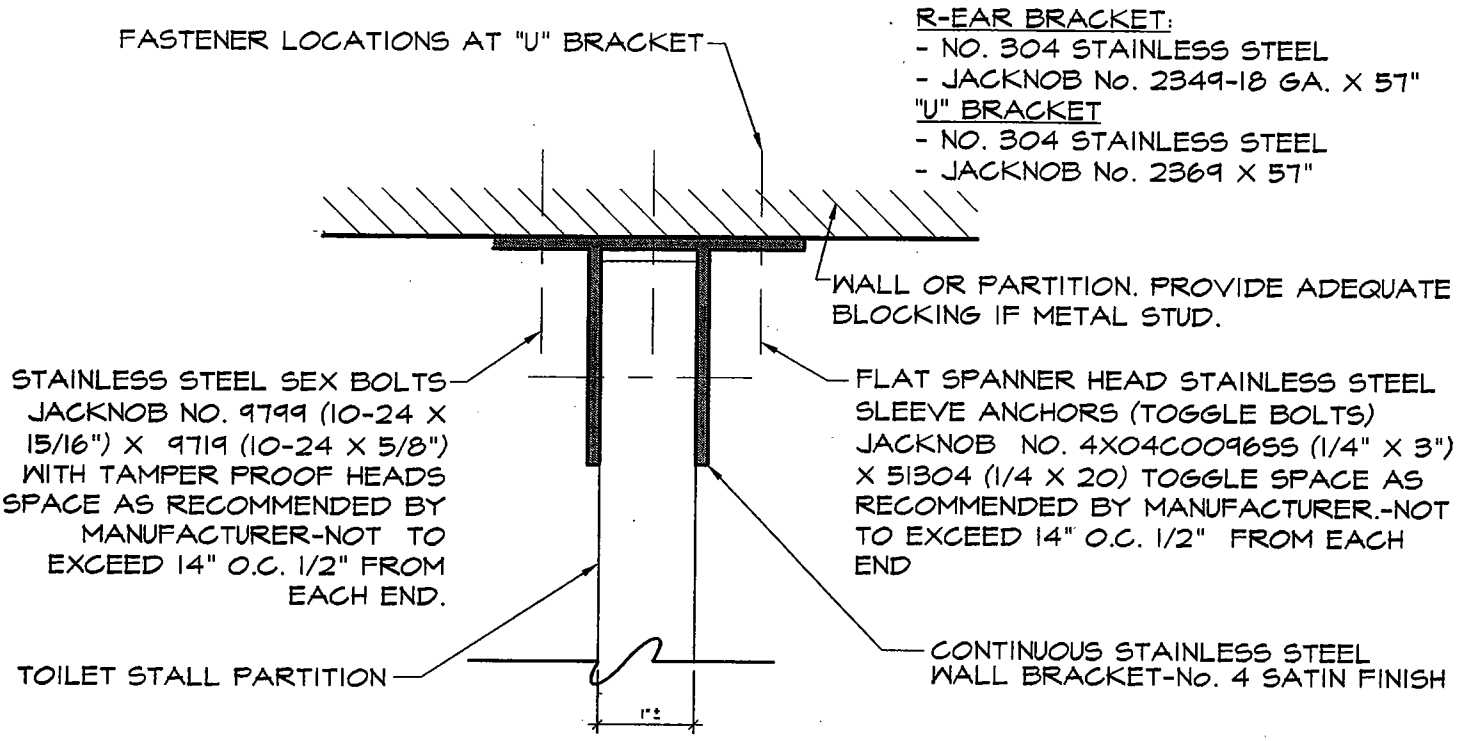
SHEET TITLE: TOILET STALL AND DETAILS

SCALE: AS NOTED

DATE: MAY 2004

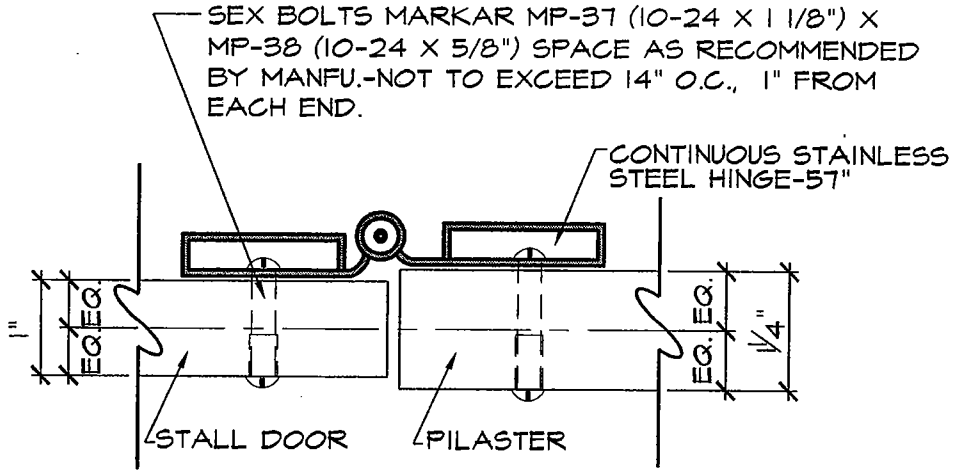
PROJECT NO.: TASK 1314.20

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

Baker
Michael Baker Jr., Inc.
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801 Cromwell Park Drive
Suite 110
Glen Burnie, Maryland 21061

PROJECT TITLE: RESTROOM DESIGN STANDARDS

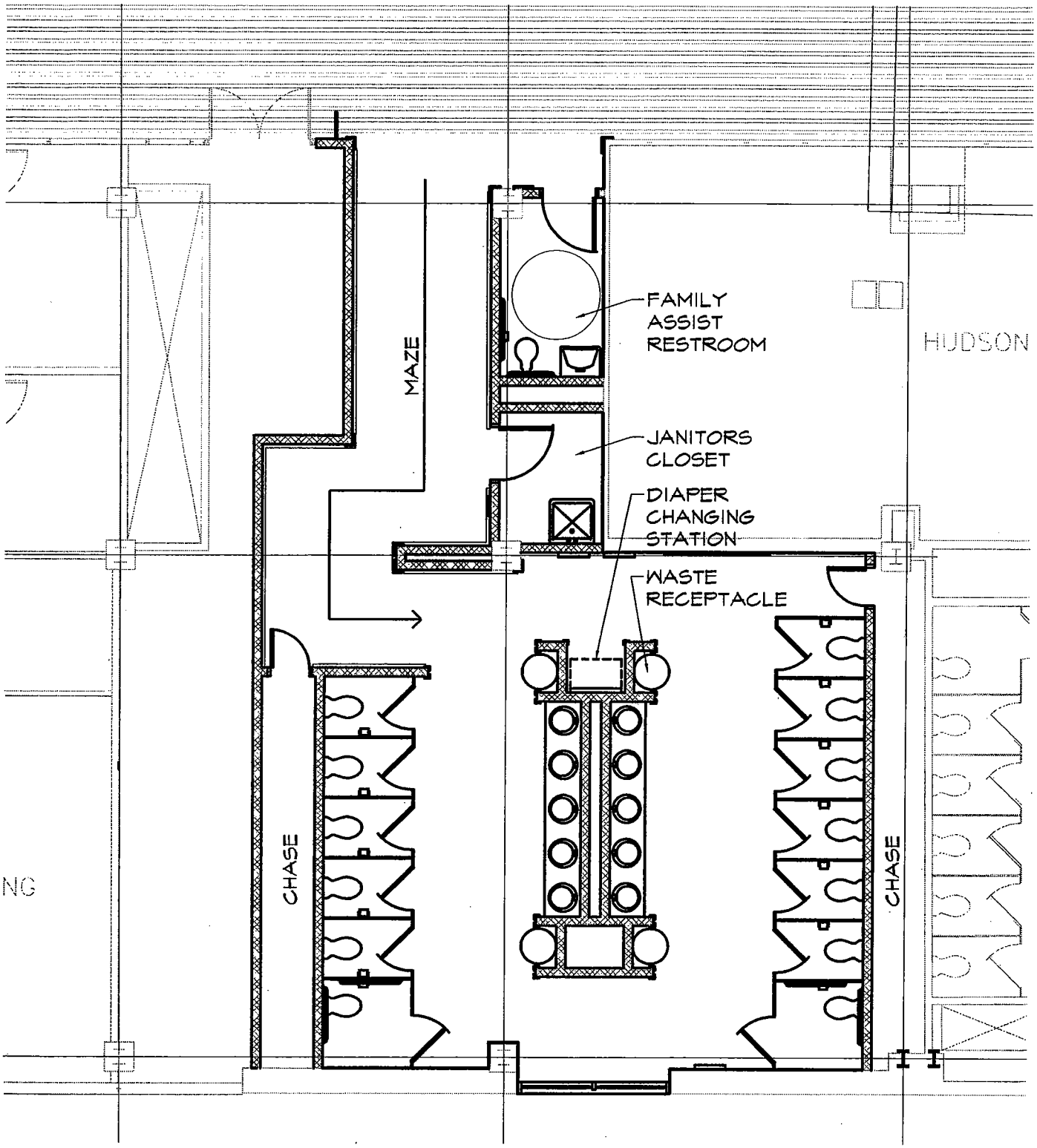
SHEET TITLE: TOILET STALL DETAILS

SCALE: AS NOTED

DATE: MAY 2004

PROJECT NO.: TASK 1314.20

EXHIBIT A-2



1 / A-3 SAMPLE LAYOUT - WOMEN'S ROOM

NOT TO SCALE

N

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Michael Baker Jr., Inc.
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PROJECT TITLE
RESTROOM DESIGN STANDARDS

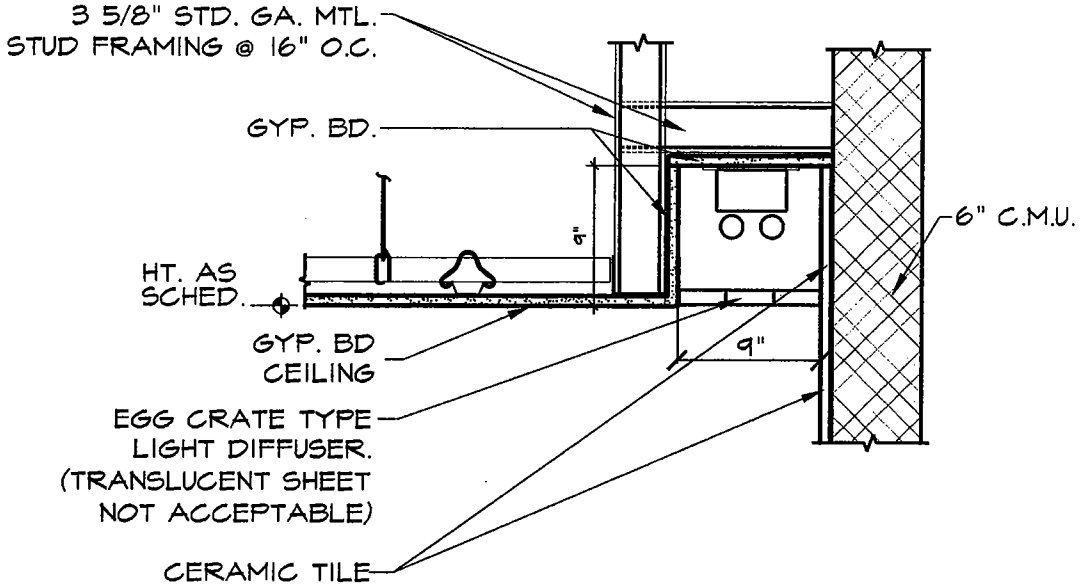
SHEET TITLE
SAMPLE LAYOUT - WOMEN'S ROOM

SCALE AS NOTED

DATE MAY 2004

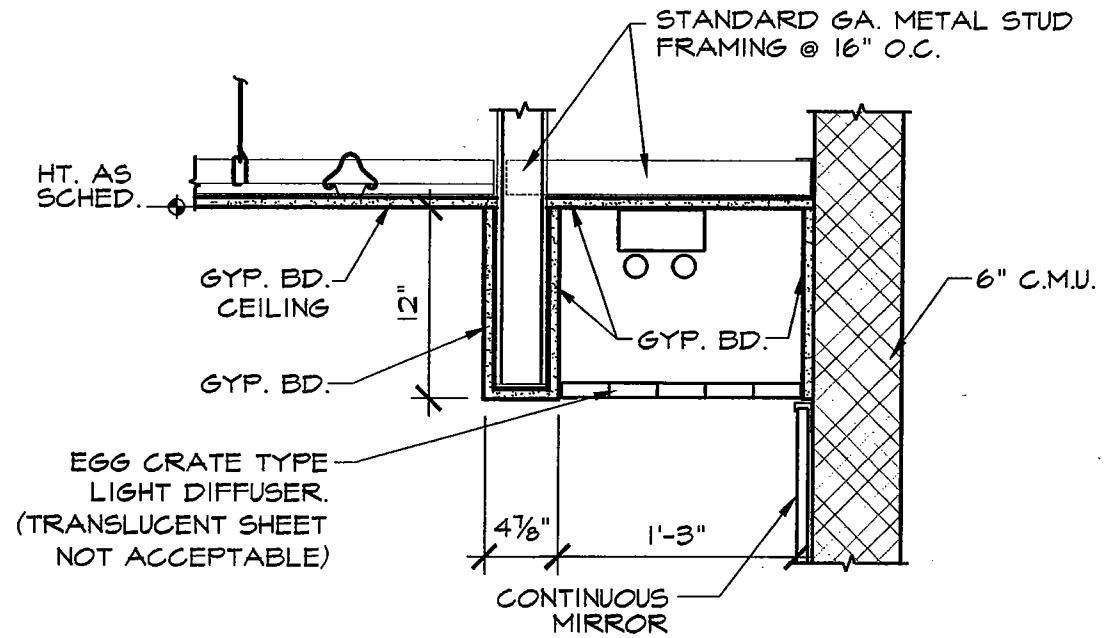
PROJECT NO.
TASK 1314.20

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

Baker
Michael Baker Jr., Inc.
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PROJECT TITLE
RESTROOM DESIGN STANDARDS

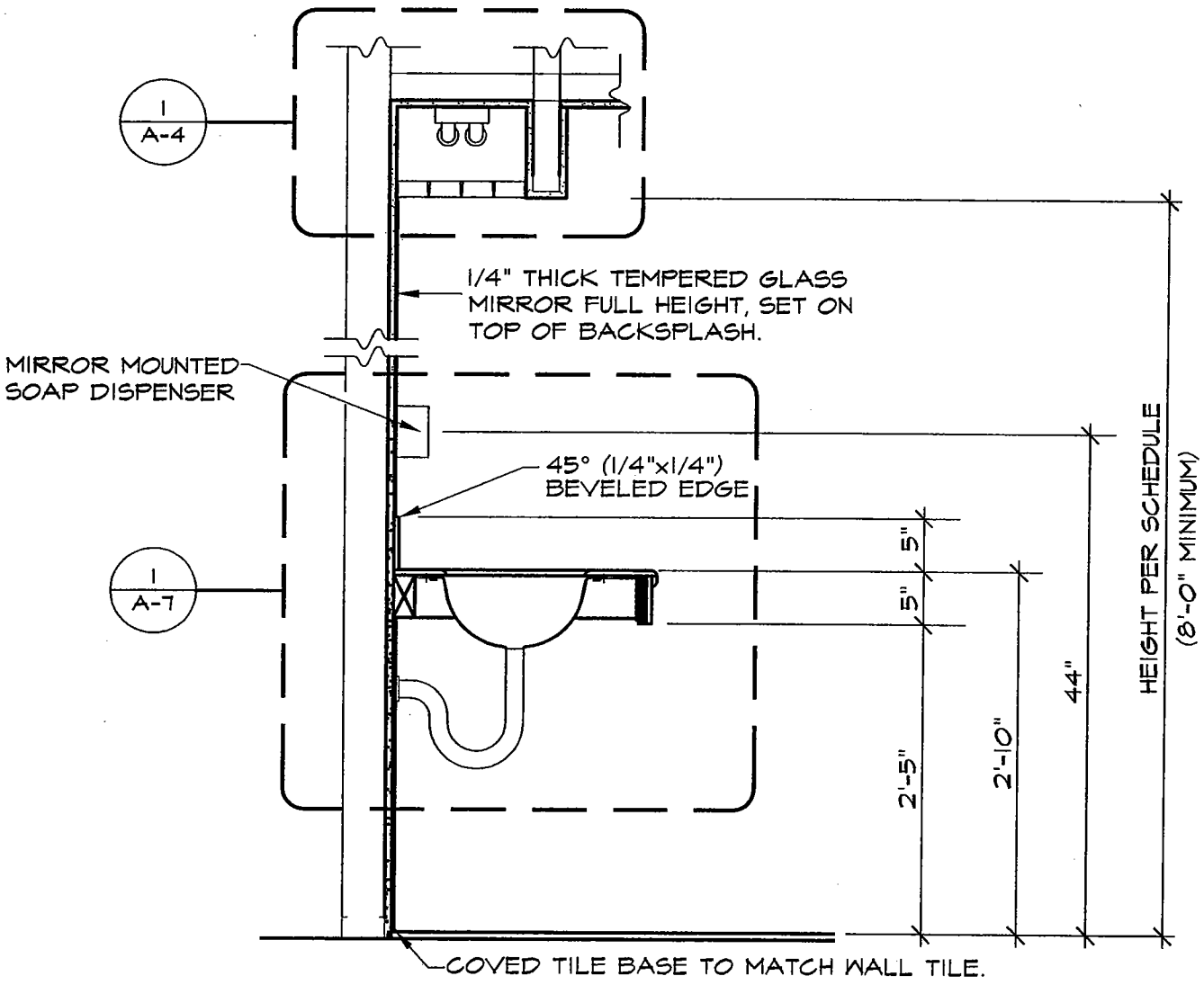
SHEET TITLE
LIGHT COVE DETAILS

SCALE AS NOTED

DATE MAY 2004

PROJECT NO.
TASK 1314.20

EXHIBIT A-4



1/A-5 SECTION THROUGH LAVATORIES

NOT TO SCALE

Baker
Michael Baker Jr., Inc.
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801 Cromwell Park Drive
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PROJECT TITLE
RESTROOM DESIGN STANDARDS

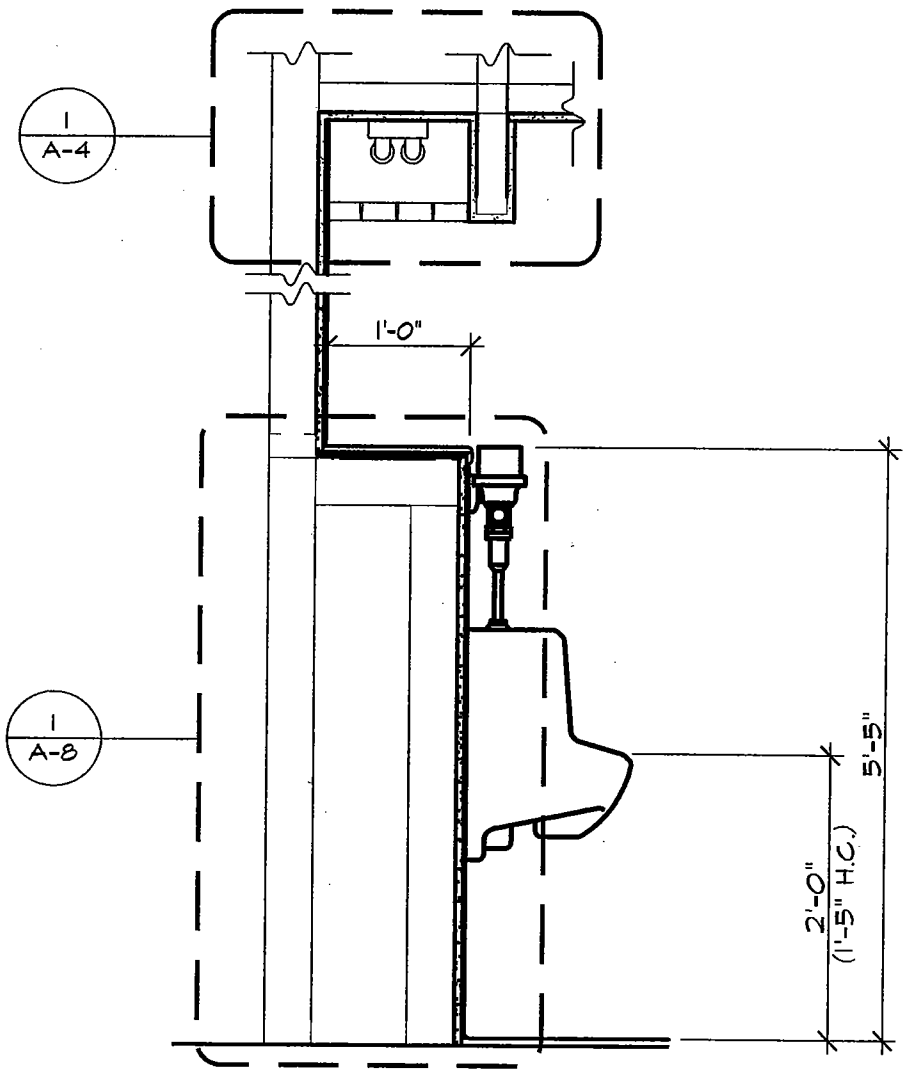
SHEET TITLE
SECTION THROUGH LAVATORIES

SCALE AS NOTED

DATE MAY 2004

PROJECT NO.
TASK 1314.20

EXHIBIT A-5



1
A-6

SECTION THROUGH URINAL SHELF

NOT TO SCALE

Baker
Michael Baker Jr., Inc.

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801 Cromwell Park Drive
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PROJECT TITLE
RESTROOM DESIGN STANDARDS

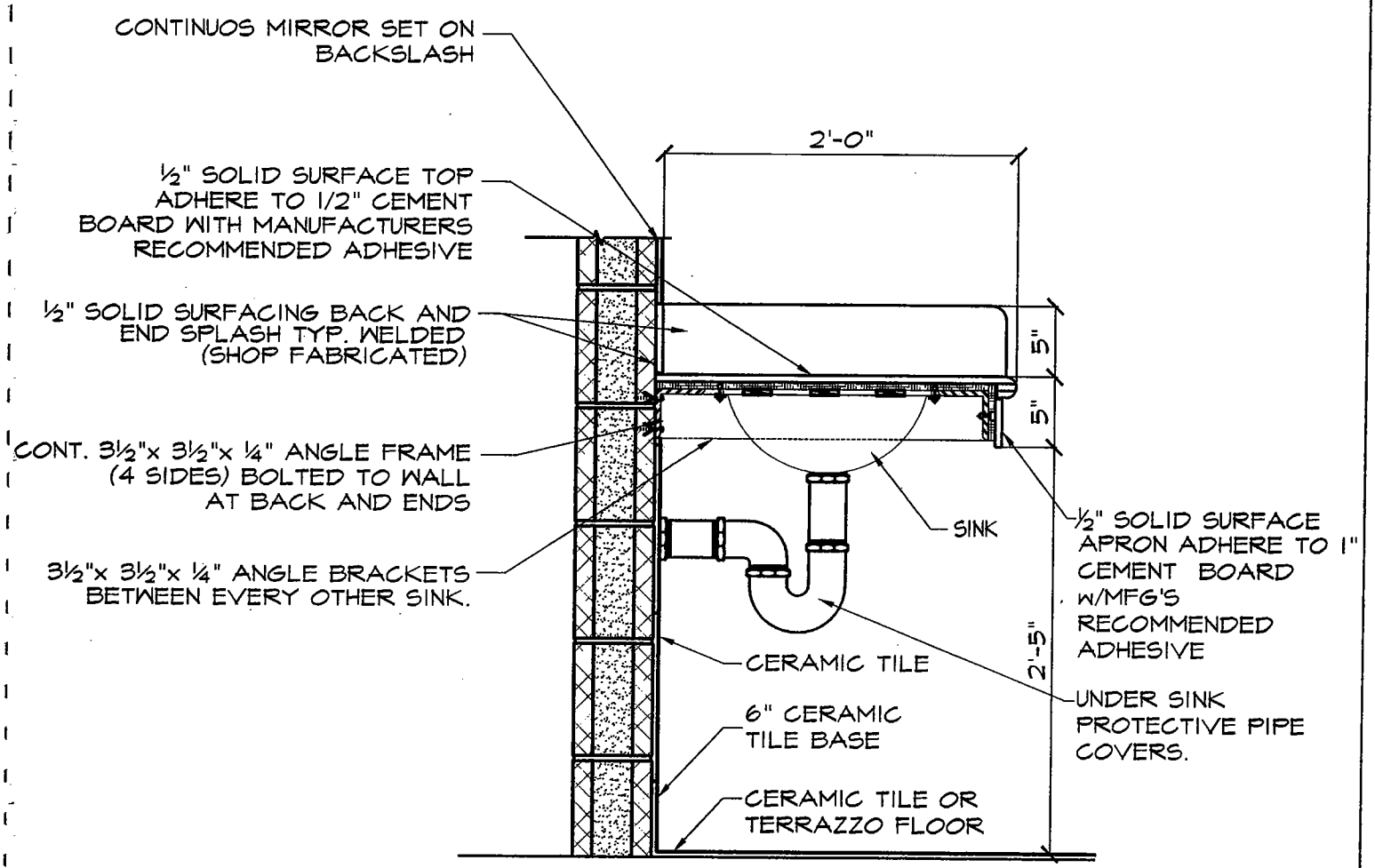
SHEET TITLE
SECTION THROUGH URINAL SHELF

SCALE AS NOTED

DATE MAY 2004

PROJECT NO.
TASK 1314.20

EXHIBIT A-6



1 / A-7

LAVATORY COUNTERTOP

NOT TO SCALE

NOTE: FINAL COUNTER STRUCTURE REQUIREMENTS TO BE VERIFIED BASED ON WALL CONSTRUCTION, ANCHORING & LENGTH OF VANITY COUNTER.

Baker
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PROJECT TITLE: RESTROOM DESIGN STANDARDS

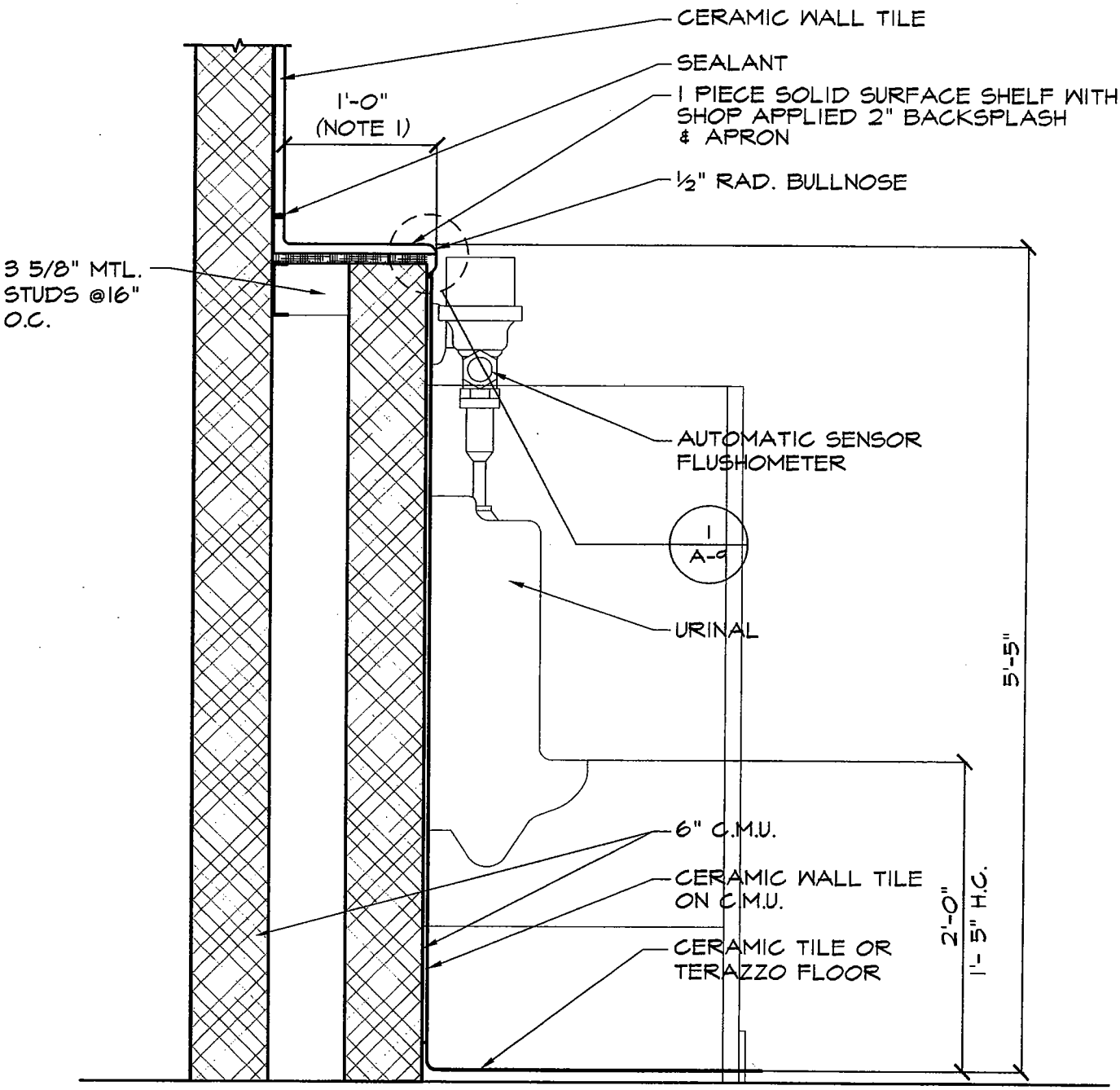
SHEET TITLE: LAVATORY COUNTERTOP

SCALE: AS NOTED

DATE: MAY 2004

PROJECT NO.: TASK 1314.20

EXHIBIT A-7



NOTE 1: COORDINATE FINAL DIMENSION REQUIREMENTS WITH URINAL CARRIAGE.

1 A-8 **URINAL WALL & SHELF**

NOT TO SCALE

Baker
Michael Baker Jr., Inc.
MICHAEL BAKER JR. INC.
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801 Cromwell Park Drive
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Glen Burnie, Maryland 21061

PROJECT TITLE
RESTROOM DESIGN STANDARDS

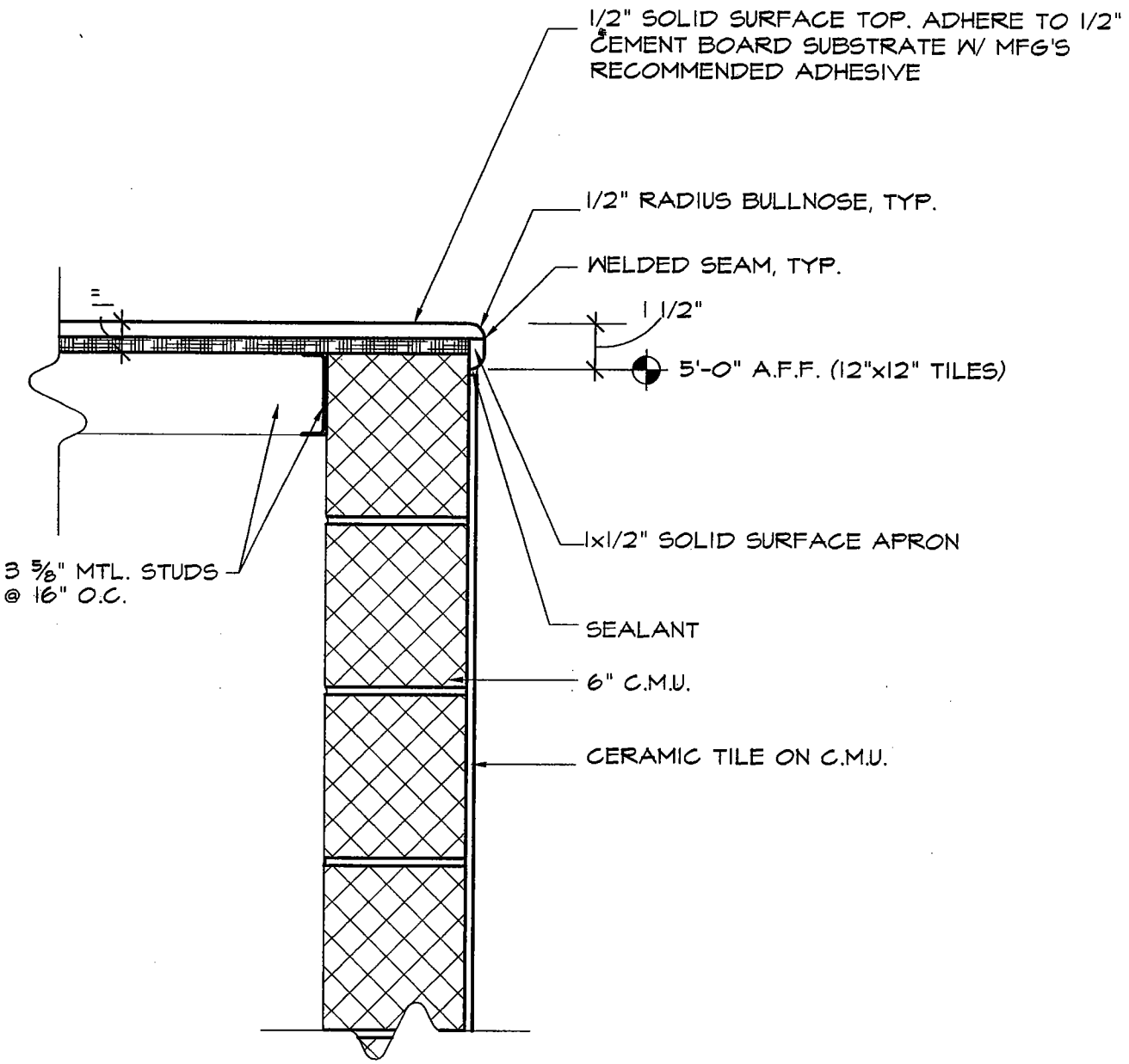
SHEET TITLE
URINAL WALL & SHELF

SCALE AS NOTED

DATE MAY 2004

PROJECT NO.
TASK 1314.20

EXHIBIT A-8



1 / A-9

URINAL SHELF BULLNOSE DETAIL

NOT TO SCALE

Baker
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801 Cromwell Park Drive
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PROJECT TITLE: RESTROOM DESIGN STANDARDS

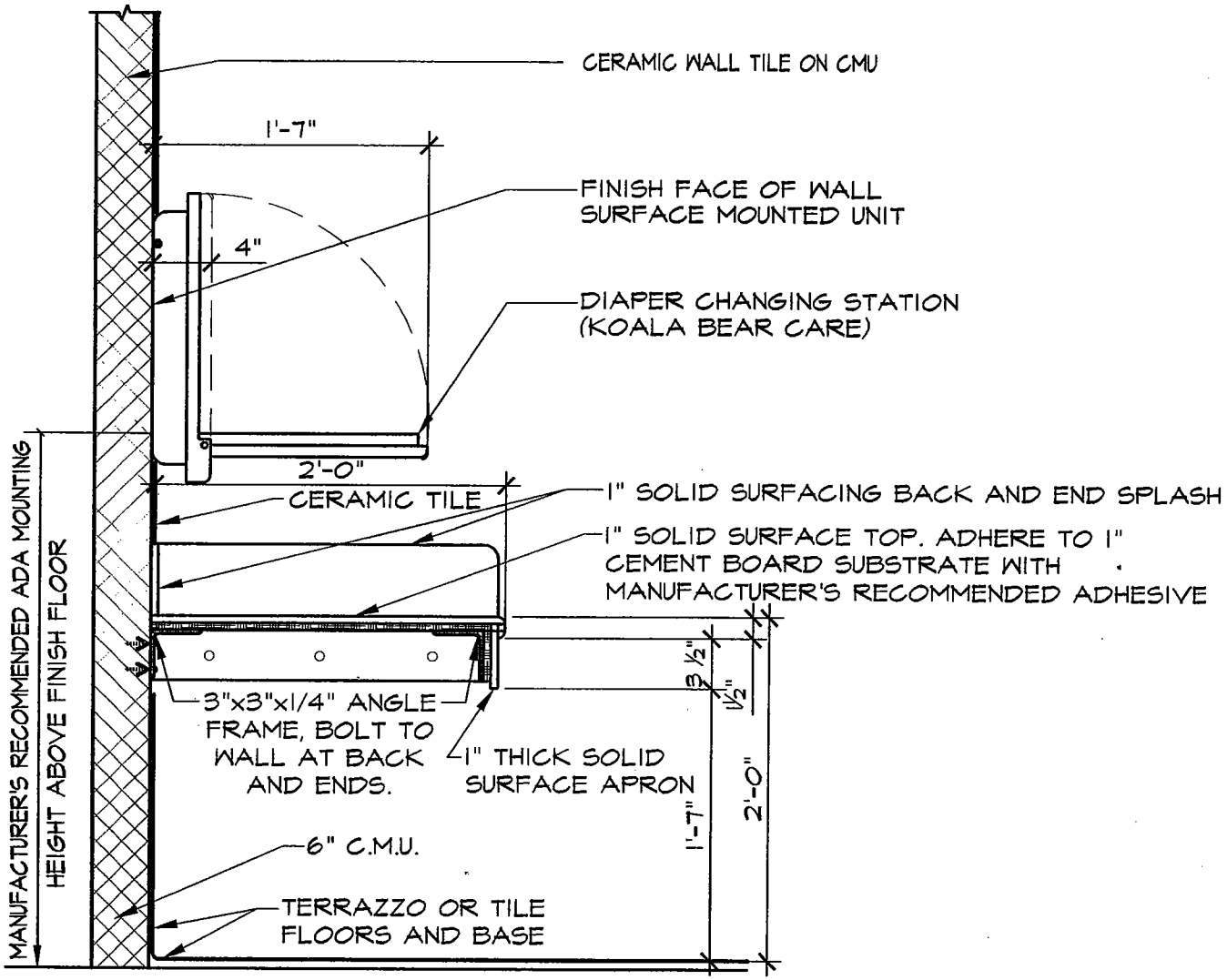
SHEET TITLE: URINAL SHELF BULLNOSE DETAIL

SCALE: AS NOTED

DATE: MAY 2004

PROJECT NO.: TASK 1314.20

EXHIBIT A-9



1 / A-10

TOILET ROOM SHELF-DIAPER CHANGING

NOT TO SCALE

Baker
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PROJECT TITLE: RESTROOM DESIGN STANDARDS

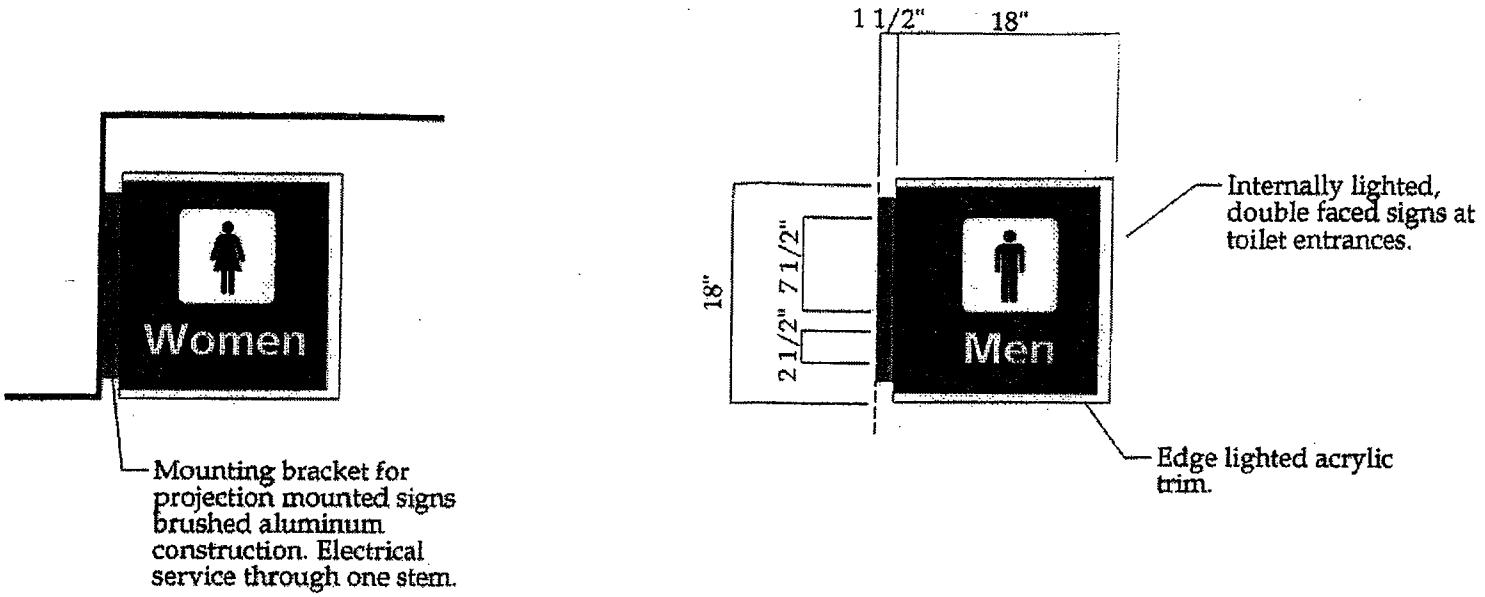
SHEET TITLE: TOILET ROOM SHELF-DIAPER CHANGING

SCALE: AS NOTED

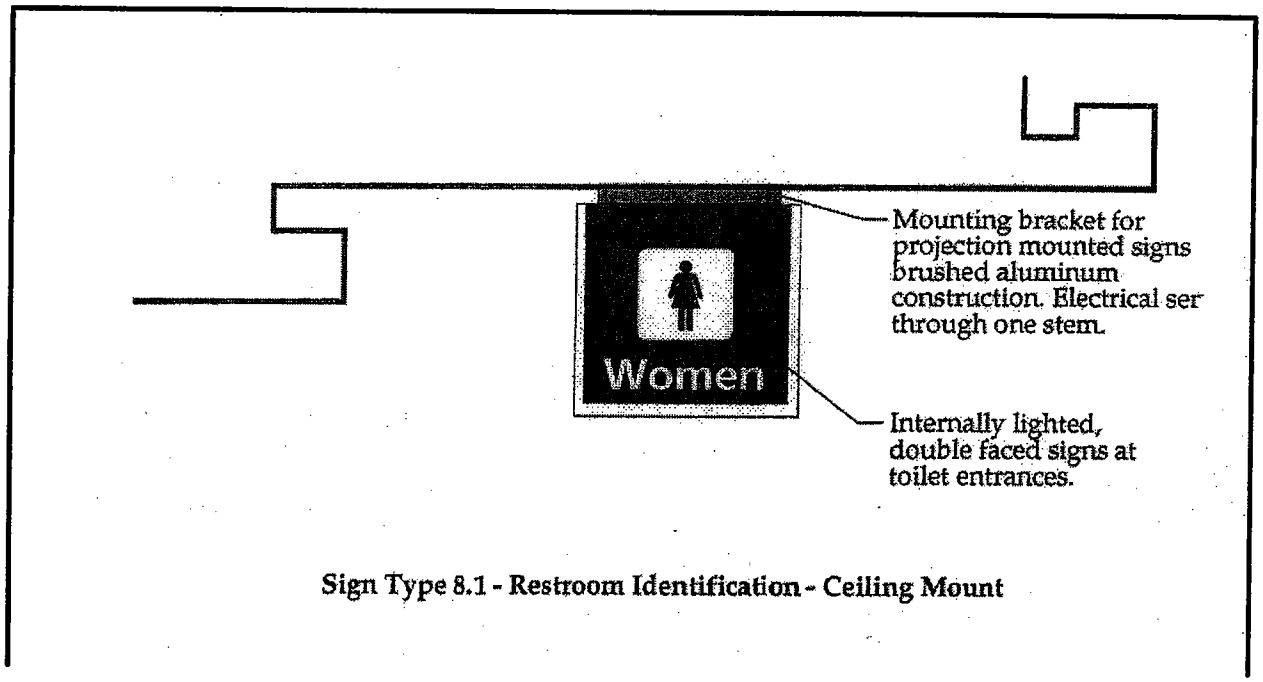
DATE: MAY 2004

PROJECT NO.: TASK 1314.20

EXHIBIT A-10



Sign Type 8 - Restroom Identification - Flag Mount

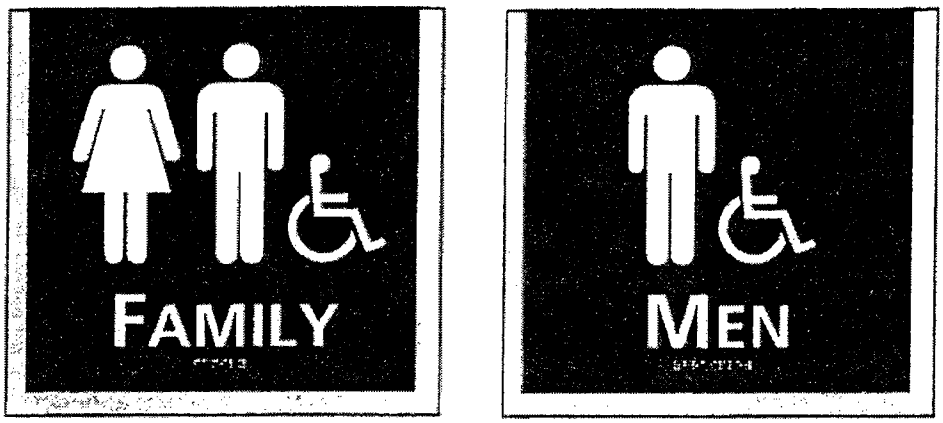


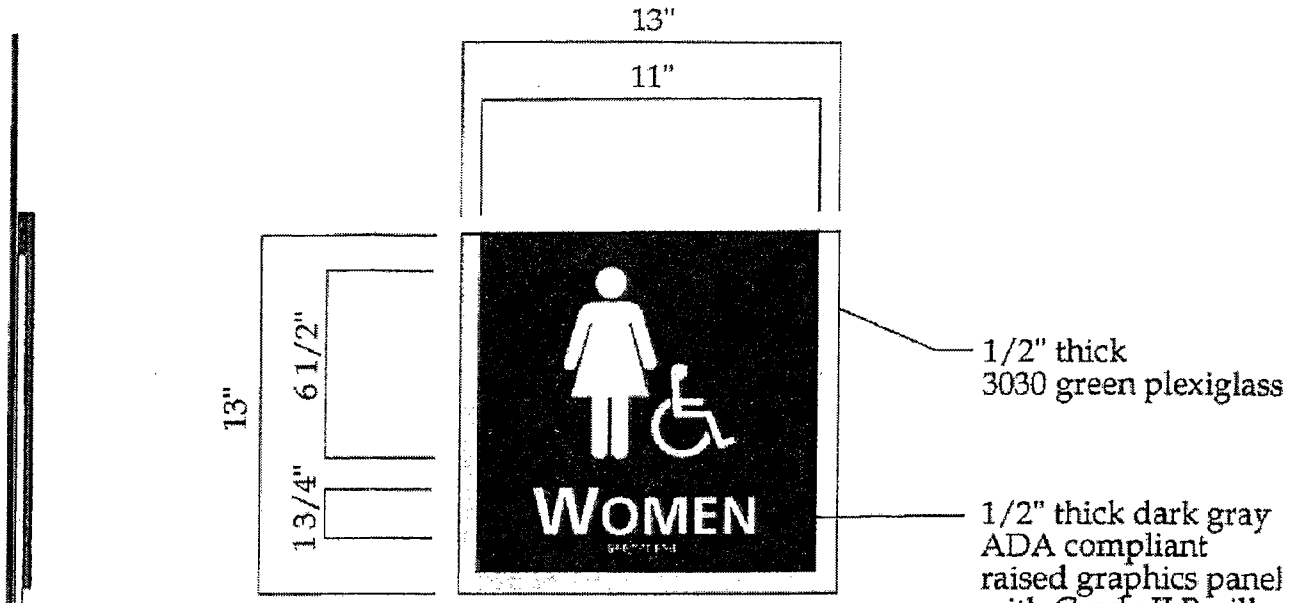
Sign Type 8.1 - Restroom Identification - Ceiling Mount

1 / A-11 SIGNAGE

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		PROJECT NO.: TASK 1314.20
	SHEET TITLE: SIGNAGE-1		EXHIBIT A-11
	SCALE: AS NOTED	DATE: MAY 2004	



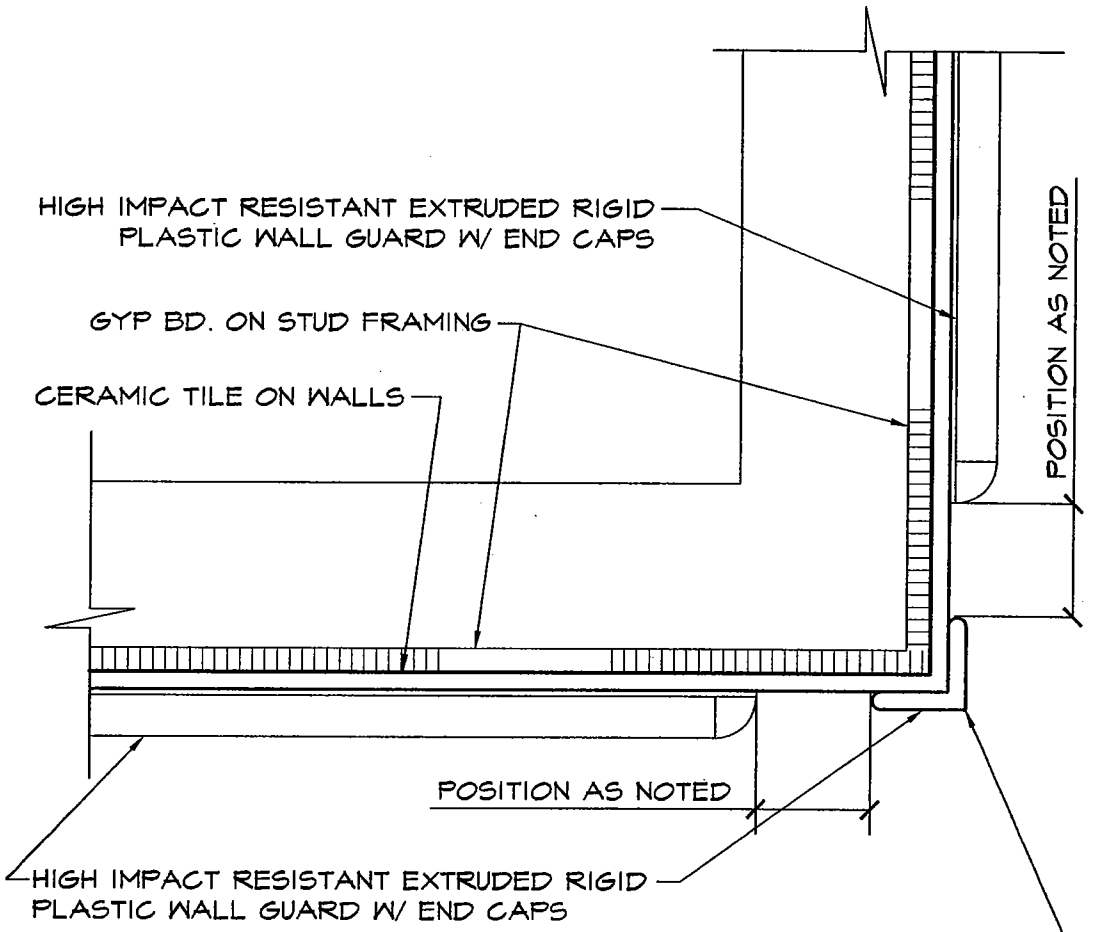


1
A-12

SIGNAGE

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		PROJECT NO.: TASK 1314.20
	SHEET TITLE: SIGNAGE-2		EXHIBIT A-12
	SCALE: AS NOTED	DATE: MAY 2004	



NOTE:
WALL GUARDS ARE END CAPPED AND ARE SET 2" FROM ALL CORNER GUARDS.

1 / A-13 CORNER GUARD/WALL GUARD DETAIL

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

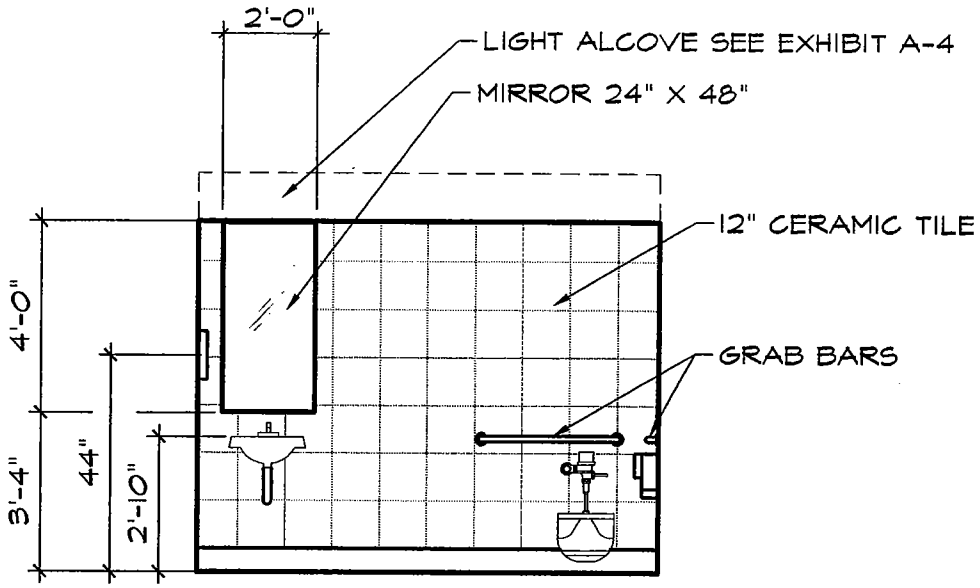
SHEET TITLE: CORNER GUARD/WALL GUARD DETAIL

SCALE: AS NOTED

DATE: MAY 2004

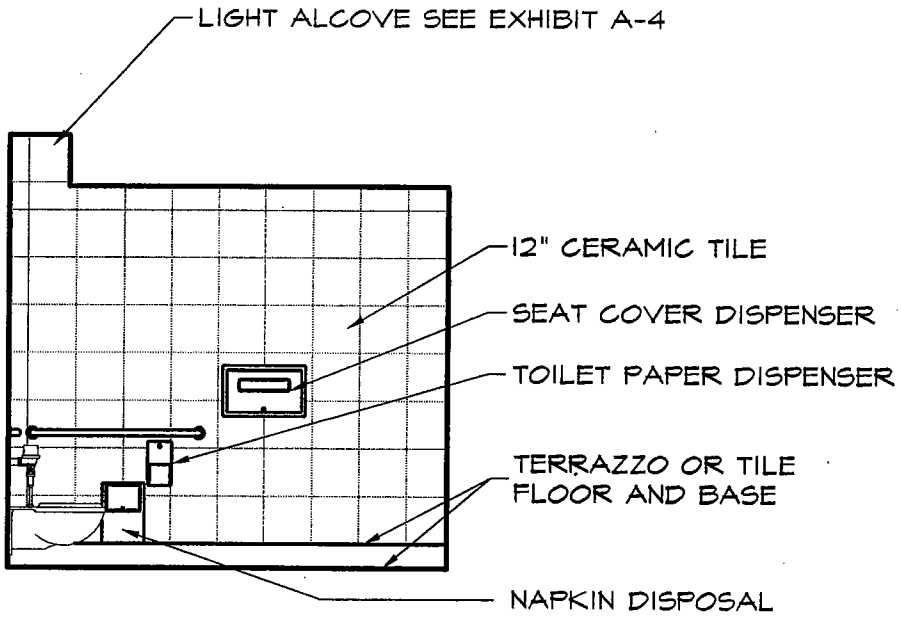
PROJECT NO.: TASK 1314.20

EXHIBIT A-13



2 / A-14 FAMILY ASSIST RESTROOM

NOT TO SCALE



1 / A-14 FAMILY ASSIST REST ROOM

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
REST ROOM DESIGN STANDARDS

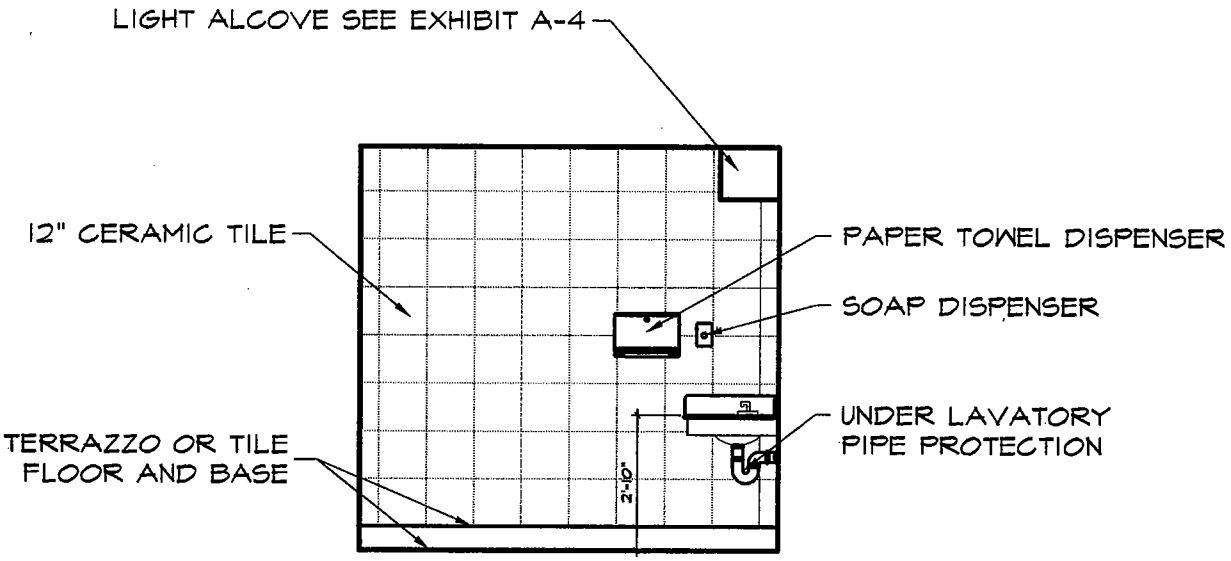
SHEET TITLE
TOILET ROOM ELEVATIONS-1

SCALE AS NOTED

DATE MAY 2004

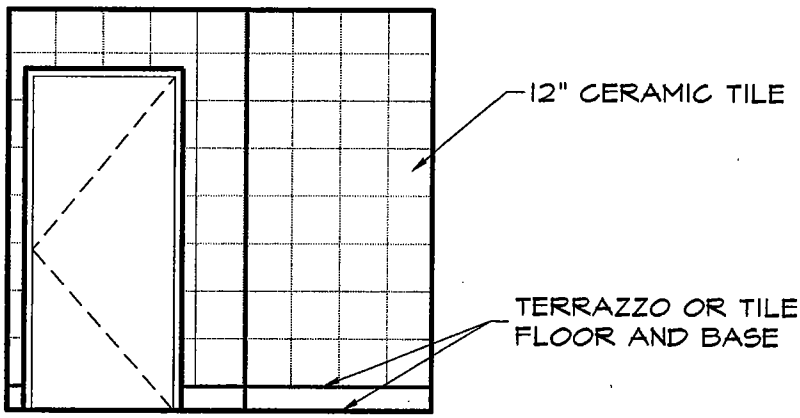
PROJECT NO.
TASK 1314.20

EXHIBIT A-14



2 / A-15 FAMILY ASSIST RESTROOM

NOT TO SCALE



1 / A-15 FAMILY ASSIST 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

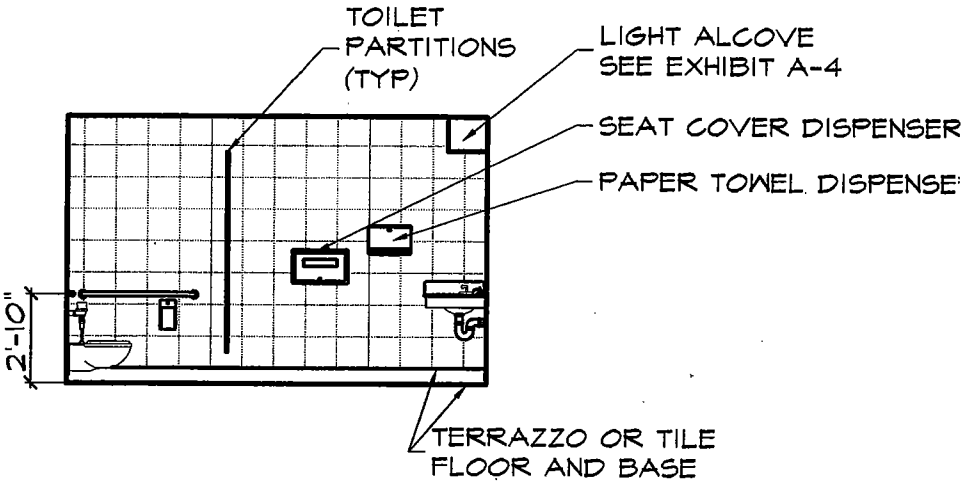
SHEET TITLE
TOILET ROOM ELEVATIONS-2

SCALE AS NOTED

DATE MAY 2004

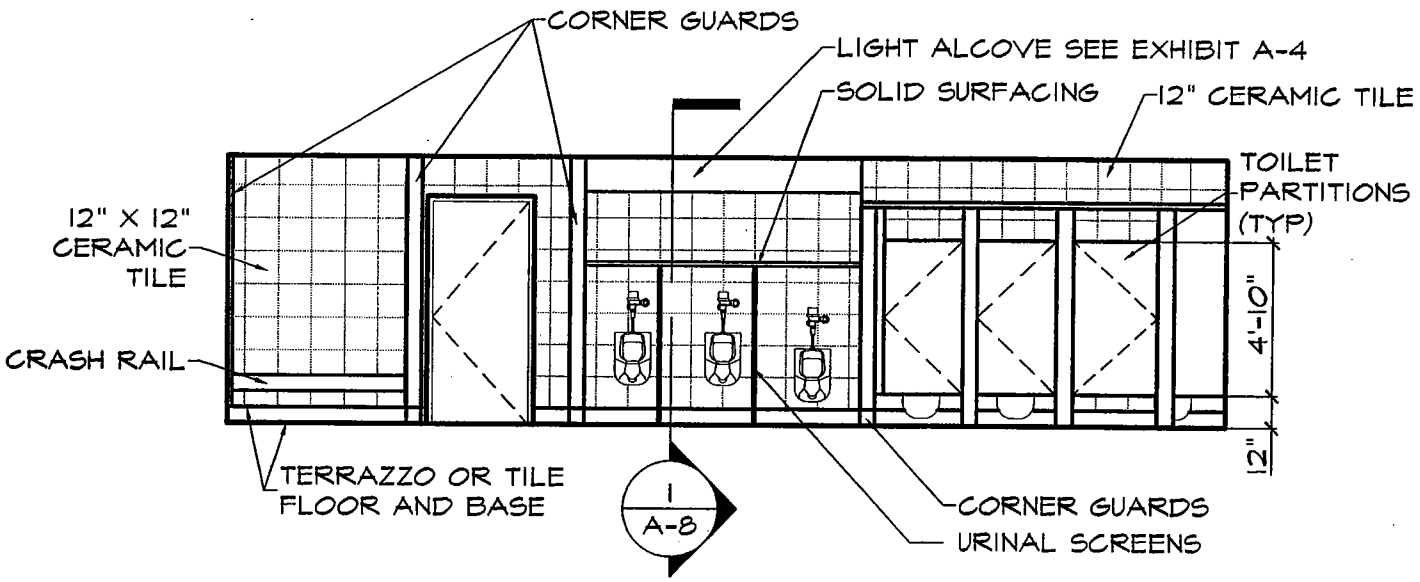
PROJECT NO.
TASK 1314.20

EXHIBIT A-15



2 / A-16 MEN'S RESTROOM

NOT TO SCALE



1 / A-16 MEN'S REST ROOM

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

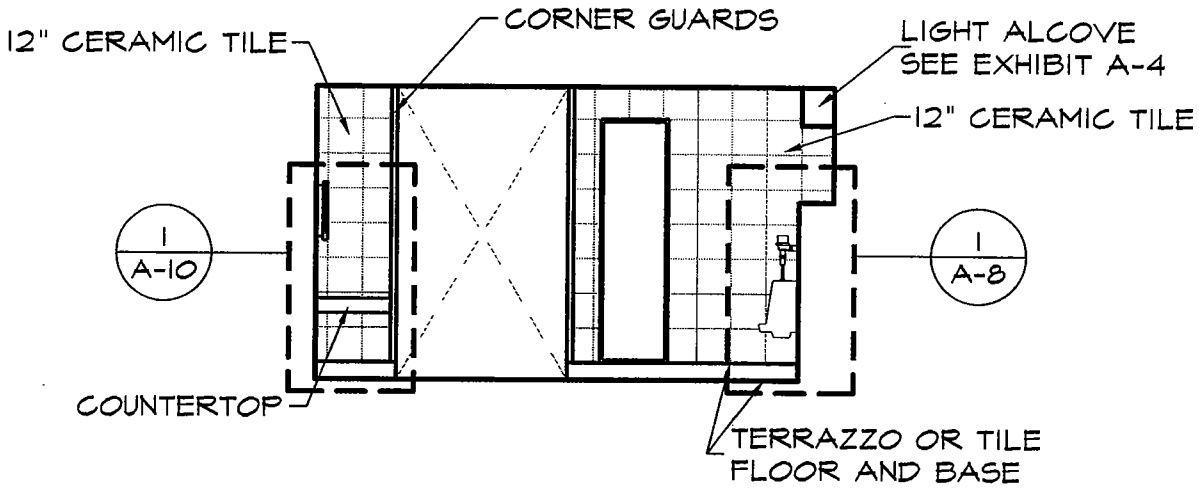
SHEET TITLE: TOILET ROOM ELEVATIONS-3

SCALE: AS NOTED

DATE: MAY 2004

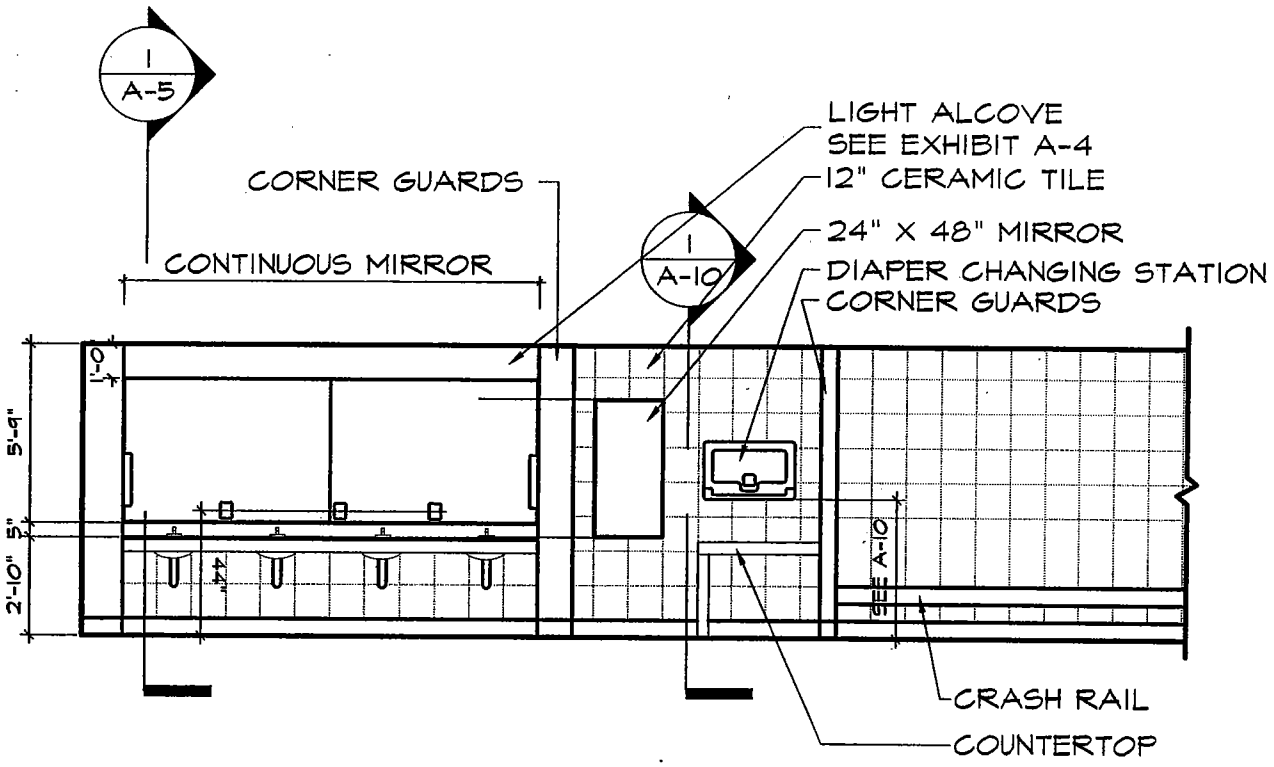
PROJECT NO.: TASK 1314.20

EXHIBIT A-16



2 / A-17 **MEN'S RESTROOM**

NOT TO SCALE



1 / A-17 **MEN'S RESTROOM**

NOT TO SCALE

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PROJECT TITLE
RESTROOM DESIGN STANDARDS

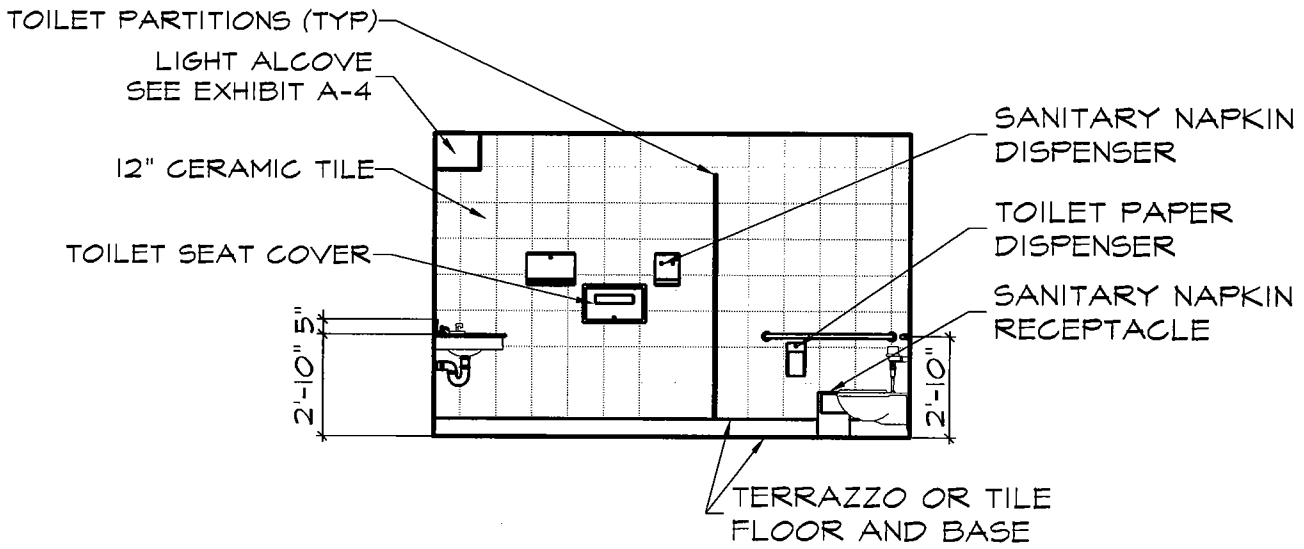
SHEET TITLE
TOILET ROOM ELEVATIONS-4

SCALE AS NOTED

DATE MAY 2004

PROJECT NO.
TASK 1314.20

EXHIBIT A-17



2 / A-18 WOMEN'S RESTROOM

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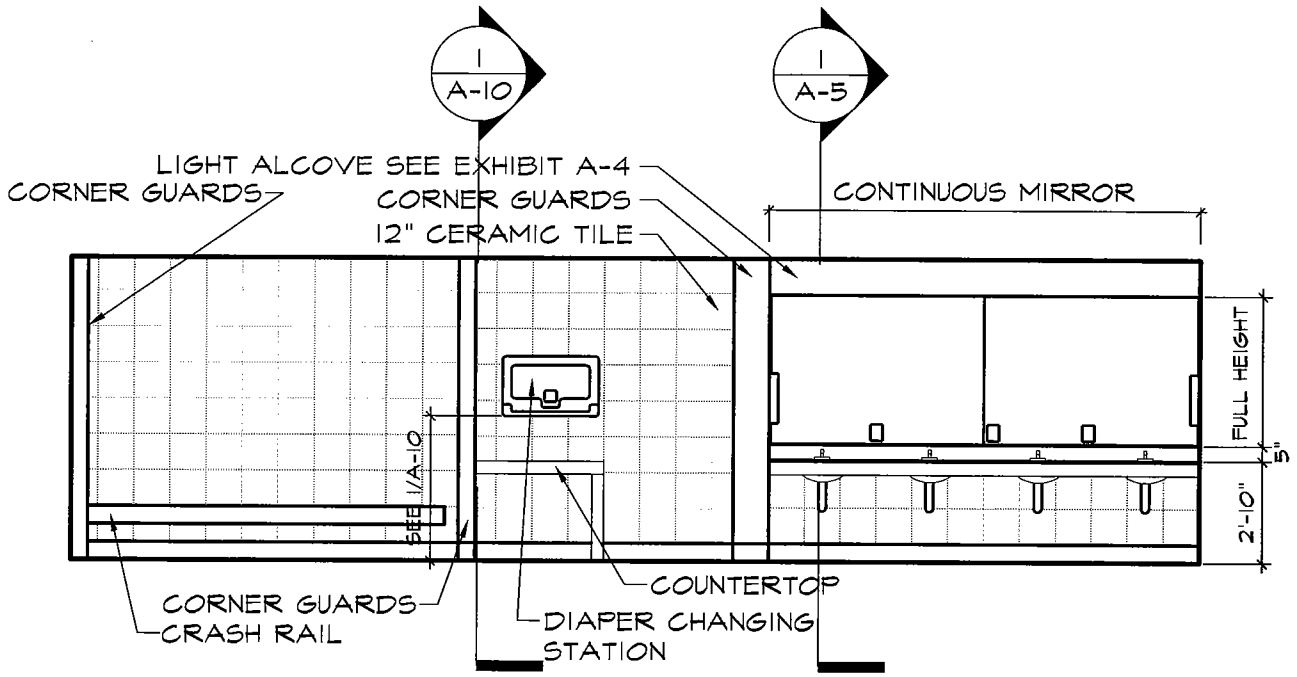

1 / A-18 WOMEN'S RESTROOM

NOT TO SCALE

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PROJECT TITLE
RESTROOM DESIGN STANDARDS

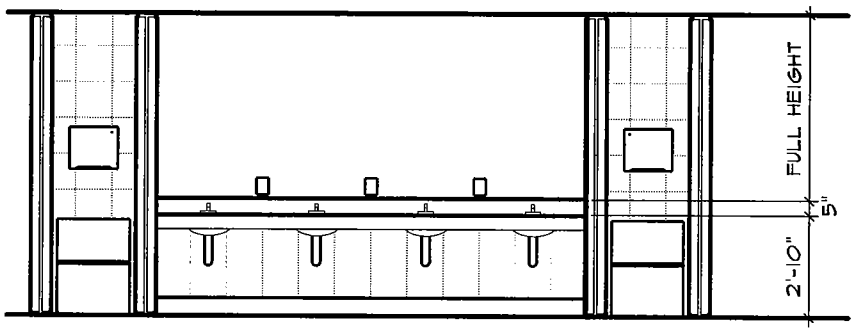
SHEET TITLE
TOILET ROOM ELEVATIONS-5

SCALE AS NOTED

DATE MAY 2004

PROJECT NO.
TASK 1314.20

EXHIBIT A-18



MAXIMUM OF 2 BASINS TO TOWEL DISPENSER

1 / A-19 INTERIOR ELEVATION

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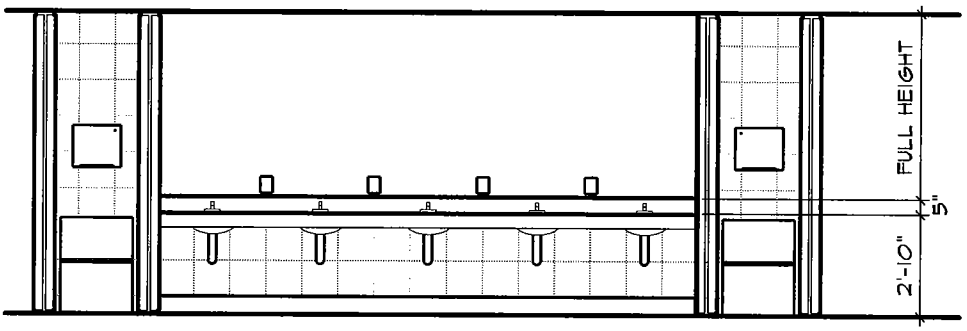

MAXIMUM OF 3 BASINS TO TOWEL DISPENSER

2 / A-19 INTERIOR ELEVATION

NONE

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PROJECT TITLE
RESTROOM DESIGN STANDARDS

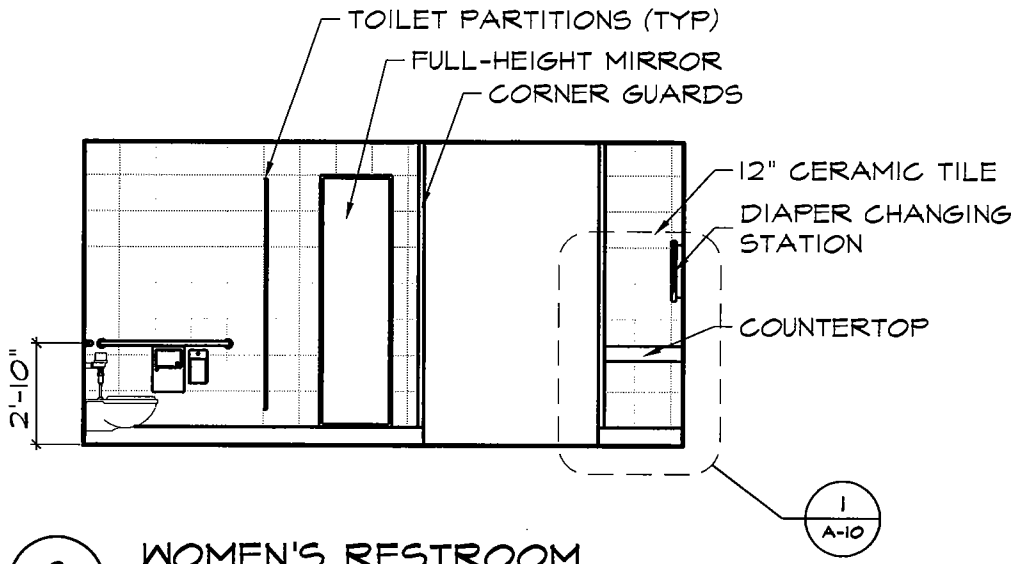
SHEET TITLE
TOILET ROOM ELEVATIONS-5

SCALE AS SHOWN

DATE JANUARY 2003

PROJECT NO.
TASK 1314.20

EXHIBIT A-19



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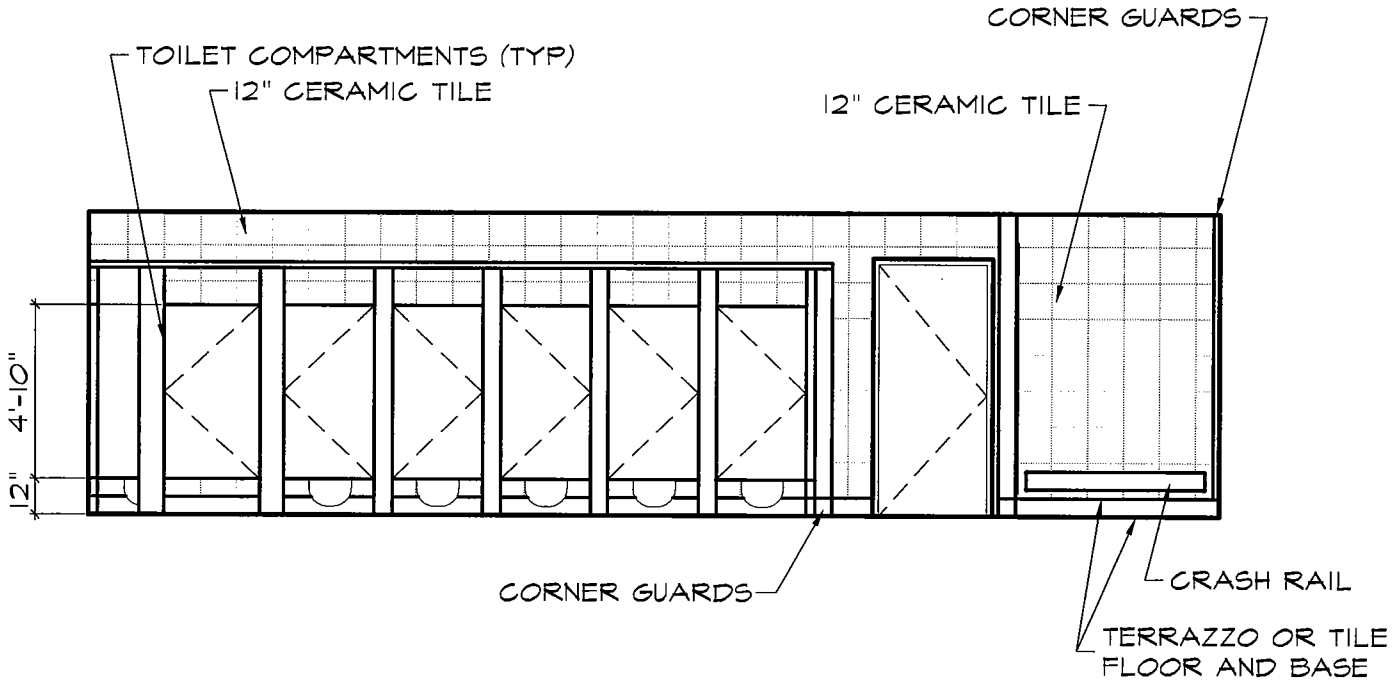
NOT TO SCALE



1 / A-20 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	PROJECT NO.: TASK 1314.20
	SHEET TITLE: TOILET ROOM ELEVATIONS-6	EXHIBIT A-20
	SCALE: AS NOTED — DATE: MAY 2004	

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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

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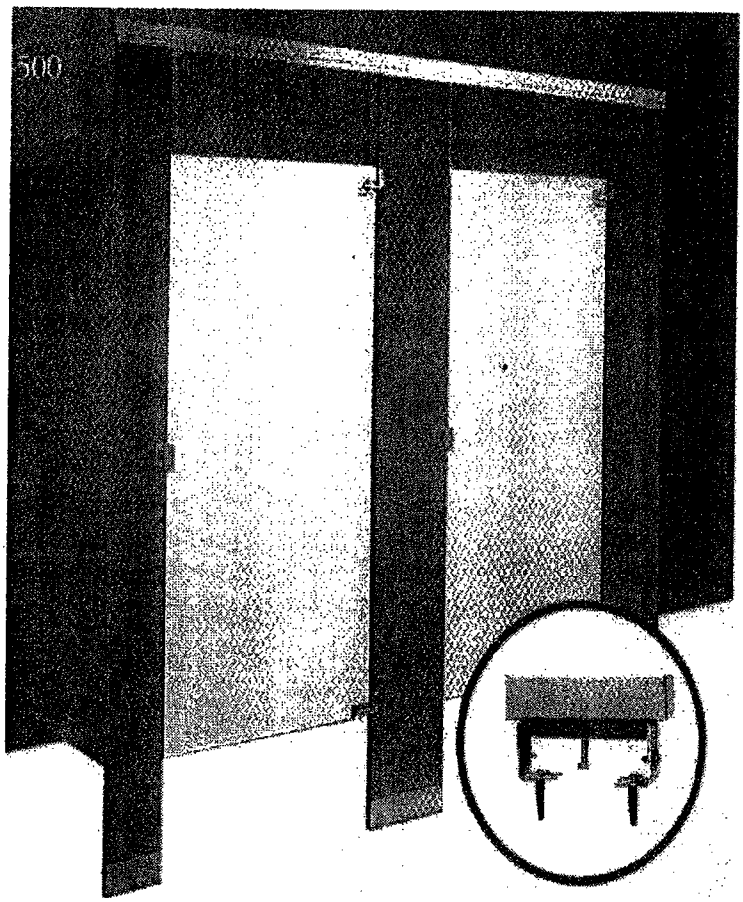
APPENDIX B – PRODUCT CUT SHEETS (cont.)



FP500 - *Corinthian* Overhead Braced

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-1** SCALE **NONE** DATE **MARCH 2005**	PROJECT NO. **TASK 1314.20** **B-1**

STAINLESS STEEL TOILET ENCLOSURES

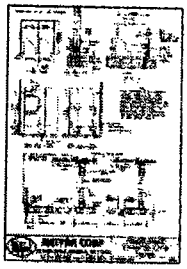
THE CORINTHIAN METPAR TYPE: FP-500 Overhead Braced

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 ¼" (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-g 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 pressur 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 1¼" (31.75) thick, constructed of two sheets of 20-gauge, type 304 stainless steel, formed and assembled with a honeycomb core. Face sheets are electrically welded at intervals around the entire perimeter. All pilasters will have a 3" (7 #4 finish stainless steel plinth (18-8 type 304) and have straight, flat sides profile with rounded edges to match the pilaster pr Pilasters will have leveling bolts threaded to the pilaster support bracket. Floor mounting will be with #12 x 2½" (63.5) scre shields. Headrail is anodized aluminum .050" (1.27) wall thickness with anti-grip profile. The headrail is set into a 16ga. cha 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-ser"*, 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 ap slide latch with external *"in-use"* indicator.

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

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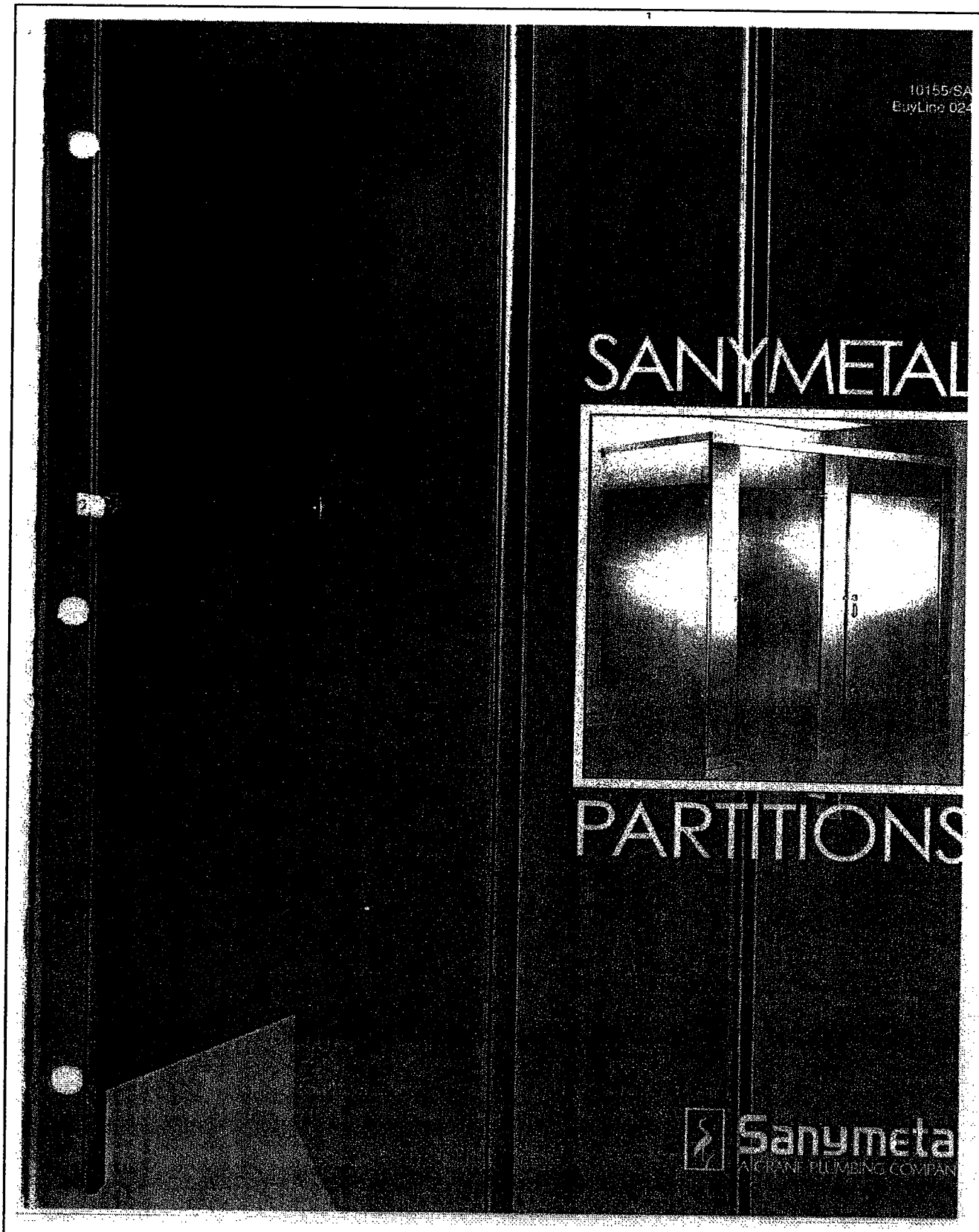
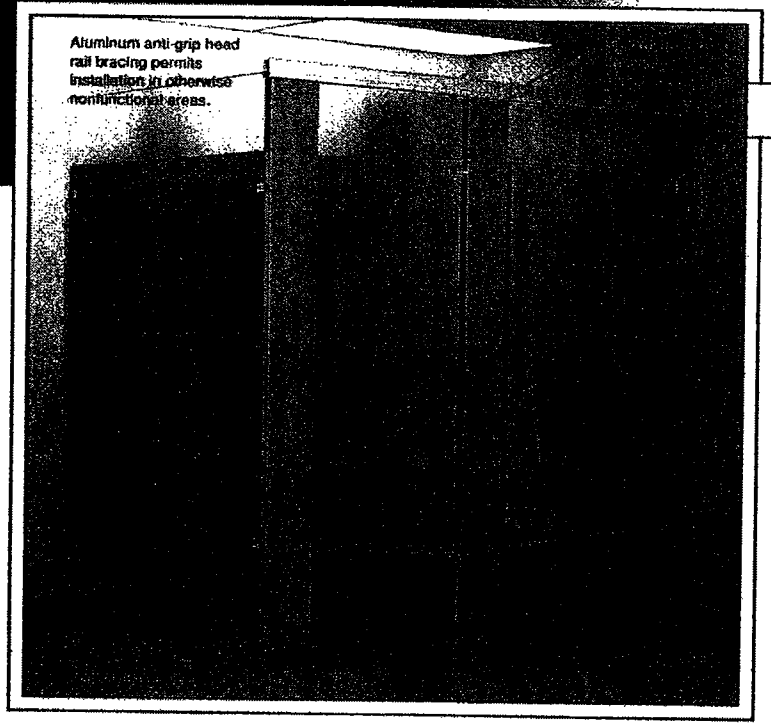
PROJECT TITLE	RESTROOM DESIGN STANDARDS
SHEET TITLE	TOILET PARTITIONS AND DOOR HARDWARE-2
SCALE	NONE
DATE	MARCH 2005
PROJECT NO.	TASK 1314.20
	B-2



Baker MICHAEL BAKER JR. INC. 801 Cromwell Park Drive Suite 110 Glen Burnie, MD 21061	PROJECT TITLE **RESTROOM DESIGN STANDARDS**		PROJECT NO. **TASK 1314.20**
	SHEET TITLE **TOILET PARTITIONS AND DOOR HARDWARE-3**		**B-3**
	SCALE **NONE**	DATE **MARCH 2005**	



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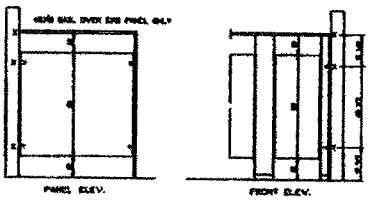
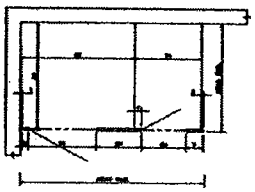
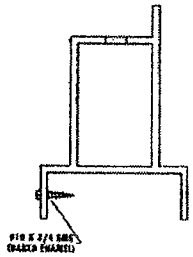
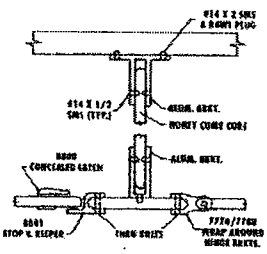
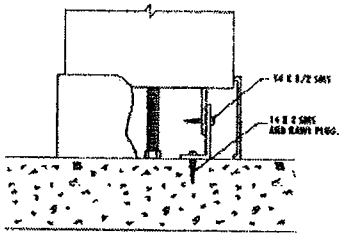




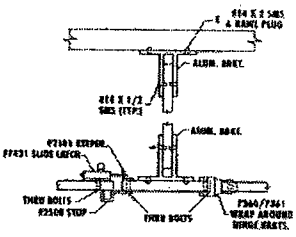
ACADEMIC STANDARDS

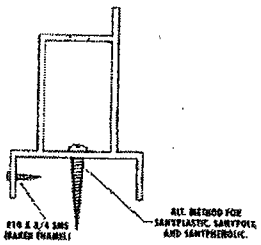


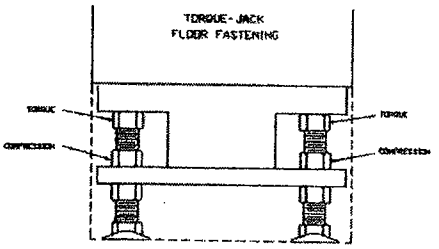




PENITENTIARY







4

Baker MICHAEL BAKER JR. INC. 801 Cromwell Park Drive Suite 110 Glen Burnie, MD 21061	PROJECT TITLE **RESTROOM DESIGN STANDARDS**		PROJECT NO. **TASK 1314.20**
	SHEET TITLE **TOILET PARTITIONS AND DOOR HARDWARE-4**		**B-4**
	SCALE **NONE**	DATE **MARCH 2005**	

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: Sanyplastic panels can be installed with steel pilasters.

	BAKED ENAMEL	STAINLESS STEEL
1 TYPE	1: Academy toilet compartments shall be Acrylic Coated Academy type as manufactured by Sanymetal. Century toilet compartments shall be Acrylic Coated Century type as manufactured by Sanymetal. Normandie toilet compartments shall be Acrylic Coated Normandie type as manufactured by Sanymetal.	1: Academy toilet compartments shall be stainless steel Academy type as manufactured by Sanymetal. Century toilet compartments shall be stainless steel Century type as manufactured by Sanymetal. Normandie toilet compartments shall be stainless steel Normandie type as manufactured by Sanymetal.
2 DOORS	2: Shall be 1" thick with two sheets of #22 Galvanneal-Bonderized 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. Standard door size, other than "handicapped" is 24".	2: Shall be 1" thick with two sheets of #22 gauge, 304 18-8 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. Standard door size, other than "handicapped" is 24".
3 PANELS	3: Academy, Century and Normandie shall be 1" thick with two sheets of #22 Galvanneal-Bonderized 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.	3: Academy, Century and Normandie shall be 1" thick with two sheets of #22 gauge, 304 18-8 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.
4 PILASTERS	4: Academy pilasters shall be 1 1/4" thick with two sheets of acrylic coated #20 gauge Galvanneal-Bonderized steel welded and finished as specified for Baked Enamel doors. Pilaster bases shall be attached with floor stirrups 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. Century pilasters shall be 1 1/4" thick with two sheets of #18 gauge, Galvanneal-Bonderized 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". Normandie pilasters shall be 1 1/4" thick with two sheets of #18 gauge. Galvanized-Bonderized 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.	4: Academy pilasters shall be 1 1/4" thick with two sheets of #20 gauge, #304 18-8 stainless steel welded and finished as specified for Stainless doors. Pilasters bases shall be attached with floor stirrups 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. 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. Normandie pilasters 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.
5 HARDWARE	5: a. Top hinge pin shall be secured at three points with all doors hinge fittings fully flush with face plates of the door. b. Each door shall be equipped with chrome plated cast alloy coat 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 biasing gravity hinge. 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. d. Pilaster hinge brackets shall be chrome-plated zamac alloy and tamper-bolted to the pilaster. e. Floor and ceiling connections shall be concealed with a one piece 304 stainless steel theftproof plinth. f. Chrome-plated zamac stirrup brackets shall be used to attach panels and pilasters.	5: a. Top hinge pin shall be secured at three points with all chrome-plated door hinge fittings fully flush with face plates of the door. b. Each door shall be equipped with chrome plated cast alloy coat 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 biasing gravity hinge. c. The door shall be adjustable to permit 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. d. Pilaster hinge brackets shall be chrome plated zamac alloy and tamper-bolted to the pilaster. e. Floor and ceiling connections shall be concealed with one piece 304 stainless steel theftproof plinth. f. Chrome-plated zamac stirrup brackets shall be used to attach panels and pilasters.
6 FINISH	6: Finish shall consist of base metal coating and a finish color coat of thermo-setting acrylic enamel applied electrostatically in a pressured, dust free atmosphere, baked on to produce a uniform, smooth lustrous protective finish.	6: All stainless steel units shall be #4 finish and shall be paper covered for protection during shipment and installation.
COLOR	7: Colors shall be.....[Sanymetal number and color name] (Any two colors for contrasting pilasters/panels and doors may be specified.)	7: Colors shall be 304 stainless steel, #4 finish
8 CERTIFICATION	8: A certificate of compliance shall be attesting that all materials are in accordance with Sanymetal's preceding specifications.	8: A certificate of compliance shall be attesting that all materials are in accordance with Sanymetal's preceding specifications.

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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 SAF
BuyLine 0247

	SANYPLASTIC	SANYPHENOLIC	SANYPOLY
1	1: Academy toilet compartments shall be Plastic Laminate 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 Normandy not recommended	1: Academy toilet compartments shall be Solid Polymer Academy type as manufactured by Sanymetal. Century not recommended Normandy not recommended
2	2: Shall be constructed of industry Standard plastic laminate NEMA approved, laminated under heat and pressure to a solid 45 lb. density Particleboard 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	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	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 nuts-tension/compression mounted. Pilasters shall be braced with extruded, anodized aluminum anti-grip headrail and wall return. 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 nuts-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 nuts-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. Headrail 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, filled with an 11 gauge stainless steel footer for attachment to min. 3/8" floor studs and expansion shields. Headrail shall be heavy duty aluminum extrusions, anodized with anti-grip configuration, and shall be fastened to the pilaster tops.
5	5: Doors: Shall be equipped with Sanymetal #6101 top hinge recessed into door 3" from top with pin supported in door above and below top hinge bracket. Lower hinge shall be Sanymetal #6100 controlled power bearing consisting of Zytel 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 270° arc. Brackets: For panels and pilasters shall be chrome-plated tamac. 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 stirrup 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. 2500 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. 304 stainless steel, polished finish to conceal floor (or ceiling) connections.	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 pintle extending the full height of the hinge. Upper and lower hinges are to both be cam operated, with the one piece pintle: Sanymetal #7280/81. Coat hook and bumper to be stainless steel 14 gauge #7267. Door strike and keeper shall be 14 gauge stainless steel, Sanymetal #7269/7270. 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 by two 3/8" diameter stainless steel studs set into expansion shields. The floor connection are to be covered by a 4" high stainless steel shoe, #4 finish. Aluminum bracket not available for phenolic material.	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 pintle extending the full height of the hinge. Upper and lower hinge are to both be cam operated, with the one piece pintle: Sanymetal #7280/81. Coat hook and bumper to be stainless steel 14 gauge #7267 Door strike and keeper shall be 14 gauge stainless steel Sanymetal #7269/7270. Door latch to be slide type, 14 gauge stainless steel, Sanymetal #7231 Panel brackets to wall pilaster to be heavy duty aluminum, anodized and painted with 3 brackets per connection. (Optional) Full height aluminum brackets with nail finish can be specified if required. Pilaster shoe 4" high stainless steel shoe #4 finish. (Optional) Heatstrips to be applied to the bottom edges of panels and doors are available in both aluminum or stainless steel to prevent burning.
6	6: All units shall be made of Sanyplastic plastic laminate. All wood grain panels longer 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.	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.	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. Colors shall be selected from the manufacturer's standard polymer colors.
8	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	8: A certificate of compliance shall be attesting that all materials are in accordance with Sanymetal's preceding specifications.	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/warpage 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.

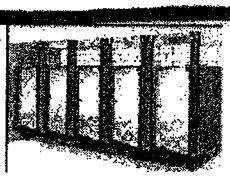
Baker MICHAEL BAKER JR. INC. 801 Cromwell Park Drive Suite 110 Glen Burnie, MD 21061	PROJECT TITLE RESTROOM DESIGN STANDARDS		PROJECT NO. TASK 1314.20
	SHEET TITLE TOILET PARTITIONS AND DOOR HARDWARE-6		B-6
	SCALE NONE	DATE MARCH 2005	

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

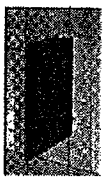
Sentinel Overhead Braced
Provides the most economical solution for heavy traffic or vandalism prone areas.

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

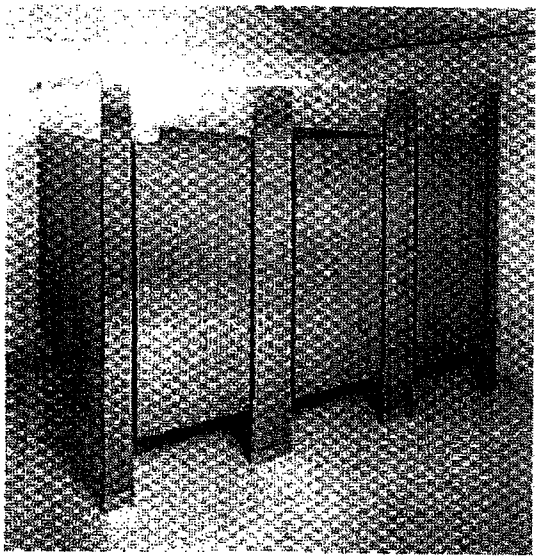
Ceiling Hung
The ceiling hung system is ideal for areas with low ceilings. This models fast and easy maintenance .



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**		PROJECT NO. **TASK 1314.20**
	SHEET TITLE **TOILET PARTITIONS AND DOOR HARDWARE-7**		**B-7**
	SCALE **NONE**	DATE **MARCH 2005**	



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

Global Stainless Steel

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

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

View Specifications/Drawings
Care and Maintenance Instructions

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.

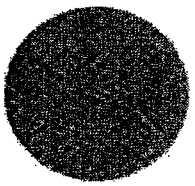
Theft - Resistant Fasteners
Special driver installs fasteners which virtually eliminates unauthorized removal and ensure easy installation.

Optional Textured Finishes

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.



Options:

Plywood Core

No Sight Line

Eastern Style Height

Full Height Aluminum Brackets

Full Height Stainless Steel Brackets

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 pilasaters.

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

Baker
MICHAEL BAKER JR. INC.
801 Cromwell Park Drive
Suite 110
Glen Burnie, MD 21061

PROJECT TITLE	RESTROOM DESIGN STANDARDS
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SCALE	NONE
DATE	MARCH 2005
PROJECT NO.	TASK 1314.20
	B-8

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

GLOBAL STEEL PRODUCTS CORP.

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 architects 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.

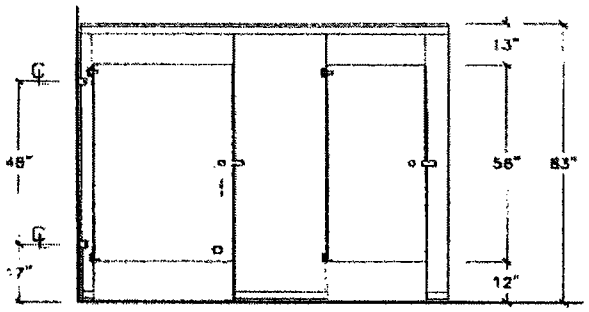
3.03 WARRANTY

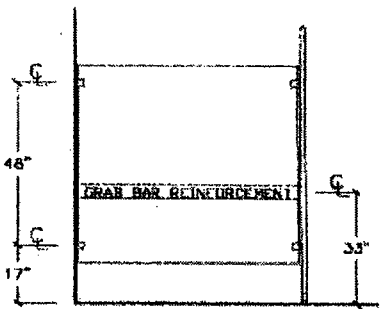
A. Global Steel Products Corp. guarantees its textured leather grain stainless steel units, properly maintained, against corrosion or discoloration for 5 years from the date of receipt by the customer. If materials are found defective during that period for the reasons listed above, the material will 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.

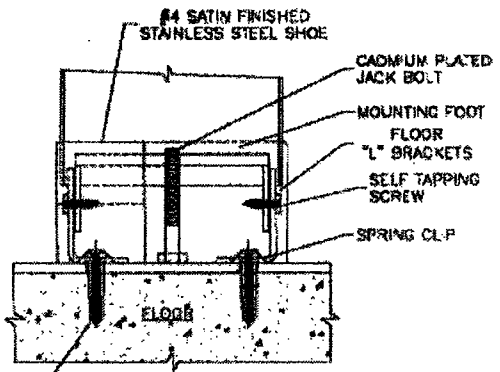
2.17

GLOBAL STEEL PRODUCTS CORP.

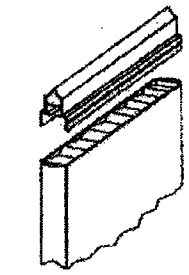
FLOOR ANCHORED/OVERHEAD BRACED
STAINLESS STEEL
TEXTURED LEATHER GRAIN



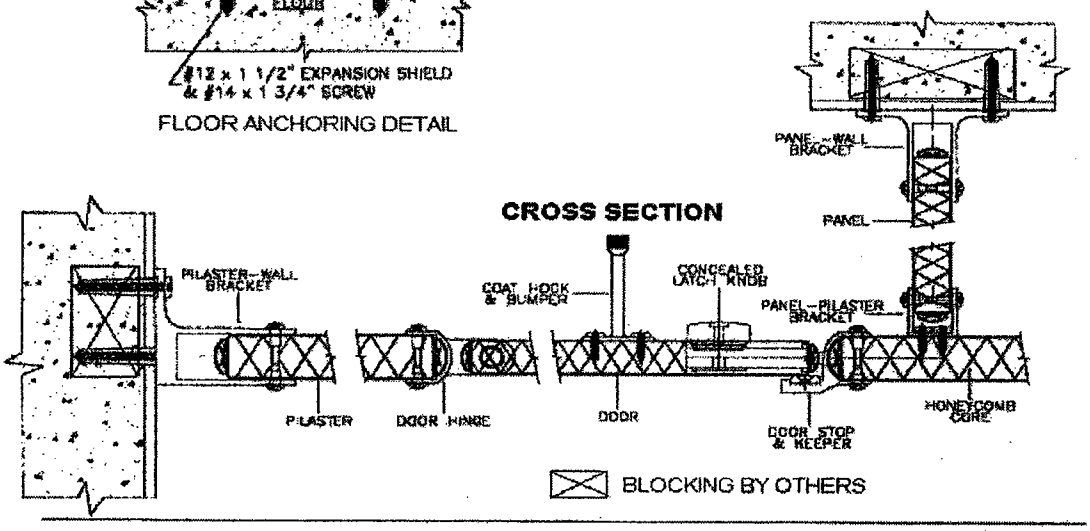




FLOOR ANCHORING DETAIL



HEADRAIL DETAIL



2.18

95 Marcus Blvd., Deer Park, New York 11729 Phone: 631-586-3330 Fax: 631-586-3455
Website: www.globalpartitions.com email: sales@globalpartitions.com

Baker MICHAEL BAKER JR. INC. 801 Cromwell Park Drive Suite 110 Glen Burnie, MD 21061	PROJECT TITLE RESTROOM DESIGN STANDARDS		PROJECT NO. TASK 1314.20
	SHEET TITLE TOILET PARTITIONS AND DOOR HARDWARE-10		B-10
	SCALE NONE	DATE MARCH 2005	

Jacknob®

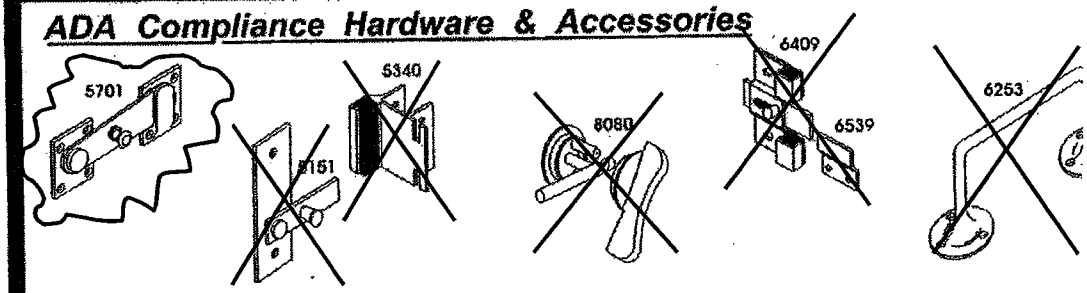
Our Commitment to Your Satisfaction

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.

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.

Jacknob®

Tel: 631-231-9

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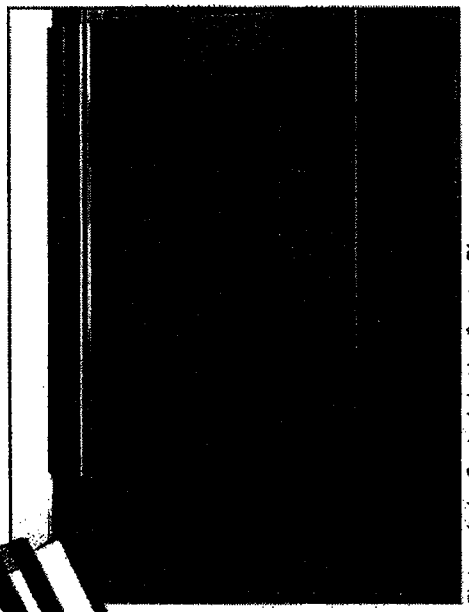
	SHEET TITLE TOILET PARTITIONS AND DOOR HARDWARE-11		B-11
	SCALE NONE	DATE MARCH 2005	

TP HINGES

t e c h s h e e t

- ❑ **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.



Photographed at Comtec Industries, Scranton, PA

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.

Torx Tip Cap shown with adjusting tools and setting pins.

MARKAR

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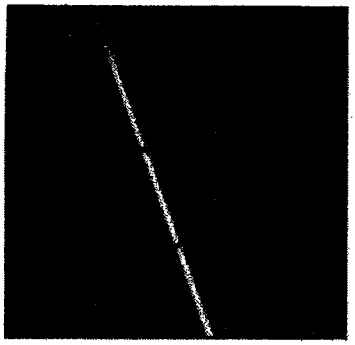
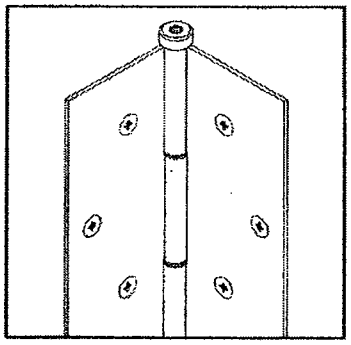
	SCALE NONE	DATE MARCH 2005	

TP HINGES toilet

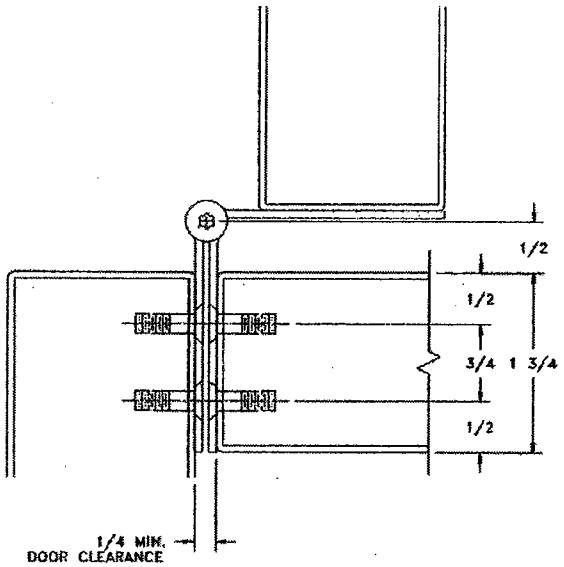
Edge Mount

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.

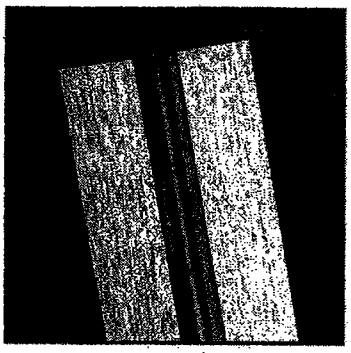
Markar Products, Inc.

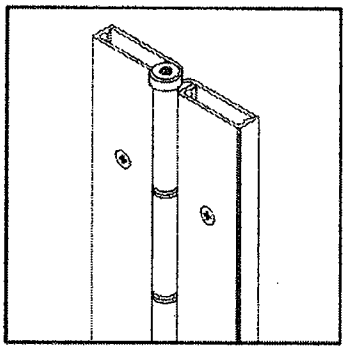
68 Ward Road • Lancaster, NY 14086 • 716-685-4104 • Toll Free: 1-800-866-1686 • Fax: 716-685-3919

TP HINGES
toilet

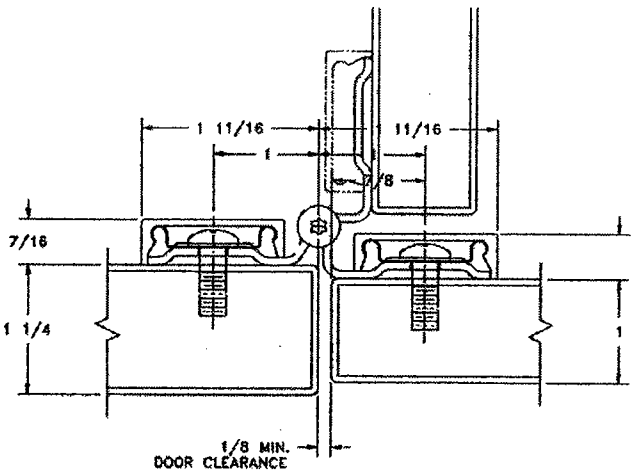
Full Surface

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.

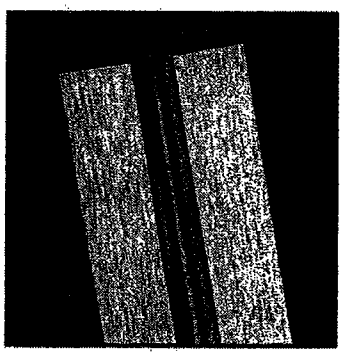
Markar Products, Inc.

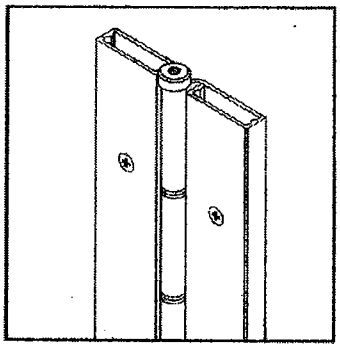
68 Ward Road • Lancaster, NY 14086 • 716-685-4104 • Toll Free: 1-800-866-1688 • Fax: 716-685-3919

TP HINGES
toilet

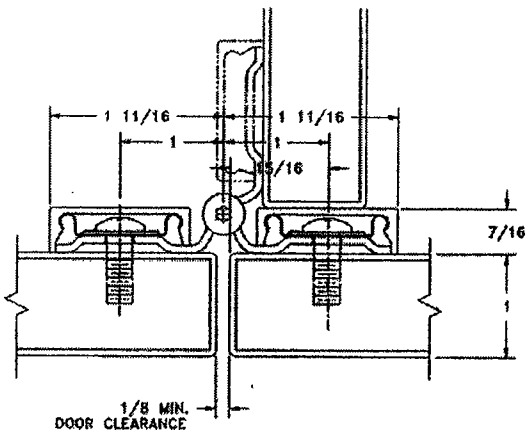
Full Surface

FS-902-TP Flush Spring-Loaded
FS-502-TP Flush





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.



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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

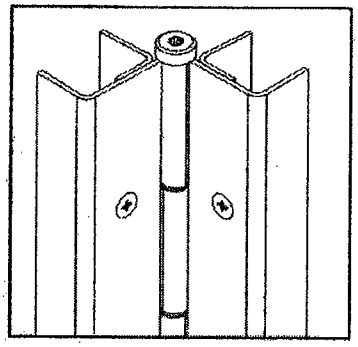
- 84 powder coated paint colors
- Custom lengths (in inches).
- Custom hole pattern.
- Tamper-proof security screws.

Markar Products, Inc.
68 Ward Road • Lancaster, NY 14086 • 716-685-4104 • Toll Free: 1-800-866-1698 • Fax: 716-685-3919

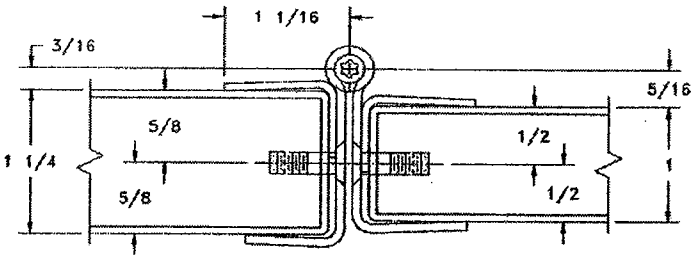
TP HINGES toilet

Hinge Guard

HG-906-TP 1/8" Offset Spring-Loaded
HG-506-TP 1/8" Offset



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



Standard Features

Material
Heavy-duty 14 gauge 304 stainless steel.

Finishes
US 32D satin stainless steel (630).

Pin and Barrel Type Hinge
- 1/4" diameter stainless steel pin.
- Long-life split nylon bearings.
- 28 bearing surfaces.

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

Mounting Hardware
No exposed mounting hardware.

Capacity
Supports weights up to 80 lbs.

Sizes
54" and 57"

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

Optional Features

- US 32 bright polished stainless steel (629).
- 84 powder coated paint colors
- Custom lengths (in inches).
- Custom hole pattern.
- Tamper-proof security screws.
- AdjustaScrew for corrections of door fit problems up to 1/2".

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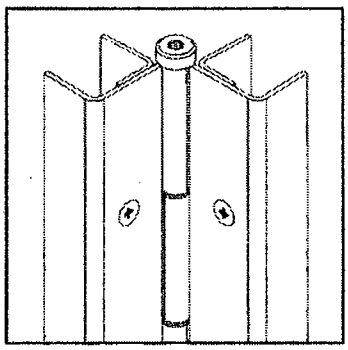
68 Ward Road • Lancaster, NY 14086 • 716-685-4104 • Toll Free: 1-800-868-1688 • Fax: 716-685-3919

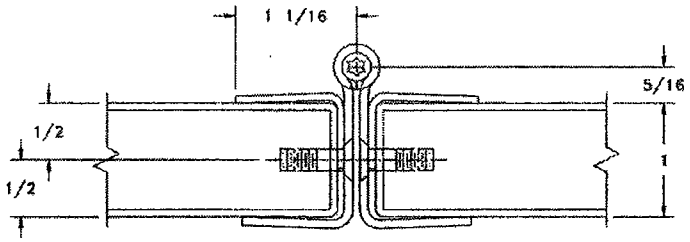
TP HINGES
toilet

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".

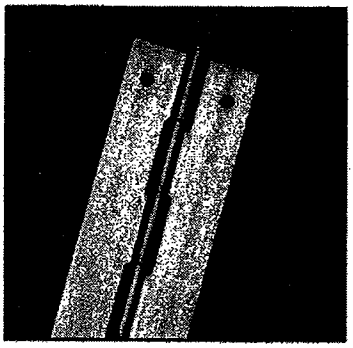
Markar Products, Inc.

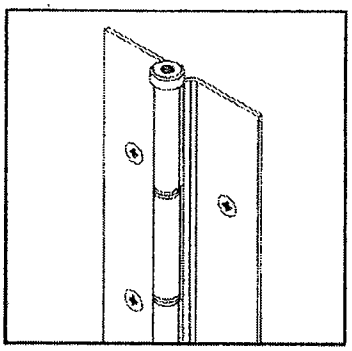
68 Ward Road • Lancaster, NY 14086 • 716-685-4104 • Toll Free: 1-800-866-1668 • Fax: 716-685-3919

TP HINGES
toilet

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.

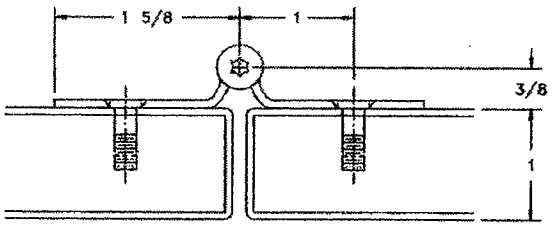
Torx Adjusting Screw
(with Spring-Loaded hinges only)
- Torx tip cap.
- Internal stainless steel spring mechanism.
- Adjust tension on door to close tightly for out-swinging ADA compliance.
- Allows door to stay open in predetermined position.

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).
- 84 powder coated paint colors
- Custom lengths (in inches).
- Custom hole pattern.
- Tamper-proof security screws.
- One way shoulder bolt and screws.

Markar Products, Inc.

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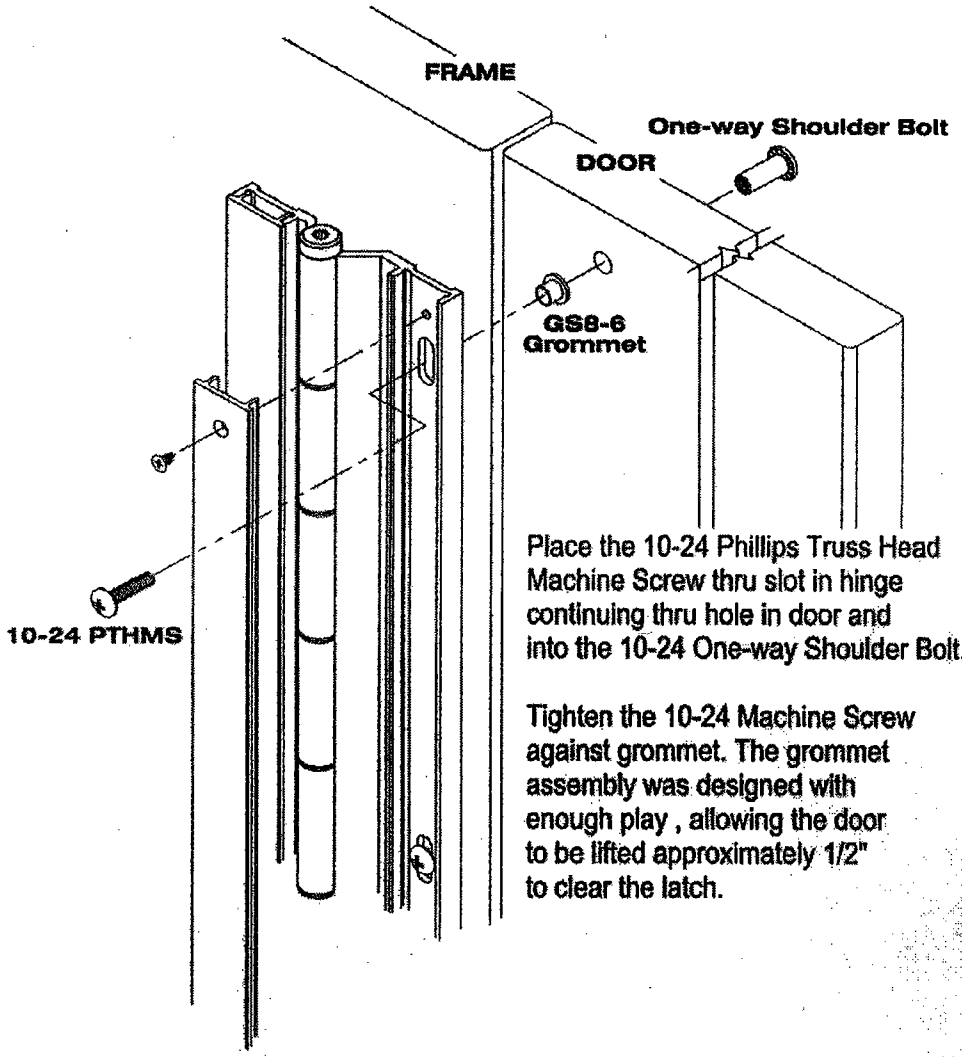
TECHNICAL MEMO

400 SERIES TOILET PARTITION SAFETY LIFT FEATURE



Place the 10-24 Phillips Truss Head Machine Screw thru slot in hinge continuing thru hole in door and into the 10-24 One-way Shoulder Bolt.

Tighten the 10-24 Machine Screw against grommet. The grommet assembly was designed with enough play , allowing the door to be lifted approximately 1/2" to clear the latch.

4/99 *For more information contact:*
Markar Products, Inc. *68 WARD ROAD LANCASTER, NEW YORK 14086 1-800-868-1688 (716) 685-4104 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-19 SCALE NONE DATE MARCH 2005	PROJECT NO. TASK 1314.20 B-19

TECHNICAL MEMO

STRENGTH OF COMPONENTS

12 GAUGE STAINLESS STEEL CONTINUOUS HINGES

Leaves

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

Stress Analysis

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

Tensile Limits

7' door 4.5 in²
x 85,000 P.S.I. = 385,075 lbs
+ 12 (safety factor) = 32,100 lbs

8' door 5.0 in²
x 85,000 P.S.I. = 440,675 lbs
+ 12 (safety factor) = 36,725 lbs

10' door 6.5 in²
x 85,000 P.S.I. = 551,850 lbs
+ 12 (safety factor) = 46,000 lbs

Shear Limits

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

8' door 10.25 in²
x 35,000 P.S.I. = 551,850 lbs
+ 12 (safety factor) = 46,000 lbs

10' door 13.0 in²
x 35,000 P.S.I. = 454,450 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 in²

7' hinge 16 fasteners
x 0.0145 in² = 0.232 in²
x 83,000 P.S.I. = 19,256 lbs
+ 12 (safety factor)= 1,604 lbs

8' hinge 18 fasteners
x 0.0145 in² = 0.261 in²
x 83,000 P.S.I. = 21,663 lbs
+ 12 (safety factor)= 1,805 lbs

10' hinge 20 fasteners
x 0.0145 in² = 0.290 in²
x 83,000 P.S.I. = 24,070 lbs
+ 12 (safety factor)= 2,005 lbs

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

7' hinge 16 fasteners
x 0.0269 in² = 0.430 in²
x 83,000 P.S.I. = 35,723 lbs
+ 12 (safety factor)= 2,977 lbs

8' hinge 18 fasteners
x 0.0269 in² = 0.484 in²
x 83,000 P.S.I. = 40,189 lbs
+ 12 (safety factor)= 3,349 lbs

10' hinge 20 fasteners
x 0.0269 in² = 0.538 in²
x 83,000 P.S.I. = 44,654 lbs
+ 12 (safety factor)= 3,721 lbs

4/99 MP *For more information contact:*
Markar Products, Inc. *68 WARD ROAD LANCASTER, NEW YORK 14086 1-800-666-1688 (716) 685-4104 FAX (716) 685-3919*

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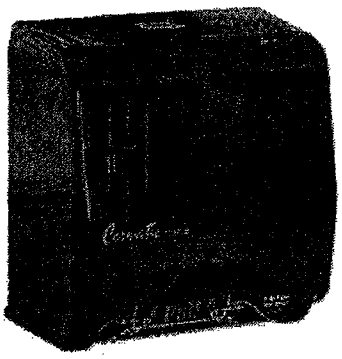
PRODUCT DETAIL

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 rese helps you meet higher public health s in pollution prevention and control yo costs through waste and maintenance self-locking dispenser is designed to c pilferage while making towel dispensi Choose our VuAll® dispenser for a co system solution that is suitable for an

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

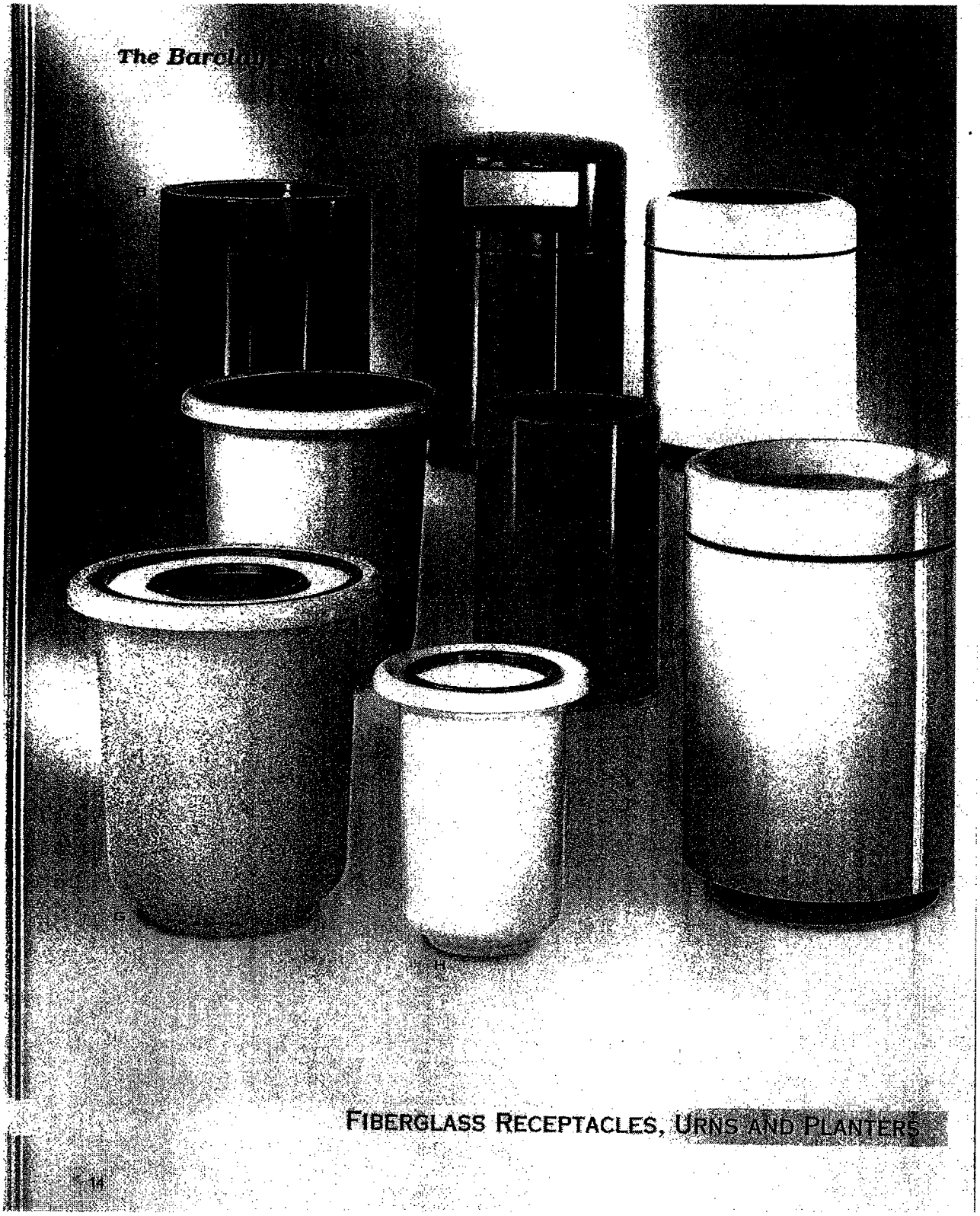
Item #	Product Family	Pack	Inner Pack Count
HV200K	Hygiene		6 Count

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

Baker MICHAEL BAKER JR. INC. 801 Cromwell Park Drive Suite 110 Glen Burnie, MD 21061	PROJECT TITLE RESTROOM DESIGN STANDARDS		PROJECT NO. TASK 1314.20
	SHEET TITLE PAPER TOWEL DISPENSER		B-21
	SCALE NONE	DATE MARCH 2005	



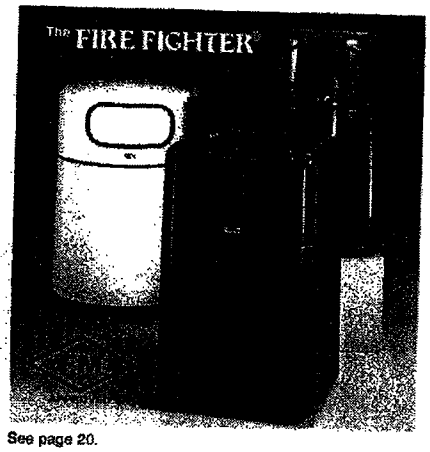
Baker MICHAEL BAKER JR. INC. 801 Cromwell Park Drive Suite 110 Glen Burnie, MD 21061	PROJECT TITLE RESTROOM DESIGN STANDARDS		PROJECT NO. TASK 1314.20
	SHEET TITLE RECEPTACLES-1		B-22
	SCALE NONE	DATE MARCH 2005	

THE BARCLAY SERIES

FIRE SAFE / SELF-EXTINGUISHING FIBERGLASS RECEPTACLES

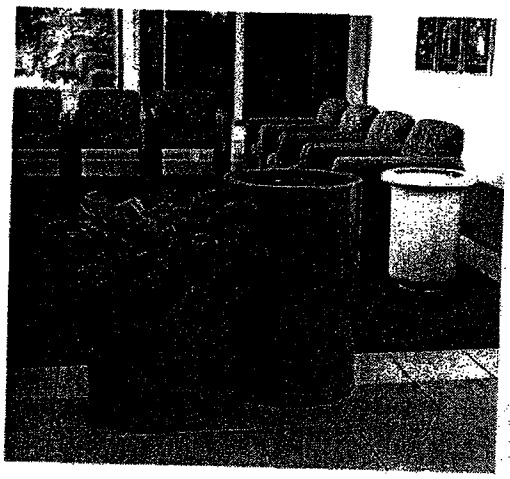
The Barclay Series of fiberglass receptacles offers a variety of styles from classic to contemporary that complement and enhance their surroundings.

- 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.



See page 20.

Folding retainer bands hold poly bags securely inside the receptacle.



	Description	Model Number	Liner	Gallon Capacity RB	PL	GL	Dimensions	Disposal Opening Dimensions	Color Shown
A	Waste Receptacle	FG1838ARLD	PL / GL	—	21	21	18" Dia. x 30" H	9" Dia.	Blackberry
B	Waste Receptacle	FG2432†	RB / PL / GL	57	40	31	24" Dia. x 32" H	18" Dia.	Black
C	Waste Receptacle	FG2439†	RB / PL / GL	57	40	31	24" Dia. x 39" H	two 13" W x 6.5" H	Plum
D	Waste Receptacle	FG2432AR†	RB / PL / GL	57	40	31	24" Dia. x 32" H	8" Dia.	Almond
E	Waste Receptacle	FG2438†	RB / PL	62	50	—	24" Dia. x 39" H	13" Dia.	Warm Gray
F	Waste Receptacle	FGL2730GT†	PL	—	22	—	27" Dia. x 30" H	12" Dia.	Tan
G	Ash / Trash	FGL2730GSUT†	PL	—	22	—	27" Dia. x 30" H	12" Dia.	Rose Gran-x
H	Urn	FGL1824GSU	—	—	—	—	18" Dia. x 24" H	—	Mauve

Liner codes: RB - Poly Bag Retainer Bands, PL - Germ-Fighter® Rigid Plastic Liner, GL - Galvanized Steel Liner.

† FG2432, FG2439, FG2432AR, FG2438, FGL2730GT, FGL2730GSUT cannot ship UPS

Baker
MICHAEL BAKER JR. INC.
801 Cromwell Park Drive
Suite 110
Glen Burnie, MD 21061

PROJECT TITLE: RESTROOM DESIGN STANDARDS

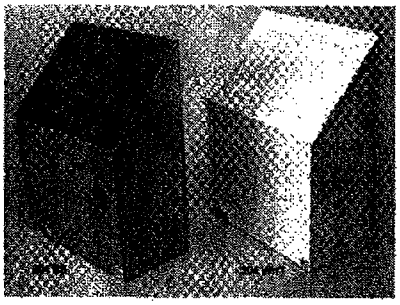
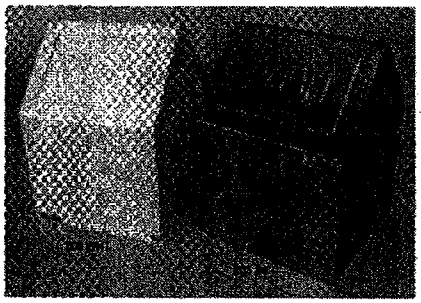
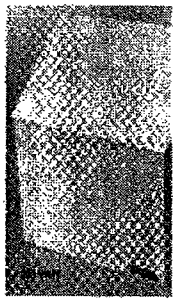
SHEET TITLE: RECEPTACLES-2

SCALE: NONE

DATE: MARCH 2005

PROJECT NO.: TASK 1314.20

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 floo 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 - Floo
●		205 WHT	White Gloss	Sanitary Napkin Receptacle - Floo
●		206 WHT	White Gloss	Individual Sanitary Napkin Bag D
●		225	Liner	Individual Sanitary Napkin Bag

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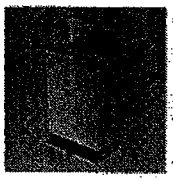
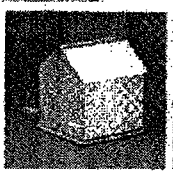
- Trash Receptacles



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

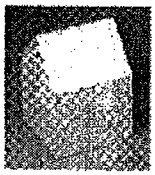
Price **$74.10** Save up to **7%**

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

5 items

Company Information | Delivery Information | Return Policy | Suggestions

Baker MICHAEL BAKER JR. INC. 801 Cromwell Park Drive Suite 110 Glen Burnie, MD 21061	PROJECT TITLE RESTROOM DESIGN STANDARDS		PROJECT NO. TASK 1314.20
	SHEET TITLE RECEPTACLES-4		B-25
	SCALE NONE	DATE MARCH 2005	

Channel Frame

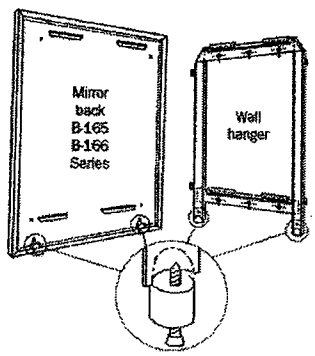
B-165 SERIES

B-165 SERIES FRAMED MIRRORS One-piece channel frame is ½" x ½" x ½" (13 x 13 x 13mm) with bright polished finish and mitered corners. Phillips-head frame screw permits easy replacement of mirror. No. 1 quality, ¼" (6mm) glass mirror electrolytically copper-plated; guaranteed against silver spoilage 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.

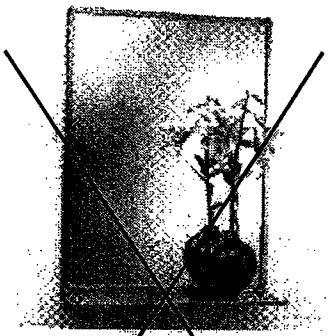
STANDARD STOCK SIZES B-165 SERIES MIRROR

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"	(152x 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 ⅜" (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.

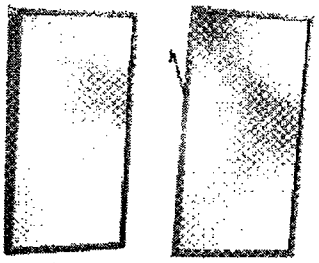
Frameless, stainless steel

B-1556 SERIES FRAMELESS MIRRORS Bright polished stainless steel. Mirror has ¼" (6mm) return concealing ¼" (6mm) tempered masonite backing. Furnished with four mounting screws.

STANDARD STOCK SIZES B-1556 SERIES MIRROR

Model No.	Width	Height	
B-1556 1620	15 ½"	19 ½"	(39 x 50cm)
∮B-1556 1824	17 ½"	23 ½"	(44 x 60cm)
B-1556 1830	17 ½"	29 ½"	(44 x 75cm)
∮B-1556 2436	23 ½"	35 ½"	(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, ¼" (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" (914 x 1219mm).

B-294 SERIES TILTING MIRRORS Tilt forward to provide full visibility for wheelchair patients or return to upright position. Frame is ¾" x ¾" (19 x 19mm), type-304 stainless steel angle, satin finish. Special bevel design hugs mirror. No. 1 quality, ¼" (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 ¼" x 17 ¼" (285 x 440mm) overall, ¾" (6mm) deep. 18-gauge (1.2mm), type-430 stainless steel with bright polished finish.

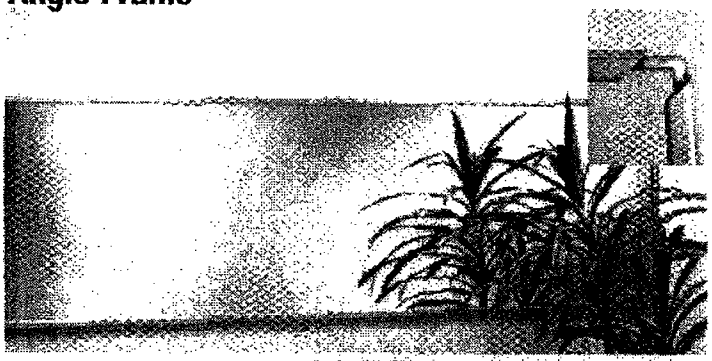
B-9436 FRAMED MIRROR (Secured From Front) Reflective surface: type-304 bright polished stainless steel. Frame: 14-guage (2mm), type-304 stainless steel with satin finish; ⅝" (16mm) deep; corners heliarc welded, ground and polished smooth, mirror protected by ½" (13mm) thick fiberboard backing. Overall 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		PROJECT NO. TASK 1314.20
	SHEET TITLE MIRRORS-1		B-26
	SCALE NONE	DATE MARCH 2005	

MIRRORS

Angle Frame



B-290 SERIES

B-290 SERIES FRAMED MIRRORS One-piece roll formed frame is ¾" x ¾" (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, ¼" (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 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).

STANDARD STOCK SIZES B-290 SERIES MIRROR

Model No.	Width	Height	
B-290 1824	18"	24"	(46 x 61cm)
⸗B-290 1830	18"	30"	(46 x 76cm)
⸗B-290 1836	18"	36"	(46 x 91cm)
B-290 2430	24"	30"	(61 x 76cm)
⸗B-290 2436	24"	36"	(61 x 91cm)
B-290 2448	24"	48"	(61 x 122cm)
B-290 2460	24"	60"	(61 x 152cm)
B-290 2472	24"	72"	(61 x 183cm)
B-290 3636	36"	36"	(91 x 91cm)
B-290 4836	48"	36"	(122 x 91cm)
B-290 7236	72"	36"	(183 x 91cm)

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.

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

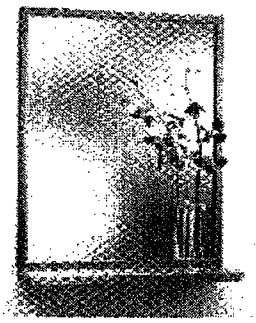
All Bobrick framed mirrors are manufactured to overall dimensions, as shown in all mirror tables on pages 18 and 19. Overall height of mirror/shelf models includes shelf.

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

Angle Frame/Shelf

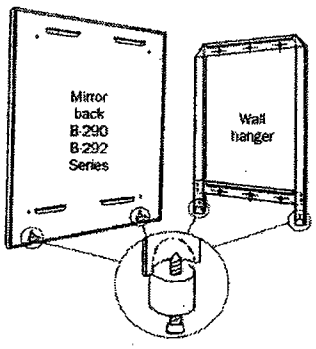


B-292 SERIES

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 ¾" (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"	(46 x 61cm)
B-292 1830	18"	30"	(46 x 76cm)
B-292 1836	18"	36"	(46 x 91cm)
B-292 2436	24"	36"	(61 x 91cm)

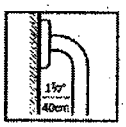


B-290, B-292, B-165 AND B-166 SERIES MIRRORS. CONCEALED WALL HANGER FOR THEFT-RESISTANT MOUNTING Simplifies installation. Mirror is held flush to wall by integral brackets at top and bottom of mirror back locked by two concealed theft-resistant screws on bottom of mirror back. Back is constructed of galvanized steel. Note: Provide minimum ¾" (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.

 ⸗ USA & Canada QuickShip model. ⸗ USA QuickShip model.

Baker	MICHAEL BAKER JR. INC. 801 Cromwell Park Drive Suite 110 Glen Burnie, MD 21061	PROJECT TITLE: RESTROOM DESIGN STANDARDS	PROJECT NO.: TASK 1314.20
		SHEET TITLE: MIRRORS-2	B-27
		SCALE: NONE	DATE: MARCH 2005

Grab Bars Comply With Barrier-Free Design Codes



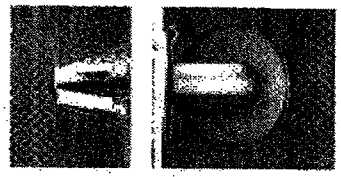
Clearance between wall and grab bar

- Constructed of satin-finish stainless steel tubing in 1 ¼" and 1 ½" (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 ½" (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 ⅝" (16mm) thick painted or tiled drywall. Can also be used on ½" (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 ½" and 3 ½" (65 and 90mm) or deeper hollow walls with finished wall surfaces ¼" to 1 ½" (6 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 ⅛" (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 ⅛" (3mm) thick, type-304 stainless steel plate, 2" W x 3 ⅛" H (50 x 80mm), with screw holes for concealed anchors.

- Cover is 22-gauge (0.8mm), type-304 stainless steel with satin finish, 3 ¼" (85mm) diameter.

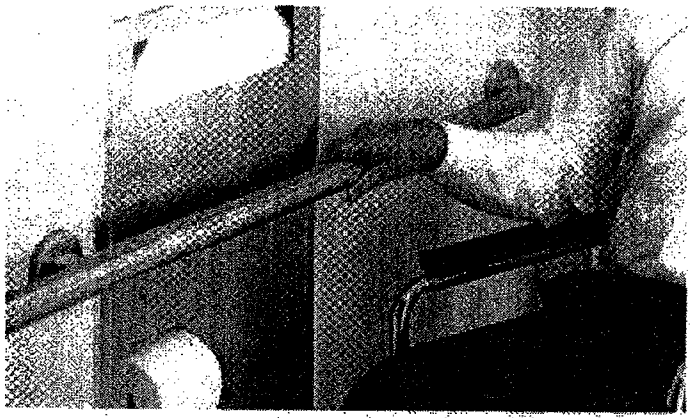
GRAB BARS

Series	Diameter	*Finish
*B-6106	1 ½" (40mm)	Satin Finish
*B-490	1 ⅛" (30mm)	Satin Finish

*Peened nonslip gripping surface available. Add suffix .99 to model number.

Series	Diameter	*Finish
*B-6806	1 ½" (40mm)	Satin Finish
*B-5806	1 ¼" (30mm)	Satin Finish

*Peened nonslip gripping surface available. Add suffix .99 to model number.

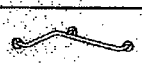
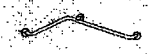
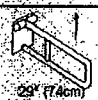


BARRIER-FREE WASHROOM GUIDELINES

GRAB BARS. Diameter of grab bars should be 1 ¼" to 1 ½" (30-40mm) with 1 ½" (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) min. 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.

Baker MICHAEL BAKER JR. INC. 801 Cromwell Park Drive Suite 110 Glen Burnie, MD 21061	PROJECT TITLE RESTROOM DESIGN STANDARDS		PROJECT NO. TASK 1314.20
	SHEET TITLE GRAB BARS-1		B-28
	SCALE NONE	DATE MARCH 2005	

Grab Bar Configurations

GRAB BAR CONFIGURATIONS	CONCEALED MOUNTING B-6806 SERIES 1 ½" (40mm) dia. satin finish or peened grip snap-flange	CONCEALED MOUNTING B-5806 SERIES 1 ¼" (30mm) dia. satin finish or peened grip snap-flange	EXPOSED MOUNTING B-6106 SERIES 1 ½" (40mm) dia. satin finish or peened grip	EXPOSED MOUNTING B-490 SERIES 1 ¼" (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 Tub/Shower/ Toilet Compartment	B-68616 B-68616.99	B-58616 B-58616.99		
 30 ⅞" W x 15 ⅞" 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-5837 B-5837.99		
 29" (74cm) Swing Up (Wall Mounted) Patented				∮B-4998 ∮B-4998.99
 33 ⅛" H x 27 ⅞" 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) sheet-metal 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 ¾" to 1" (19–25mm) panels (order one per flange)

GRAB BARS

Baker
MICHAEL BAKER JR. INC.
801 Cromwell Park Drive
Suite 110
Glen Burnie, MD 21061

PROJECT TITLE	RESTROOM DESIGN STANDARDS
SHEET TITLE	MIRRORS-2
SCALE	NONE
DATE	MARCH 2005
PROJECT NO.	TASK 1314.20
	B-29

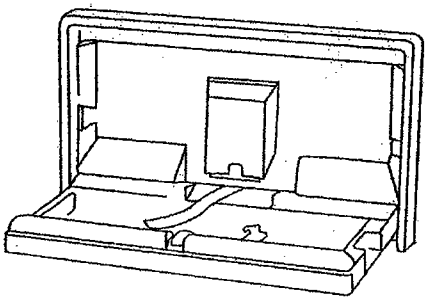
PRODUCT INFORMATION

TO ORDER, PLEASE CALL: 888.733.3456
OR FAX: 303.574.9000
7881 South Wheeling Court, Englewood, CO 80112

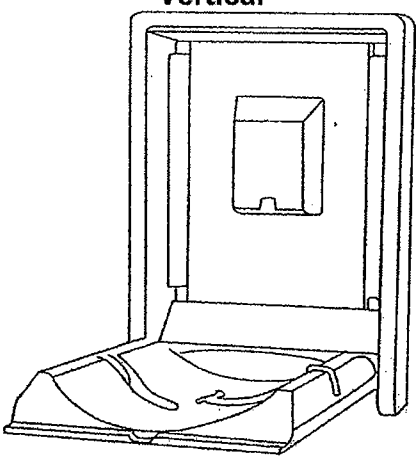
Baby Changing Station

Provides a practical place for parents to attend to their children's dirty diapers without leaving your business

Horizontal



Vertical



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)

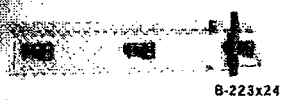
Product features:

- 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

Additional Features:

- **5-year manufacturers limited warranty**
- **Made in the USA**

Recessed and Surface Mounted

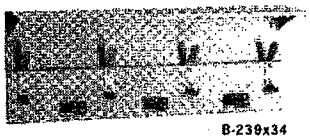


B-223 MOP AND BROOM HOLDER Type-304 stainless steel, satin finish. Anti-slip mop holders have spring-loaded rubber cam that grips handles ⅞" to 1 ¼" (20–30mm) diameter. Holds mops 3 ¼" (85mm) from wall. Height 5" (125mm).

Model No.	No. Holders	Length
B-223x24	3	24" (610mm)
B-223x36	4	36" (915mm)

B-224 SHELF WITH MOP AND BROOM HOLDERS AND RAG HOOKS Shelf is 18-gauge (1.2mm), type-304 stainless steel, satin finish; 6" H, 8" D (150 x 205mm). Anti-slip mop holders have spring-loaded rubber cam that grips handles ⅞" to 1 ¼" (20–30mm) diameter. Holds mops 8" (205mm) from wall. Stainless steel rag hooks. Rod for wet rags below shelf.

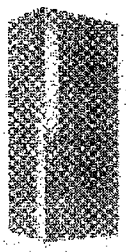
Model No.	No. Holders	No. Hooks	Length
B-224x30	3	2	30" (760mm)
B-224x36	4	3	36" (915mm)

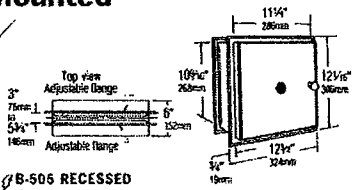


B-239 CLASSIC SERIES SHELF WITH MOP AND BROOM HOLDERS AND HOOKS Shelf is 18-gauge (1.2mm), type-304 stainless steel, satin finish; 13" H, 8" D (330 x 205mm). Anti-slip mop holders have spring-loaded rubber cam that grips handles ⅞" to 1 ¼" (20–30mm) dia. Stainless steel hooks.

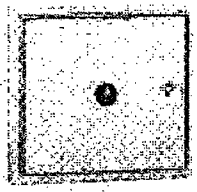
Model No.	No. Holders	No. Hooks	Length
B-239x34	3	4	34" (865mm)
B-239x44	4	5	44" (1120mm)

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 ½" x 3 ½" (90 x 90mm); 48" (1220mm) long.

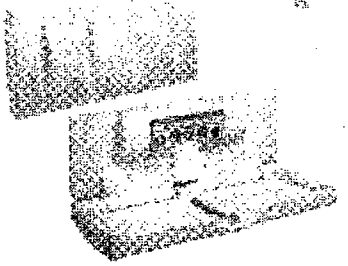




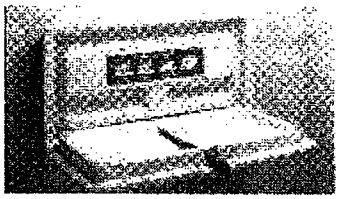
B-505 RECESSED SPECIMEN PASS-THRU CABINET Provides convenient passage for specimen from patient area to laboratory. Mounts in walls 3" to 5 ¾" (75–145mm) thick. Type-304 stainless steel, satin finish. Self-closing doors. Interlocking mechanism prevents both doors from being open at the same time; provides sight barrier. Removable stainless steel tray. Rough Wall Opening: 11 ½" W, 10 ⅞" H (290 x 275mm); 3" to 5 ¾" (75–145mm) thick.

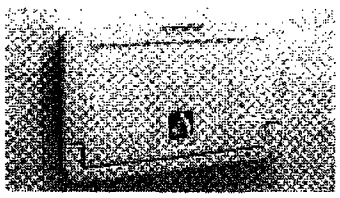


B-235 SURFACE-MOUNTED PAPER CUP DISPENSER Satin-finish stainless steel. Dispenses 150 3-oz (0.1-L) cups. Also adjusts to dispense up to 6-oz (0.2-L) cups. Tumbler lock on top and stainless steel piano hinge on bottom. Cabinet swings down for easy filling. Slot on front indicates refill time. 3 ¼" W, 14 ½" H, 3 ¼" 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 ½" W, 16 ⅞" H (870m x 430 mm). When closed, surface-mounted unit projects 4" (102 mm) 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 ½" to 10 ⅝" long by 2 ⅝" to 4 ⅞" 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 ⅝" (40mm). When open, surface mounted bed projects 19" (485mm) from wall; semi-recessed bed projects 16 ⅜" (420mm). For semi-recessing, provide Rough Wall Opening 30 ½" W, 18 ½" H, 4" D (775 x 470 x 102mm). Patented.

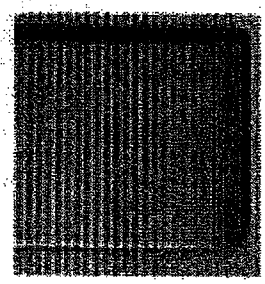
B-2200 Similar to B-2210, but without multi-size liner dispenser. Patented.

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 CHILDSEAT 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 ½" D (330 x 455 x 115mm). Seat projects 13 ¼" (335mm) from partition when open.

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

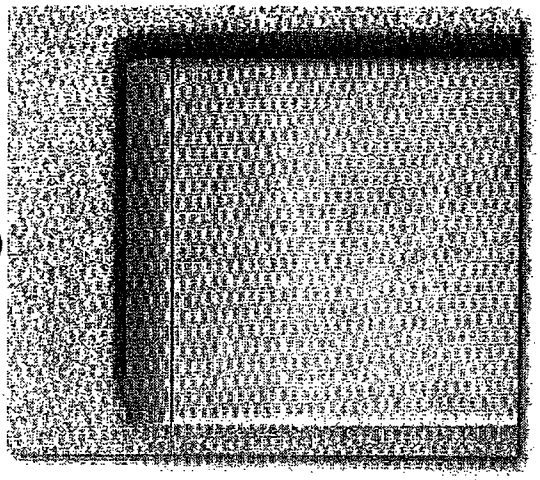
- 8" rail with continuous aluminum retainer (except C860)
- Exclusive connector plates and variety of mounting options
- Continuous vinyl cushion to protect profile cover (except C860)
- Economy models (C860 & C870) available for light- to medium-impact situations
- Available in 21 standard colors with 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(r) C800-Series Crash Rails

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

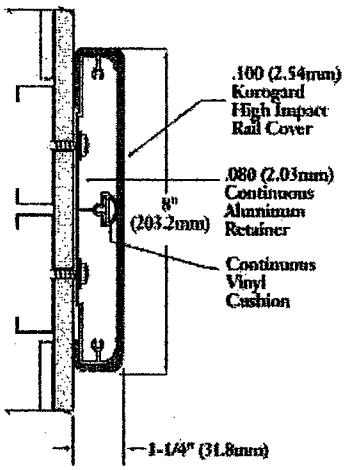


KOROGARD C800-Series Crash Rails are backed by a limited five-year warranty. All crash rails are Class I/A fire rated and meet national building code standards. All KOROGARD linear profiles color coordinate with a multitude of KOROSEAL(r) Wallcoverings for a systems approach to wall protection.

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

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

HC800 SERIES ACCESSORY ITEMS	
C801	Standard End Cap
C803	90° Corner Cap
C804	135° Corner Cap
C805	Splice Kit
C841	Extended End Cap



C800

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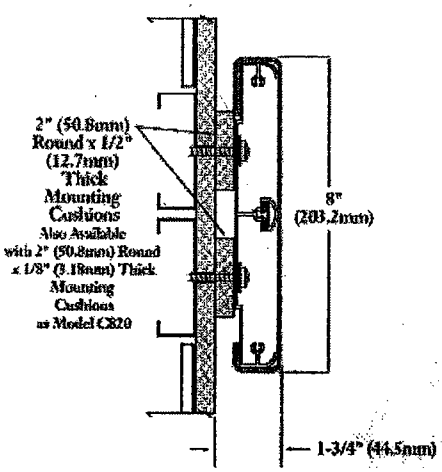

C830

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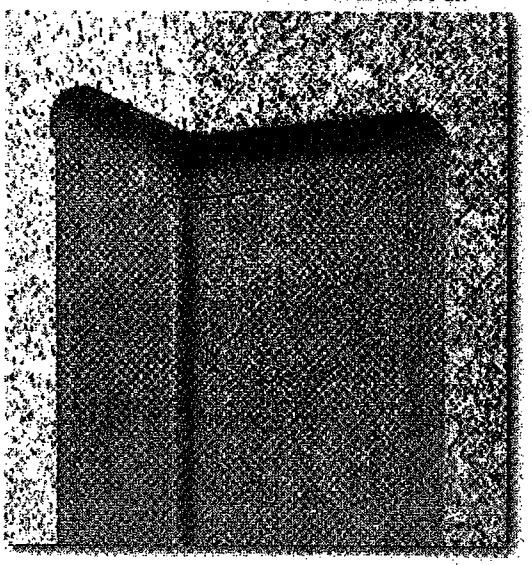
Baker MICHAEL BAKER JR. INC. 801 Cromwell Park Drive Suite 110 Glen Burnie, MD 21061	PROJECT TITLE RESTROOM DESIGN STANDARDS		PROJECT NO. TASK 1314.20
	SHEET TITLE CRASH RAILS-3		B-34
	SCALE NONE	DATE MARCH 2005	

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

KOROGARD G200-Series Corner Guards consist of a formidable 3" (76.2mm) vinyl 1/4" (6.35mm) radius cover mounted over a continuous aluminum retainer. KOROGARD Corner Guards are an attractive and durable solution to unsightly, damaged corners. G200-Series Surface-Mounted Corner Guards provide support in medium to high impact areas. The G210 Model is available for 135° angle corners.

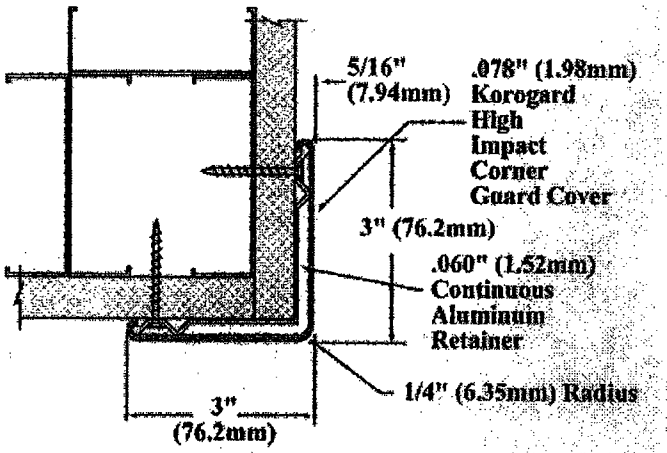


KOROGARD G200-Series Corner Guards are backed by a limited five-year warranty. All corner guards are Class I/A fire rated and meet national building code standards. All KOROGARD linear profiles color coordinate with a multitude of KOROSEAL(r) Wallcoverings for a systems approach to wall protection.

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

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

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	PROJECT NO.: TASK 1314.20
		SHEET TITLE: CORNER GUARDS-1	B-35
		SCALE: NONE / DATE: MARCH 2005	

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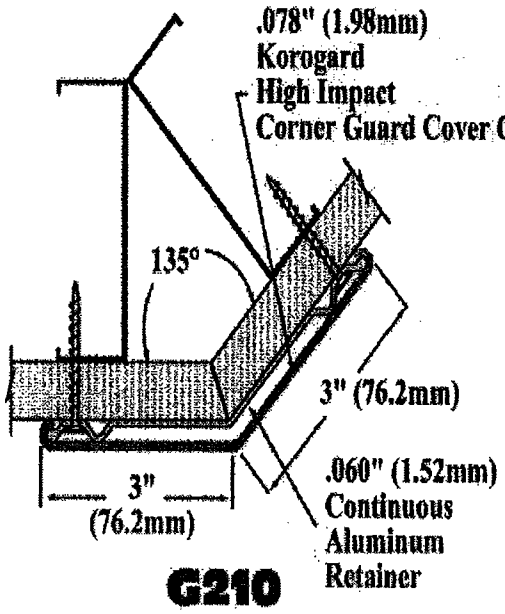

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KOROSEAL
WALL PROTECTION SYSTEMS
A Division of RJF International Corporation
3875 Embassy Parkway, Fairlawn, OH 44333
Phone 800-628-0449 or 330-668-7600
Fax 330-668-7703

Baker MICHAEL BAKER JR. INC. 801 Cromwell Park Drive Suite 110 Glen Burnie, MD 21061	PROJECT TITLE RESTROOM DESIGN STANDARDS		PROJECT NO. TASK 1314.20
	SHEET TITLE CORNER GUARDS-2		B-36
	SCALE NONE	DATE MARCH 2005	

REPUBLIC STORAGE SYSTEMS

THE LOCKER BOOK

Baker

MICHAEL BAKER JR. INC.
801 Cromwell Park Drive
Suite 110
Glen Burnie, MD 21061

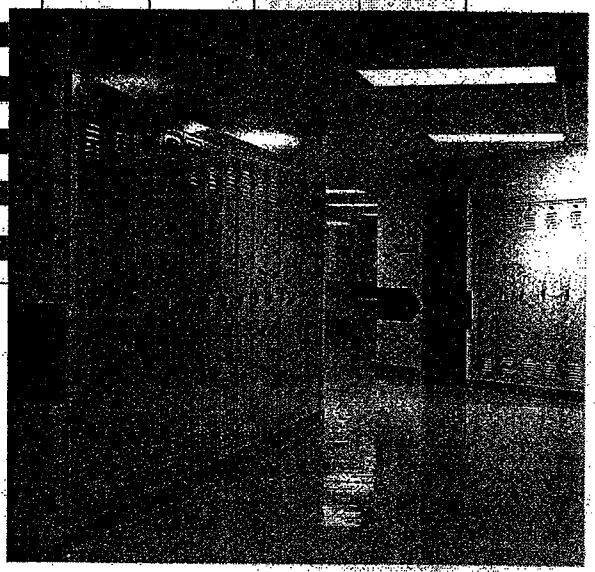
PROJECT TITLE: RESTROOM DESIGN STANDARDS		PROJECT NO.: TASK 1314.20
SHEET TITLE: LOCKERS-1		B-37
SCALE: NONE	DATE: MARCH 2005	

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 x12	48,54,60,72	30, 36			20, 24	15, 18		
9 x15	48,54,60, 72	30, 36			20, 24			
9 x18	60, 72	30, 36			20, 24			
9 x21	60, 72	30, 36						
9 x24	60, 72	30, 36						
12x12	36,48,54,60,72	24,30,36,42	20, 24	18	20, 24	15, 18	12, 14.4	12
12x15	36,48,54,60,72	24,30,36,42	20, 24		20, 24	15, 18	12, 14.4	12
12x18	36,48,60,72	24,30,36,42	20, 24		20, 24	15, 18	12, 14.4	12
12x21	60, 72	30, 36						
12x24	60, 72	30, 36						
15x12	60, 72	30, 36			20, 24		12, 14.4	12
15x15	60, 72	30, 36			20, 24	15, 18	12, 14.4	12
15x18	60, 72	30, 36			20, 24	15, 18	12, 14.4	12
15x21	60, 72	30, 36						
15x24	60, 72	30, 36						
18x12	60, 72	30, 36						
18x15	60, 72	30, 36						
18x18	60, 72	30, 36						
18x21	60, 72	30, 36						
18x24	60, 72	30, 36						
24x18	60, 72	30, 36						
24x21	60, 72	30, 36						
24x24	60, 72	30, 36						

ADDITIONAL SIZES FOR STANDARD LOCKERS

W x D Inches	Two Person Heights	Duplex Heights	Double Door Heights
15x12	60, 72		
15x15	60, 72	60, 72	
15x18	60, 72	60, 72	
15x21	60, 72		
18x15	60, 72		
18x18	60, 72	60, 72	
18x21		60, 72	
24x18			60, 72
24x21			60, 72
24x24			60, 72



Actual height of the 36" single tier locker is 36½"

Above: Standard Lockers
Jeannette McKee Elementary/Middle School
Jeannette, Pennsylvania
Architect: Kaclik and Graves, Pittsburgh, Pennsylvania
Distributor: Tri-State Lockers & Shelving, Pittsburgh, Pennsylvania

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MICHAEL BAKER JR. INC.
801 Cromwell Park Drive
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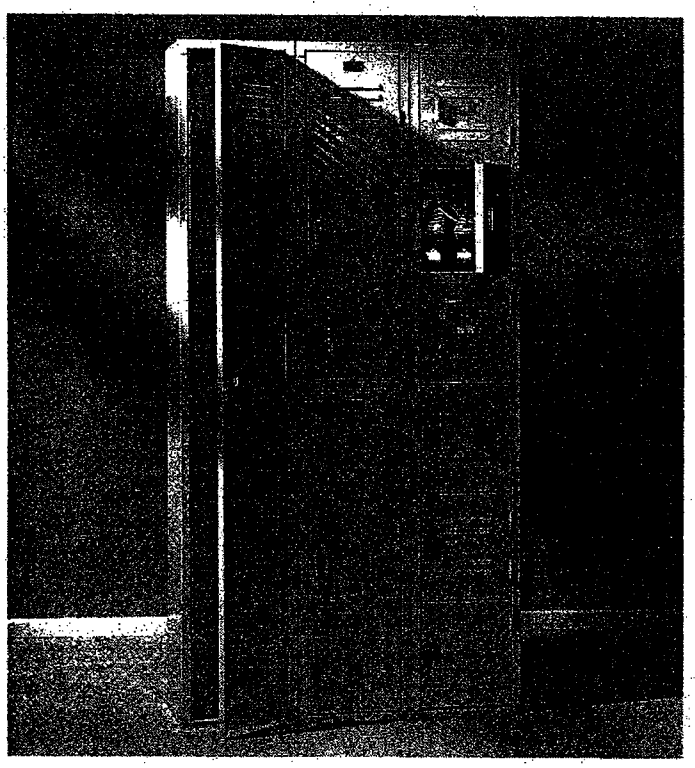
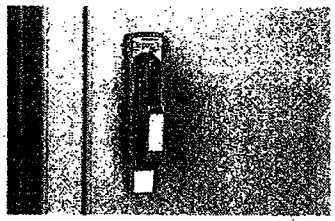
Glen Burnie, MD 21061

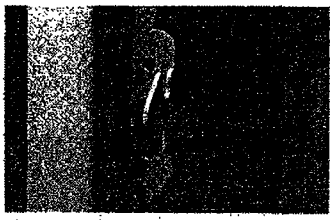
PROJECT TITLE: RESTROOM DESIGN STANDARDS
PROJECT NO.: TASK 1314.20
SHEET TITLE: LOCKERS-2
SCALE: NONE
DATE: MARCH 2005
B-38

S T A N D A R D L O C K E R S

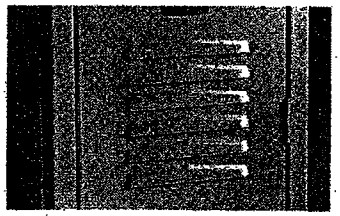




***Lift handle** is made of attractive, durable chrome plated die cast zinc. The rugged handle case protects the lift trigger from kicking and other abuse, and also serves as a padlock strike. Handle equipped with two rubber silencers to reduce mechanism noise.*



***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.*



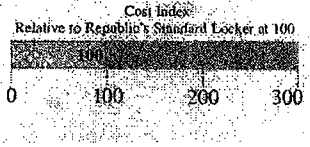
***Louvers** are provided on all Standard Lockers. Single tier and double tier lockers have a block of six louvers located near the top and bottom of each door.*

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

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

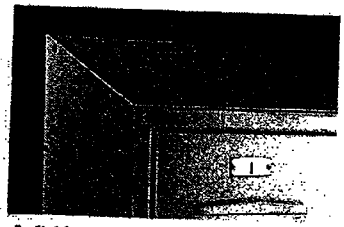
- Continuous vertical door strikes
- Heavy gauge frame hooks
- Full-flanged, channel edged doors
- Heavy duty guarded door handle
- Double-channel lock bar
- Full loop, 2", 5-knuckle hinges welded to frames, double-riveted to doors
- Double-lapped rear vertical corners in body
- Overlapped upright/frame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

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

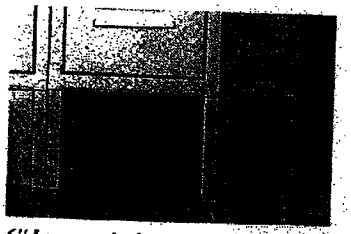


Baker
MICHAEL BAKER JR. INC.
801 Cromwell Park Drive
Suite 110
Glen Burnie, MD 21061

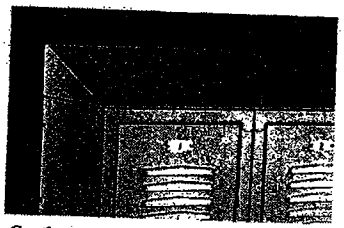
PROJECT TITLE	RESTROOM DESIGN STANDARDS
SHEET TITLE	LOCKERS-3
SCALE	NONE
DATE	MARCH 2005
PROJECT NO.	TASK 1314.20
	B-39



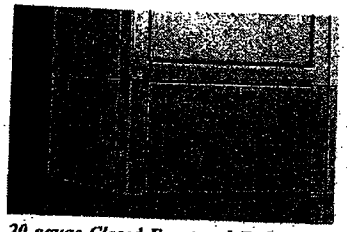
***Individual Sloping Tops** provide a finished appearance, prevent trash accumulation on locker tops and discourage using locker tops as storage areas. The rise of the slope is ½ the locker depth. Standard flat tops are omitted.*



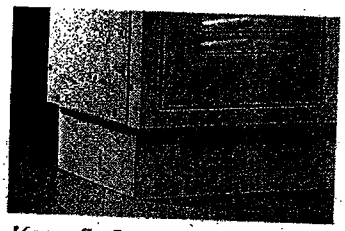
***6" Legs** may be furnished with all lockers. Front legs are an extension of vertical frames. Adjustable rear angle legs are provided for every third upright.*



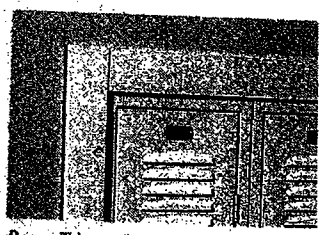
***Continuous Sloping Tops** provide a smooth, finished appearance for lockers mounted along walls or in island groups. The rise of the slope is ½ the locker depth. Customize your installation with sloping top splices, valley corners and hip ends - all without exposed fasteners.*



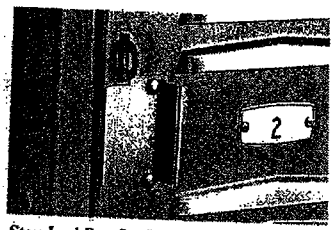
***20 gauge Closed Front and End Bases**, give a finished appearance to lockers with legs. Closed Bases also cover the hard to clean area under the lockers.*



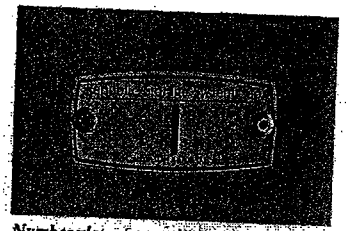
***16gauge Zee Bases** offer an attractive and economical way to raise lockers above the floor and create an overhang or "toe space". Available in 3", 4" and 6" heights.*



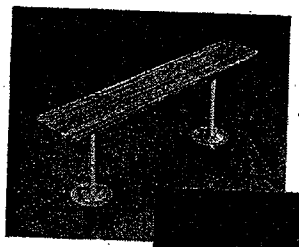
***Recess Trim** really sets off your recessed locker installations. The trim has a 3" face and a ⅞" top return. Integral corner caps and hairline joints reinforced with welded-on splice fingers leave a clean appearance. When used with Mondrian® or Designer lockers the trim can be set in a sculptured design (locker projects 1" beyond wall) or a flush design (locker projects ⅛" beyond wall).*

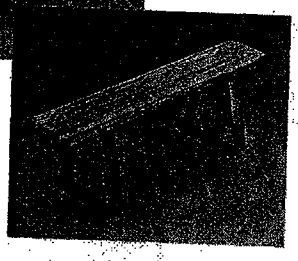


***Standard Box Locker Pull** provides a convenient finger pull and serves as a padlock strike and lock hole cover. Made from 20 gauge stainless steel.*



***Number plates** feature ¾" high black numerals on brushed aluminum to permit easy locker identification.*



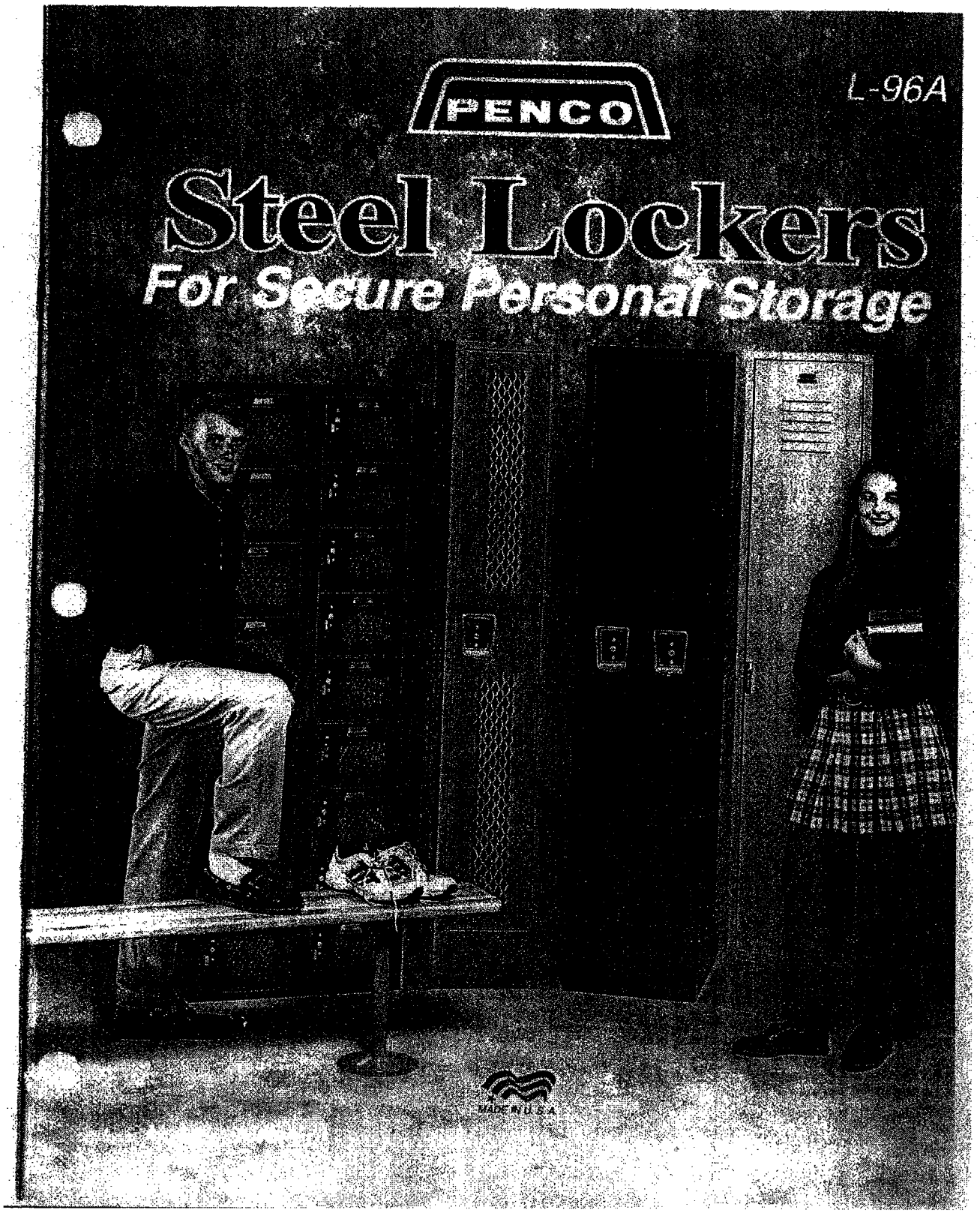


***Benches and Pedestals** have an overall height of 17½". Benches are 9½" wide x 1¼" full finished thickness laminated maple. Pedestals consist of sturdy 1¼" O.D. tubing with 10 gauge steel flanges welded to each end.*

***Moveable Benches** consist of maple bench tops mounted to free-standing trapezoidal-shaped pedestals. Pedestals made from ¼"x3" aluminum bar stock, with black anodized finish.*

Baker
MICHAEL BAKER JR. INC.
801 Cromwell Park Drive
Suite 110
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



Baker MICHAEL BAKER JR. INC. 801 Cromwell Park Drive Suite 110 Glen Burnie, MD 21061	PROJECT TITLE RESTROOM DESIGN STANDARDS		PROJECT NO. TASK 1314.20
	SHEET TITLE LOCKERS-5		B-41
	SCALE NONE	DATE MARCH 2005	

PENCO Vanguard Lockers

KD

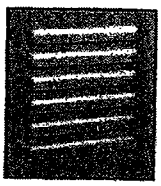
Penco has been building lockers for decades that last for decades, and the Vanguard line is the embodiment of what it takes to withstand the daily use and abuse typically given to a locker.

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.

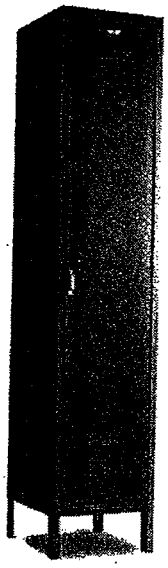


Vanguard Louvers

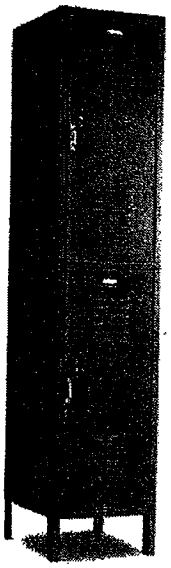
The door frames have mortise and tenon construction and are securely spot welded for lifetime rigidity. Every door frame has a vertical flange which creates a continuous door strike. All hinges are full loop, 5-knuckle design, welded to the frame, and riveted to the door.

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.



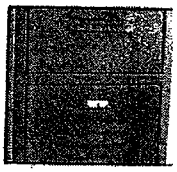
Single Tier



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. Cat. No.	72" Opening Ht. Cat. No.	30" Opening Ht. (60" overall ht.) Cat. No.	36" Opening Ht. (72" overall ht.) Cat. No.	42" Opening Ht. (84" overall ht.) 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	6218V	-
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	6196V	-	-	-
*24	21	6158V	6198V	-	-	-
*24	24	6160V	6199V	-	-	-

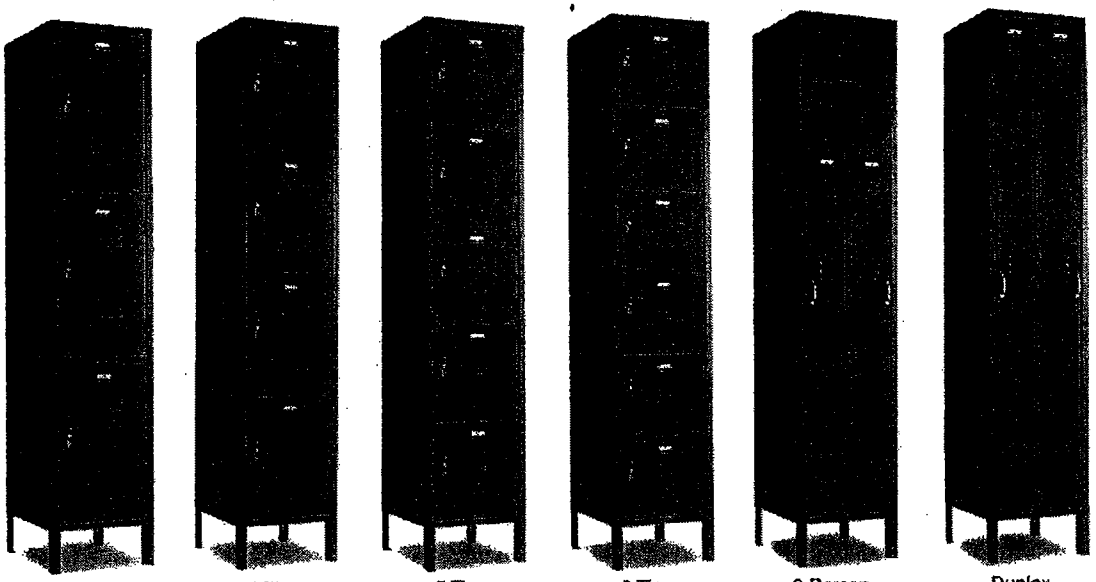
* 24" wide lockers are also available with double doors. Contact your representative.

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

Baker
MICHAEL BAKER JR. INC.
801 Cromwell Park Drive
Suite 110
Glen Burnie, MD 21061

PROJECT TITLE: RESTROOM DESIGN STANDARDS
PROJECT NO.: TASK 1314.20
SHEET TITLE: LOCKERS-6
SCALE: NONE
DATE: MARCH 2005
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.	14-2/5" 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	6635V
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
Suite 110
Glen Burnie, MD 21061

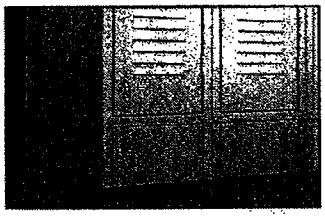
PROJECT TITLE: RESTROOM DESIGN STANDARDS
SHEET TITLE: LOCKERS-7
SCALE: NONE
DATE: MARCH 2005
PROJECT NO.: TASK 1314.20
B-43

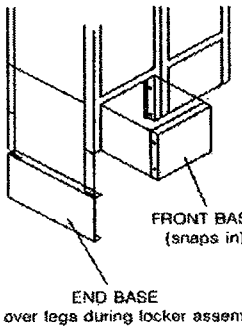
PENCO Locker Accessories

Individual Closed Bases

Front and end bases are designed to fit beween standard Penco 6" legs. They present a clean flush apppearance 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



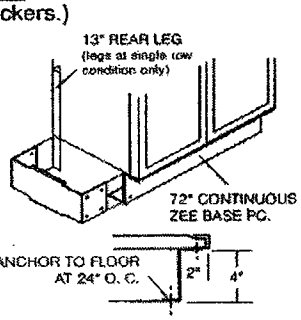


Zee Bases

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 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.)

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	66092C



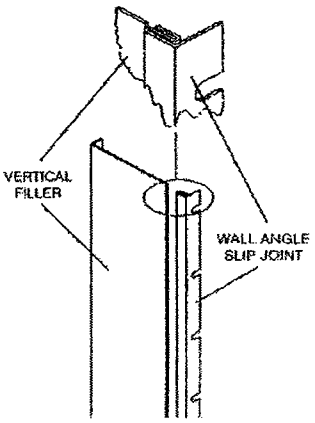
Fillers

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.

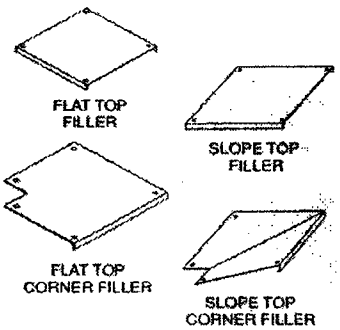
A. Vertical Fillers			
Size (Inches)			Cat. No.
W	D	H	
Fillers, Vertical Angle			
5	-	60	66112C
5	-	72	66115C
9	-	60	66114C
9	-	72	66117C
9	-	78	66127C
12	-	60	66113C
12	-	72	661141C
12	-	78	66116C
Wall Angle Slip Joints			
-	-	60	66118C
-	-	72	66119C
-	-	78	66121C



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.

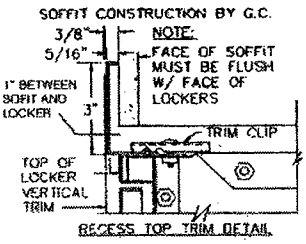
Baker MICHAEL BAKER JR. INC. 801 Cromwell Park Drive Suite 110 Glen Burnie, MD 21061	PROJECT TITLE RESTROOM DESIGN STANDARDS		PROJECT NO. TASK 1314.20
	SHEET TITLE LOCKERS-8		B-44
	SCALE NONE	DATE MARCH 2005	

PENCO Locker Accessories

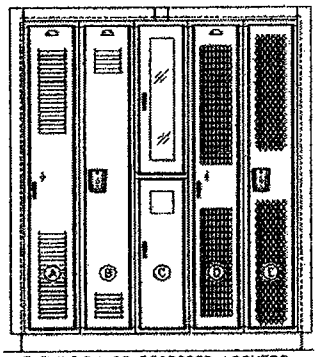
Recess Trim

Recess Trim - 3" Recess trim bridges the gap between lockers and wall and/or soffits when the lockers are recessed into a wall.

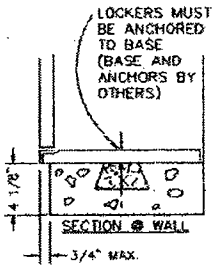
Recess Trim			
Size (Inches)			Cat. No.
W	D	H	
Side Trim, LH			
3	-	63	60465C
3	-	75	60469C
Side Trim, RH			
3	-	63	60466C
3	-	75	60470C
Top Trim			
74	-	3	60456H
Splice			
2	-	3	60105C
Outside Corner Splice			
2	2	3	66108C

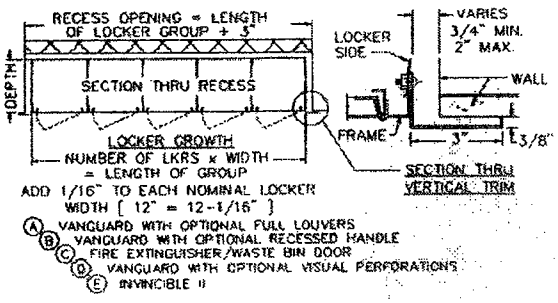


RECESS TOP TRIM DETAIL



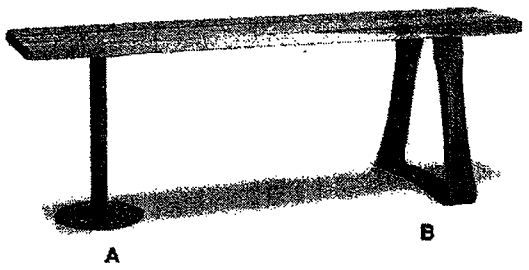
ELEVATION OF RECESSED LOCKERS





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) W	Cat. No.
36	09611
48	09600
60	09601
72	09602
84	09603
96	09604
108	09605
120	09606
132	09607
144	09608

Bench Pedestals

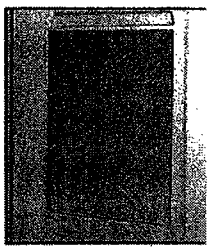
Penco offers a choice in bench pedestal styles, as shown below. *Order two pedestals for benches 96" long or less; order three pedestals for benches over 96" long.*

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.



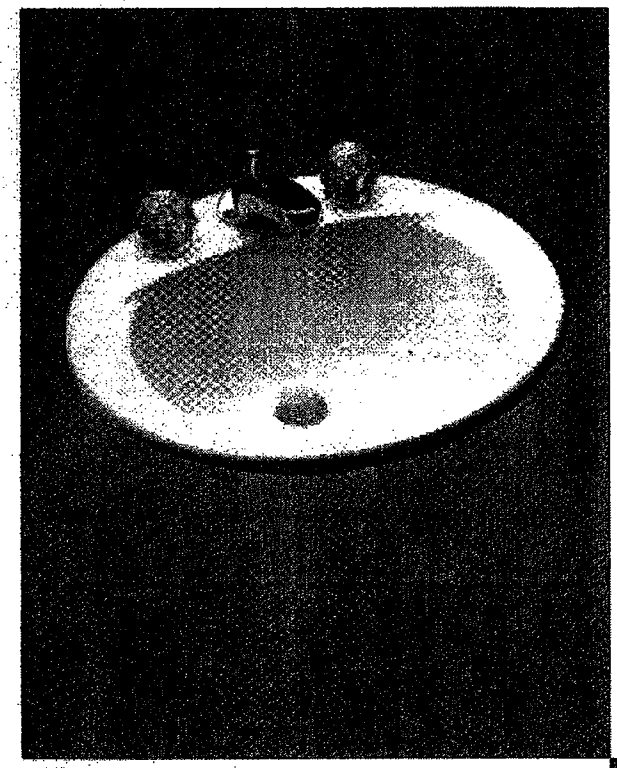
FOR SAFETY PURPOSES WE STRONGLY RECOMMEND THAT ALL LOCKERS BE EITHER FLOOR OR WALL ANCHORED.

Baker
MICHAEL BAKER JR. INC.
801 Cromwell Park Drive
Suite 110
Glen Burnie, MD 21061

PROJECT TITLE	RESTROOM DESIGN STANDARDS
SHEET TITLE	LOCKERS-9
SCALE	NONE
DATE	MARCH 2005
PROJECT NO.	TASK 1314.20
	B-45

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.

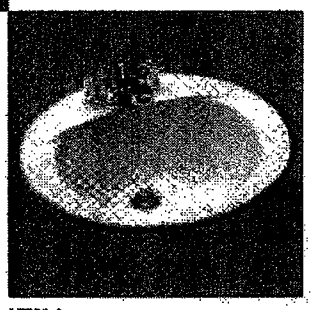
LT501
Lavatory only with single hole faucet center

LT501.4
Lavatory only with 4" faucet centers

LT501.8
Lavatory only with 8" faucet centers

Colors:
Standard *#01 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

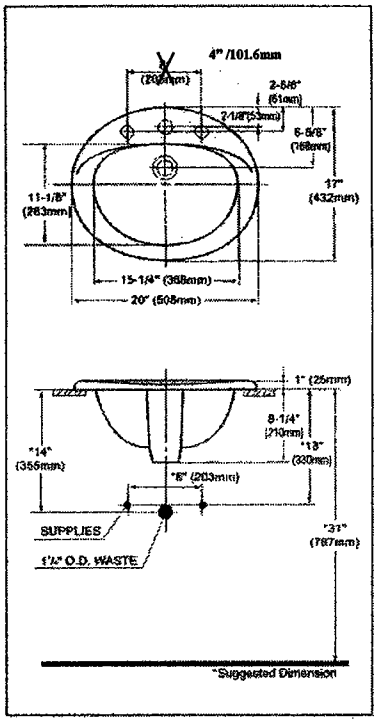
Waste:	1¼" O.D.
Size:	20"W x 17"D
Basin:	15¼"W x 11⅛"D
Material:	Vitreous china
Warranty:	One Year Limited Warranty
Shipping Weight:	**LT501 / LT501.4 / LT501.8** 20.5 lbs.
Shipping Dimensions:	**LT501 / LT501.4 / LT501.8** 21⅞"L x 19⅞"W x 10⅛"H

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

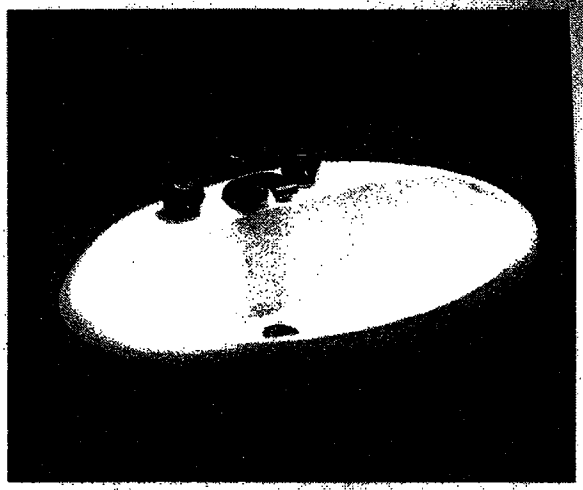
TOTO®
Perfection by Design

TOTO U.S.A., INC. • 1155 Southern Road, Morrow, GA 30260
Tel. (770) 282-8686 • Fax. (770) 282-8701 • www.totousa.com

Baker MICHAEL BAKER JR. INC. 801 Cromwell Park Drive Suite 110 Glen Burnie, MD 21061	PROJECT TITLE RESTROOM DESIGN STANDARDS		PROJECT NO. TASK 1314.20
	SHEET TITLE LAVATORIES-2		B-47
	SCALE NONE	DATE MARCH 2005	

SONNET™ 1-345-V or S

SELF-RIMMING
COUNTERTOP LAVATORY
VITREOUS CHINA



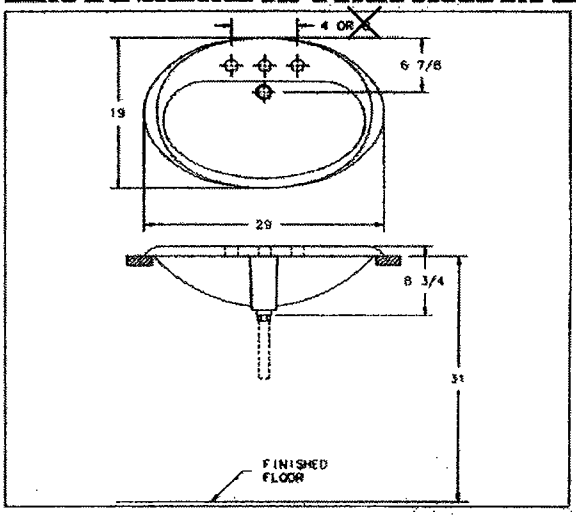
FEATURES

- ***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 8-5260 chrome plated cast brass adjustable "P" trap (1 1/4") with cleanout and waste to wall.*

NOTES

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

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.

CR/PLSS 01/96 Printed in U.S.A.

CRANE PLUMBING

Baker MICHAEL BAKER JR. INC. 801 Cromwell Park Drive Suite 110 Glen Burnie, MD 21061	PROJECT TITLE **RESTROOM DESIGN STANDARDS**		PROJECT NO. **TASK 1314.20**
	SHEET TITLE **LAVATORIES-3**		**B-48**
	SCALE **NONE**	DATE **MARCH 2005**	

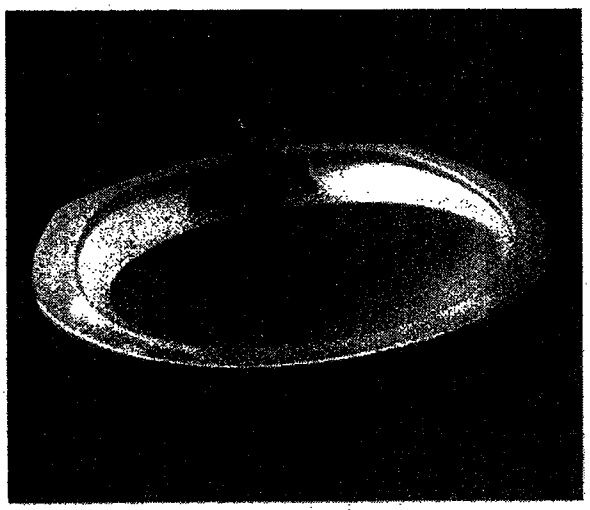
American Standard

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")

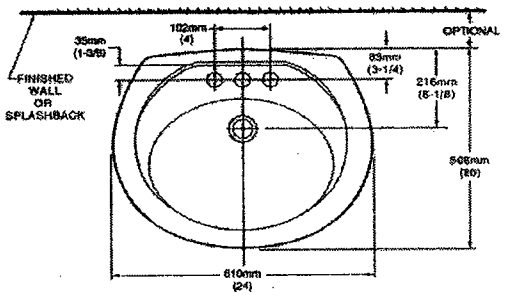
Bowl sizes:
457mm (18") wide,
324mm (12-3/4") front to back,
159mm (6-1/4") deep

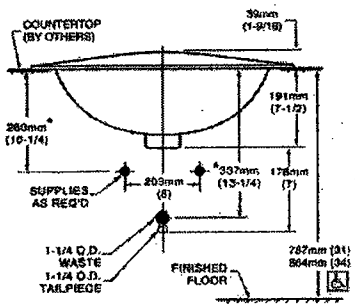
Fixture Dimensions conform to ANSI Standard A112.19.2

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

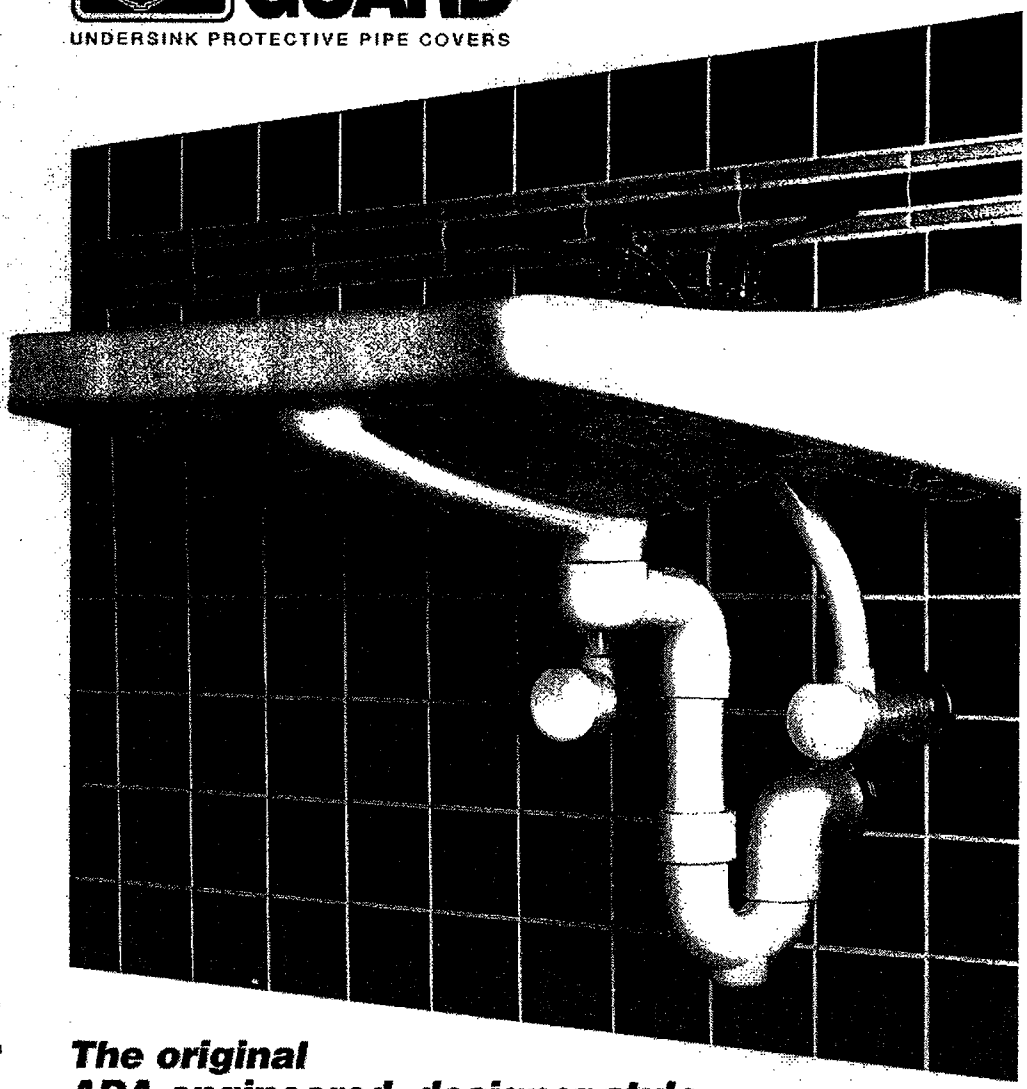
Revised 6/95

Baker — MICHAEL BAKER JR. INC., 801 Cromwell Park Drive, Suite 110, Glen Burnie, MD 21061	PROJECT TITLE: RESTROOM DESIGN STANDARDS	PROJECT NO.: TASK 1314.20
	SHEET TITLE: LAVATORIES-4	B-49
	SCALE: NONE — DATE: MARCH 2005	

10800/TR
Buy Line 9

LAV GUARD™

UNDERSINK PROTECTIVE PIPE COVERS



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.

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

LAV GUARD™

UNDERSINK PROTECTIVE PIPE COVERS

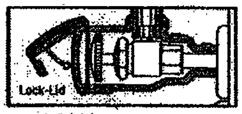
General Description

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 3/8" or 1/2" angle stop valve assembly.*

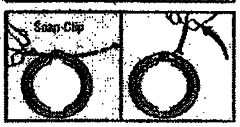
The LAV GUARD will not fit Schedule 40 plastic P-traps.

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.
- **Rotatable, 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.



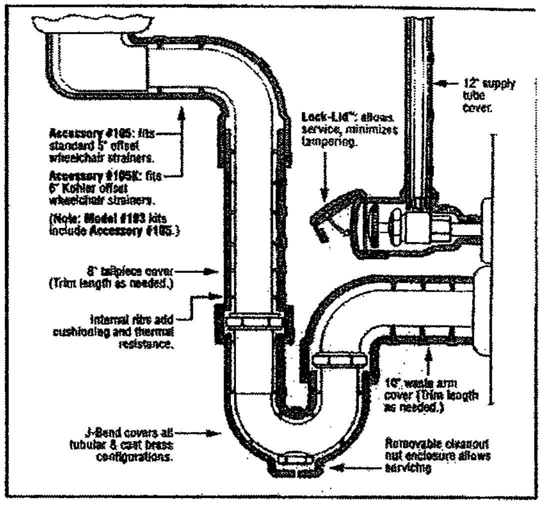
- **Internal rib design maximizes safety.** Compared to other pipe covers on the market, the LAV GUARD internal rib design increases thermal resistance and provides soft, resilient cushioning (see diagram).
- **Easy-to-clean, antimicrobial vinyl minimizes maintenance.** The LAV GUARD is molded from impact-resistant, 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
[illegible]	[illegible]
Durometer	60-70 Shore A
[illegible]	[illegible]
UV Protection	Will not fade or discolor
[illegible]	[illegible]
Fasteners	Reusable snap clips included
[illegible]	[illegible]
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
[illegible]	[illegible]
Flame Characteristics ASTM D 635	(ATB), 0 sec (AEB), 0 mm
[illegible]	[illegible]
Bacteria Resistance	Antimicrobial vinyl formula

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

Cross-Section View



Gray and White Models Available

# 99	one angle valve and one supply tube cover
#100	one P-trap cover
#101	one P-trap cover, one angle valve, and one supply tube cover
#102	One P-trap cover, two angle valve covers, and two supply tube covers
#103	one P-trap cover, two angle valve covers, two supply tube covers, one 5" offset tailpiece wheelchair strainer cover
#103K	same as #103 with one 6" Kohler offset tailpiece wheelchair strainer cover
	Accessories
#105	one 5" offset tailpiece wheelchair strainer assembly
#105K	one 6" Kohler offset tailpiece wheelchair strainer assembly
	Extensions
#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

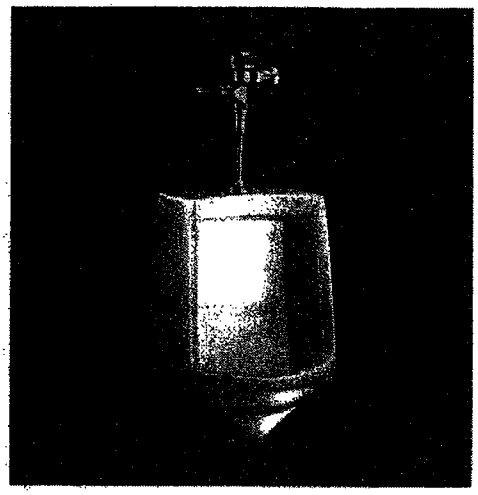
Distributed by:

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

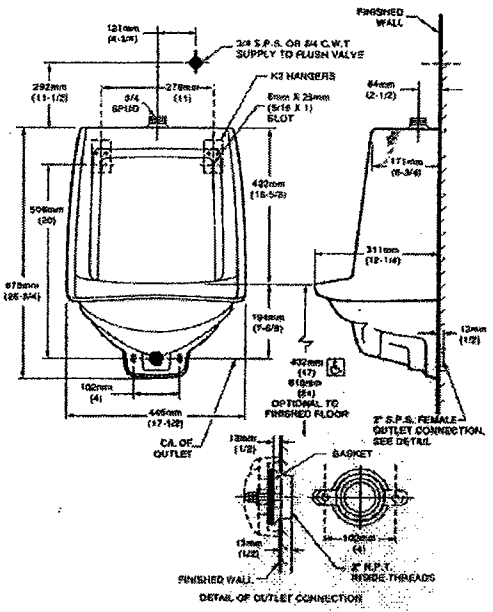
❑ **6561.017** Top spud

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

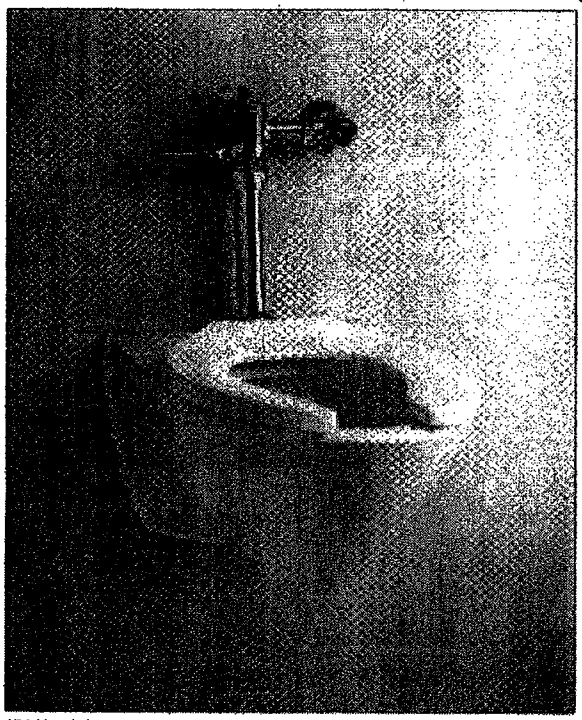
TBU-065

Revised 6/95

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

TOTO®
Perfection by Design

CT 708
Wall Hung Flushometer Toilet, 1.6 GPF



CT 708 - Wall Hung Flushometer Toilet
SC534 - Commercial Toilet Seat
TMT1HNC - 32 - Manual Toilet Flushometer Valve

- Powerful siphon 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		PROJECT NO. TASK 1314.20
	SHEET TITLE WATER CLOSET-1		B-53
	SCALE NONE	DATE MARCH 2005	

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

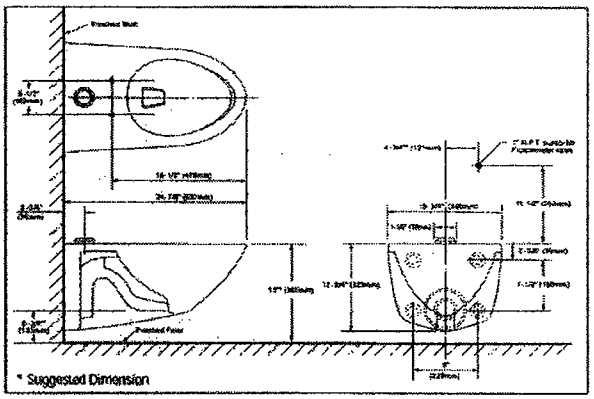
Recommended carrier: Any Jay R. Smith siphon jet support (Four-bolt).

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

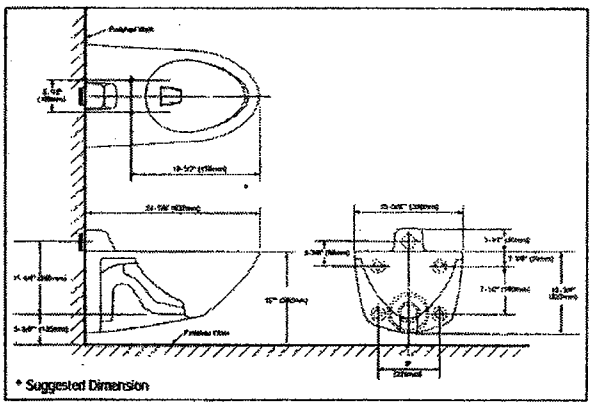
Listing / Approvals: IAPMO/UPC, CSA, City of Los Angeles, State of Massachusetts, and others.

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

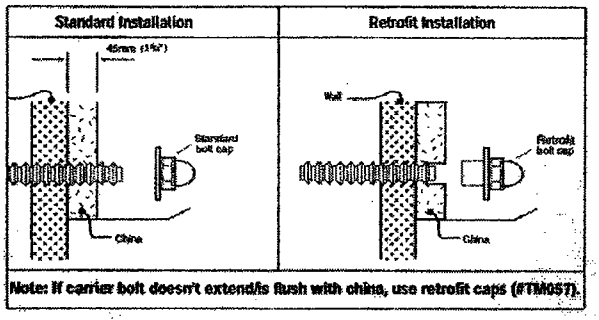
These dimensions and specifications are subject to change without notice.



CT 708 Top Spud



CT 708V Back Spud



Note: If carrier bolt doesn't extend/is flush with china, use retrofit caps (#TH057).

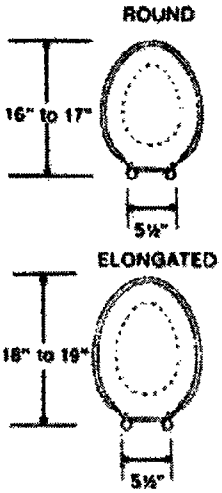
TOTO®
Perfection by Design
TOTO U.S.A., INC. • 1155 Southern Road, Morrow, GA 30260
Tel. (770) 282-8686 • Fax. (770) 282-8701 • www.totousa.com

Baker MICHAEL BAKER JR. INC. 801 Cromwell Park Drive Suite 110 Glen Burnie, MD 21061	PROJECT TITLE RESTROOM DESIGN STANDARDS		PROJECT NO. TASK 1314.20
	SHEET TITLE WATER CLOSET-2		B-54
	SCALE NONE	DATE MARCH 2005	

MOLTEX®

HEAVY DUTY
SOLID PLASTIC
HIGH IMPACT

CHURCH
THE BEST SEAT IN THE HOUSE

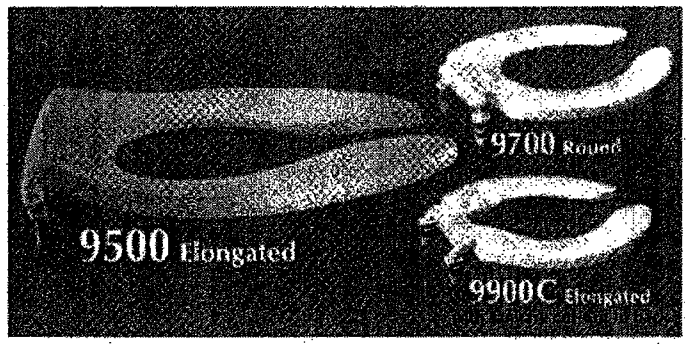


9500C

(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



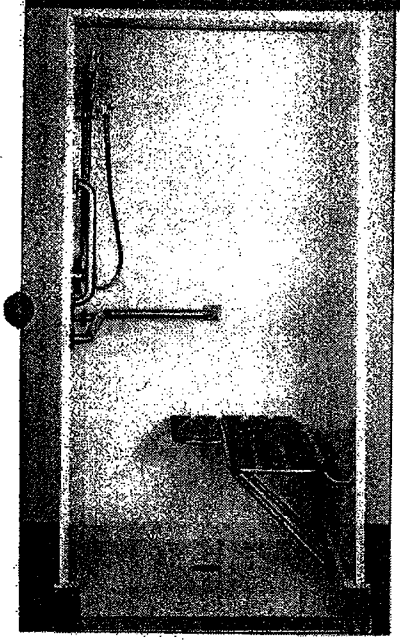
Baker MICHAEL BAKER JR. INC. 801 Cromwell Park Drive Suite 110 Glen Burnie, MD 21061	PROJECT TITLE: RESTROOM DESIGN STANDARDS SHEET TITLE: WATER CLOSET-3 SCALE: NONE DATE: MARCH 2005	PROJECT NO.: TASK 1314.20 B-55

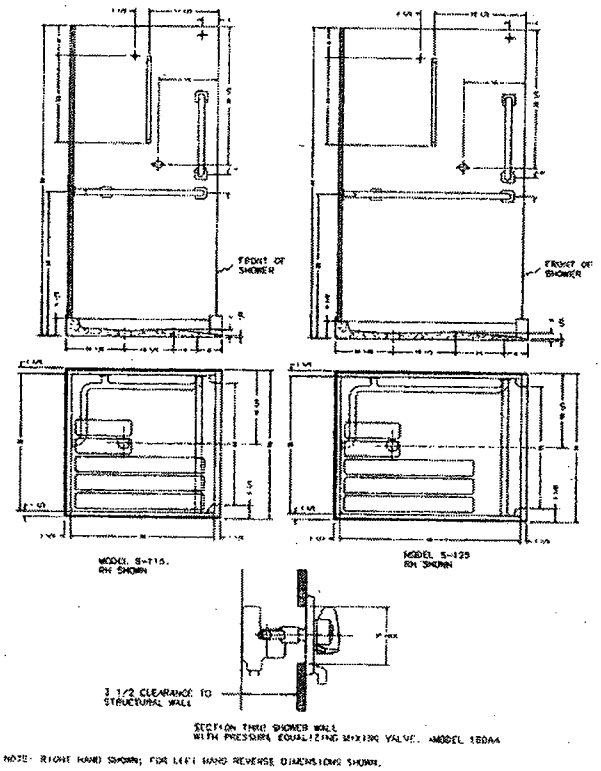
Designed for demanding institutional applications. Available in six models, all made with easy to clean Wonder-Wall sandwich panels. Models S-115 and S-125 made for the physically challenged.

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 compliable. S-115 and S-125 have the same high quality features as the standard Commander series.

Standard equipment includes a model 180AA pressure balanced mixing valve with stops, in-line vacuum breaker with wall and hand held shower head with 69" flexible stainless steel hose and a supply elbow with flange. A 24" slide guide with hanger hook, one wrap around 1½" grab bar (horizontal) and one straight 1½" 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





SECTION THRU SHOWER WALL WITH PRESSURE EQUALIZING MIXING VALVE. MODEL 180AA

NOTE: RIGHT HAND SHOWN; FOR LEFT HAND REVERSE DIMENSIONS SHOWN.

Baker MICHAEL BAKER JR. INC. 801 Cromwell Park Drive Suite 110 Glen Burnie, MD 21061	PROJECT TITLE RESTROOM DESIGN STANDARDS		PROJECT NO. TASK 1314.20
	SHEET TITLE SHOWERS-1		B-56
	SCALE NONE	DATE MARCH 2005	

14

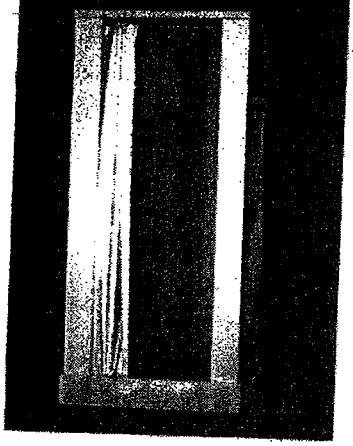
COMMANDER® SHOWER CABINETS

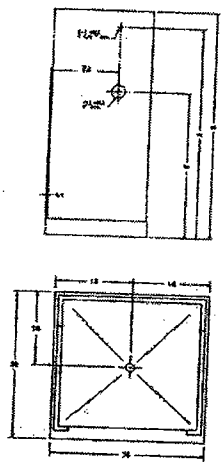
Commander shower cabinets are made for demanding institutional use. Special Wonder-Wall panels and top frame are made of galvanized-bonderized steel finished in (1) baked enamel inside and out, (2) stainless steel inside and out or, (3) stainless steel inside, baked enamel outside. Wonder-Wall panels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

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

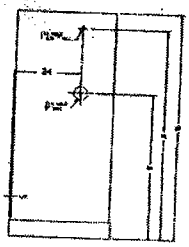
Standard equipment includes a model 190AA pressure-equalizing valve with stops, shower head, arm and flange. Also included are a stainless steel curtain rod, chromium-plated brass brackets, curtain and chromium-plated brass soap dish.

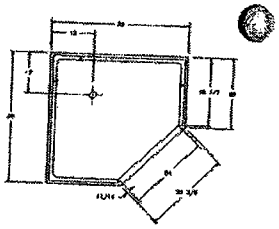
S-86 SINGLE ACCESS FRONT OPENING



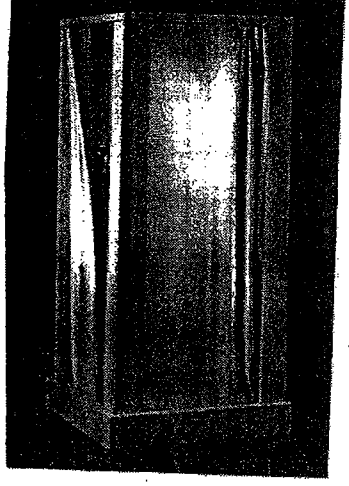


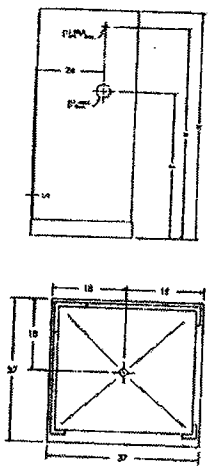
S-101 SINGLE ACCESS, FRONT OPENING NEO-CORNER



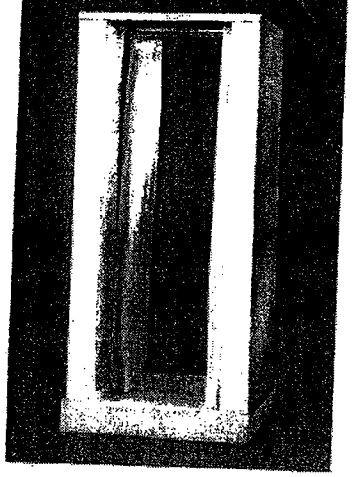


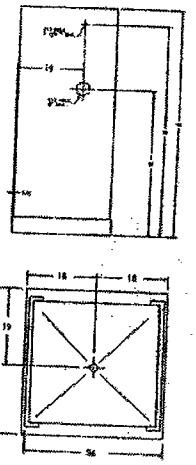
S-92 DOUBLE ACCESS CORNER OPENING





S-91 DOUBLE ACCESS WALK-THROUGH



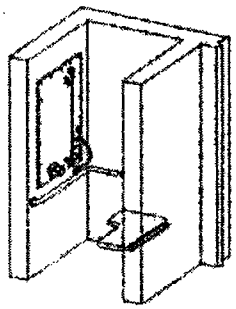


Baker MICHAEL BAKER JR. INC. 801 Cromwell Park Drive Suite 110 Glen Burnie, MD 21061	PROJECT TITLE RESTROOM DESIGN STANDARDS		PROJECT NO. TASK 1314.20
	SHEET TITLE SHOWERS-2		B-57
	SCALE NONE	DATE MARCH 2005	

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
Tech Data Sheet PDF (100k) Introduction to Bradley Showers (247k) Shower Accessories		HN200 Barrier-Free Shower - Title 24 Compliant (with hand-held hose spray) (236k) Shower Operation & Service Guide (767k)	Hot & Cold Equa-Flo Pressure Balancing Mixing Valve Tempered	Plumbing Fi Sweets

Tech Data and Install Sheets PDFs require the FREE Adobe Acrobat Reader, please download the most recent version from Adobe Systems.

CAD files require AutoDesk AutoCAD R1 compatible.

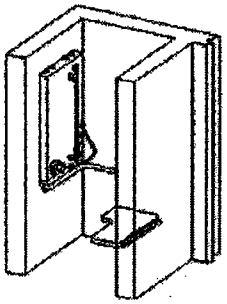
Baker
MICHAEL BAKER JR. INC.
801 Cromwell Park Drive
Suite 110
Glen Burnie, MD 21061

PROJECT TITLE: RESTROOM DESIGN STANDARDS		PROJECT NO. TASK 1314.20
SHEET TITLE: SHOWERS-3		B-58
SCALE: NONE	DATE: MARCH 2005	

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
Tech Data Sheet PDF (100k) Introduction to Bradley Showers (247k) Shower Accessories		HN250 Barrier-Free Shower - Title 24 Compliant (with hand-held hose spray) (245k) Shower Operation & Service Guide (767k)	Hot & Cold Equa-Flo Pressure Balancing Mixing Valve Tempered	Plumbing Fi Sweets

Tech Data and Install Sheets PDFs require the FREE Adobe Acrobat Reader, please download the most recent version from Adobe Systems.

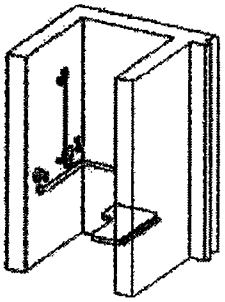
CAD files require AutoDesk AutoCAD R1 compatible.

Baker MICHAEL BAKER JR. INC. 801 Cromwell Park Drive Suite 110 Glen Burnie, MD 21061	PROJECT TITLE: RESTROOM DESIGN STANDARDS SHEET TITLE: SHOWERS-4 SCALE: NONE / DATE: MARCH 2005		PROJECT NO.: TASK 1314.20 B-59

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

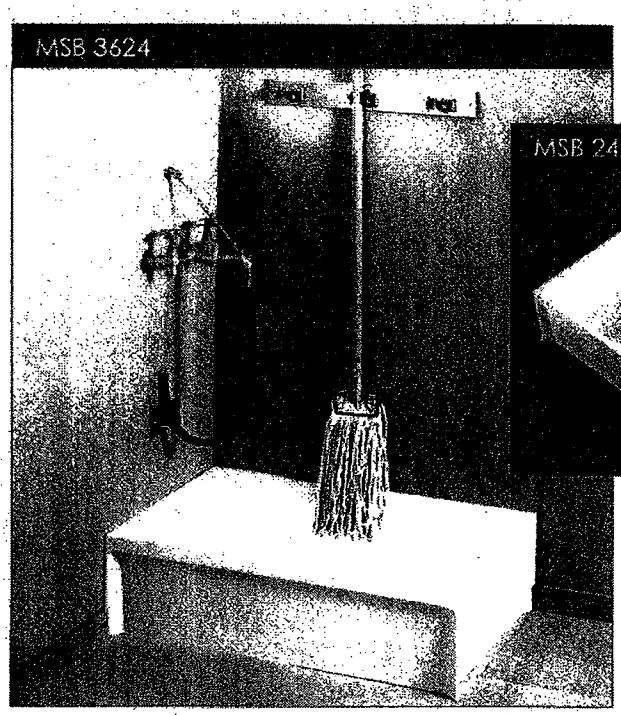
Tech Data	CAD Files	Installation Instructions	Valve Selections	Send m lite
Tech Data Sheet PDF (100k) Introduction to Bradley Showers (247k) Shower Accessories		Shower Operation & Service Guide (767k)	Hot & Cold Equa-Flo Pressure Balancing Mixing Valve Tempered	Plumbing F Sweets

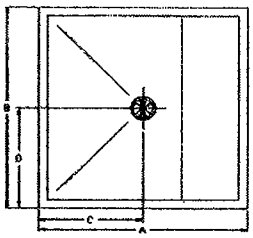
Get Acrobat Reader — Tech Data and Install Sheets PDFs require the FREE Adobe Acrobat Reader, please download the most recent version from Adobe Systems.

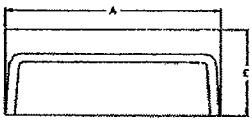
AutoCAD COMPATIBLE — CAD files require AutoDesk AutoCAD R1 compatible.

6

MOP SERVICE BASINS







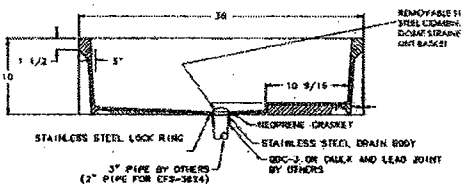
ROUGHING IN DETAILS					
MODEL NO.	A	B	C	D	E
MSB-2424	24"	24"	12"	12"	10"
MSB-3624	36"	24"	18"	12"	10"

SPECIFICATIONS

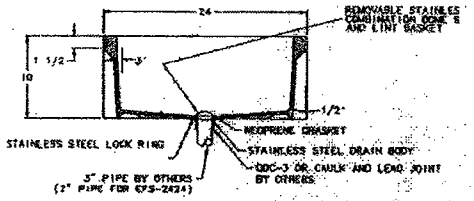
MODELS: MSB-3624; MSB-2424

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 9/16" 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)

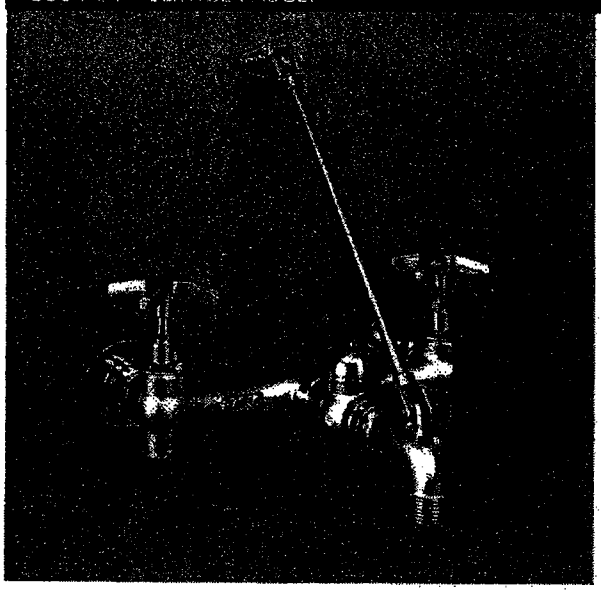
Baker

MICHAEL BAKER JR. INC.
801 Cromwell Park Drive
Suite 110
Glen Burnie, MD 21061

PROJECT TITLE: RESTROOM DESIGN STANDARDS		PROJECT NO.: TASK 1314.20
SHEET TITLE: JANITORS CLOSET 1		B-61
SCALE: NONE	DATE: MARCH 2005	

FIAT mop service receptors of Molded-Stone® set the industry standard for quality and reliability. In addition, our complete line of MSB accessories provide the plumbing professional, engineer, and specifier with a complete package: designed, engineered and backed by FIAT's commitment to the best in mop service basins.

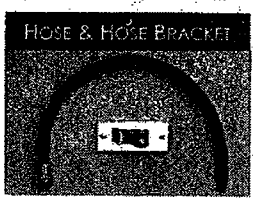
830-AA SERVICE FAUCET



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

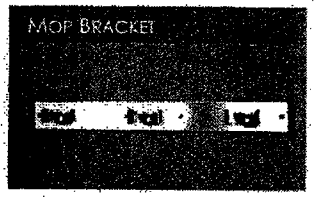
HOSE & HOSE BRACKET



Model 832-AA 30" long flexible h duty 5/8" rubber hose, cloth reinf with 3/4" chrome coupling at one Bracket is 5" long x 3" wide, stainles with rubber grip.

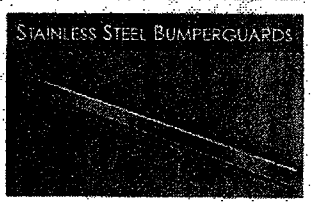
ACCESSORIES

MOP BRACKET



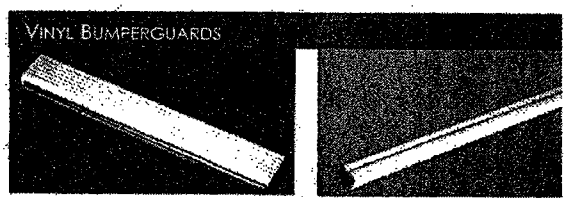
Model 889-CC 24" long x 3" wide, stainless steel with three (3) rubber loaf grips.

STAINLESS STEEL BUMPERGUARDS



Model E-88-AA
For Molded-Stone Mop Basins.

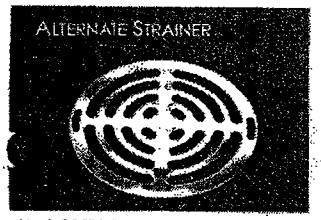
VINYL BUMPERGUARDS



Model 1239-BB
For Terrazzo Mop Basins.

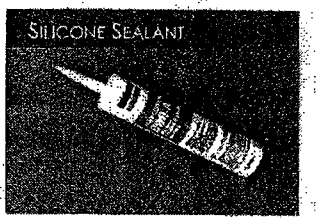
Model E-77-AA
For Molded-Stone Mop Basins.

ALTERNATE STRAINER



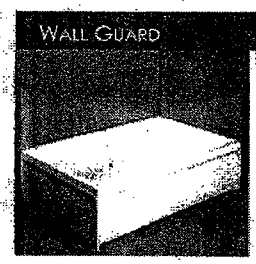
Model 1453-BB
Flat type stainless.

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 2424; MSG 3232; MSG 3624; MSG 3636

Baker MICHAEL BAKER JR. INC. 801 Cromwell Park Drive Suite 110 Glen Burnie, MD 21061	PROJECT TITLE RESTROOM DESIGN STANDARDS		PROJECT NO. TASK 1314.20
	SHEET TITLE JANITORS CLOSET-2		B-62
	SCALE NONE	DATE MARCH 2005	

Corbin Russwin

Trim Designs

Mortise Locksets ML2000 Series

Lustra

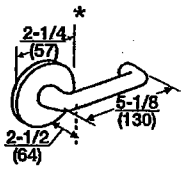
Complies with codes requiring lever to return to within 1/2" (13mm) of door face. Brass, bronze or stainless steel

LWA
Lever: Wrought
Rose: Wrought
Door thickness: 1 3/8" (35mm), 1 3/4" (44mm), 2 1/4" (57mm)

LWB
Lever: Wrought
Rose: Cast
Door thickness: 1 3/8" (35mm), 1 3/4" (44mm), 2 1/4" (57mm)

LSA
Lever: Cast
Rose: Wrought
Door thickness: 1 3/8" (35mm), 1 3/4" (44mm), 2 1/4" (57mm)

LSB
Lever: Cast
Rose: Cast
Door thickness: 1 3/8" (35mm), 1 3/4" (44mm), 2 1/4" (57mm)



*Dimensions:
inches
millimeters

ML2000.8

Baker MICHAEL BAKER JR. INC. 801 Cromwell Park Drive Suite 110 Glen Burnie, MD 21061	PROJECT TITLE RESTROOM DESIGN STANDARDS		PROJECT NO. TASK 1314.20
	SHEET TITLE MORTISE LOCKSET DOOR LEVER		B-63
	SCALE NONE	DATE MARCH 2005	

APPENDIX H

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

MARTIN STATE AIRPORT

BWI BALTIMORE/WASHINGTON INTERNATIONAL Thurgood Marshall AIRPORT

Parris N. Glendening
Governor
John D. Porcari
Secretary

Maryland Aviation Administration

"To provide services to our customers and the air transportation industry To foster and develop aviation in Maryland • To develop and empower our employees."

Theodore E. Mathison Executive Director

Project No. 22933 GEN - Corresp
DRose/JHayward/cf
ELepore/pf
RWeaver/ Anna file (DST file
DPowder/TPerry
PSchmidt - pls.dist.

MEMORANDUM

TO: Distribution

FROM: Benjamin Chin, Manager
Design Services

compare w/ 9-1-02

DATE: February 10, 1999

SUBJECT: Design Standard (DST) 99-04
Airport Wide Standard for Interface of
Fire Alarm, Life Safety, and Security Systems at
Baltimore/Washington International (BWI) Airport
Amendment Number 1

Effective immediately, please incorporate the requirements of Amendment Number 1 into the design and specification of projects at BWI Airport.

The requirements of Amendment Number 1 to the Airport Wide Standard for Interface of Fire Alarm, Life Safety, and Security Systems are as follows:

Conductors and Circuit Type (Page 7):

1. Delete "Initiating circuits shall be Class A only" and "Indicating circuits shall be Class A or B".

2. Add the following:

- Initiating Device Circuits shall be Class-A, Style D - Example: Wiring from the monitoring device to the device being monitored (WFS, VTS). This type of setup has a monitor module.

- Signaling Line Circuits shall be Class-A, Style 5α - Example: AE loop wiring to each device (smoke detector, duct detector, pull station, heat detector, intelligent devices). Monitor modules, if used, would be on this circuit.

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

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

CHANGE APPROVAL

_____ _____ ____ Yes ____ No
Mr. Steven Sheehan Date
Associate Administrator, Office of Airport Operations

_____ _____ ____ Yes ____ No
Mr. Michael West Date
Associate Administrator, Office of Planning and Engineering

_____ _____ ____ Yes ____ No
Captain Woody Cullum Date
Fire Marshall

_____ _____ ____ Yes ____ No
Ms. Sandra Hansen Date
Manager, BWI Federal Security Office

_____ _____ ____ Yes ____ No
Mr. Alex Noorani Date
Director, Division of Engineering

- Access Controlled Egress Doors, Page 28, 3rd Paragraph
  Delete "The mag-lock will not release until a preset delay has expired. Depressing the crash bar starts the delay countdown."

- Access Controlled Egress Doors, Page 28, 4th Paragraph
  Delete "In the event of an emergency, personnel will depress the crash bar, the local alarm will immediately sound and the delay countdown will begin. When the delay has expired, the audio/visual device will sound, the mag-lock will be defeated and the CASS will alert the police and the CDC of the alarm condition. The security system audio/visual device shall be coded differently from the fire alarm system audio/visual device."

  Add "In the event of an emergency, personnel or public occupants will depress the crash bar, the security system audio/visual door alarm will immediately sound, the mag-lock will be defeated and the CASS will alert the Airport Police and the CDC of the alarm condition. The security system audio/visual device shall be coded differently from the fire alarm system audio/visual device."

- Access Controlled Egress Doors, Page 28, 5th Paragraph
  Delete " The delay on release should be set to 15 seconds except for egress doors at the top of a stairwell which should be set to a maximum of 6 seconds. Designers should confirm this for every project."

- Access Controlled Egress Doors, Page 28, 6th Paragraph
  Delete "Signage should be placed on each egress door, stating "EMERGENCY EXIT ONLY, PUSH UNTIL ALARM SOUNDS, DOOR CAN BE OPENED IN 15 SECONDS"."

  Add "Signage shall be placed on each egress door to match existing, stating "WARNING, RESTRICTED AREA, PROPER DISPLAY OF BWI AUTHORIZED ID REQUIRED AT ALL TIMES".

- Access Controlled Egress Doors, Page 28, New Item
  Add "Signage shall be placed above each combination card reader/keypad to match existing, stating "ATTENTION, PLEASE ALLOW DOOR TO CLOSE BEFORE SWIPING YOUR BWI AIRPORT ID BADGE".

If the above requirements conflict with any other codes or regulations, it should be brought immediately to the attention of the Manager, Design Services Section.

If you should have any questions regarding this matter, please contact me at 410-859-7093.

BC/tmt

Distribution:

Mr. Lynn Bezilla (MAA)
Mr. Ian Bricknell (TAMS)
Mr. Emory Carrigan (MAA)
Chief Woody Cullum (MAA)
Mr. Gary Davies (MAA)
Mr. Charles Flood (MAA)
Mr. Peter Florian (PB)
Ms. Sandy Hansen (FAA)
Mr. Ray Heverling (MAA)
Mr. Bill Lins (MAA)
Mr. Ali Logmanni (MAA)
Mr. Steve Lucchesi (URSGWC)
Ms. Suzette Moore (MAA)
Mr. Chirantan Mukhopadhyay (Parsons)
Mr. Alex Noorani (MAA)
Mr. Stephen Sheehan (MAA)
Mr. Charles Steen (MAA)
Mr. William Tsai (MAA)
Mr. Ron Walden/Building Permit Committee (MAA)
Mr. Reginald Weaver (Baker)

cc: Mr. Mike West

DST 99-19 Airport Wide Standard for Interface of Fire Alarm, Life Safety, and Security Systems

NOV 17 1999

Parris N. Glendening
Governor

John D. Porcari
Secretary

Maryland Aviation Administration

*"To provide services to our customers and the air transportation industry
To foster and develop aviation in Maryland • To develop and empower our employees."*

David L. Blackshear Executive Director

Project No. 24130 GEN - Corres
DRose/JHayward/cf,
E Lepore/pf
R Weaver/af (COST binder)
PSchmidt
S Davies / C Kemp
Anne / Tracy / Derek

MEMORANDUM

TO: Distribution

FROM: Benjamin Chin, Manager
Design Services

DATE: November 12, 1999

SUBJECT: Design Standard (DST) 99-19
Airport Wide Standard for Interface of
Fire Alarm, Life Safety, and Security Systems at
Baltimore/Washington International (BWI) Airport
Amendment Number 2

• Please distribute to subs as reqd.

D Sidhu - Sidhu Assoc
R Jones - Dominion Cons. Engrs

(1999-02)

Effective immediately, please incorporate the requirements of Amendment Number 2 into the design and specification of projects at BWI Airport.

The requirements of Amendment Number 2 to the Airport Wide Standard for Interface of Fire Alarm, Life Safety, and Security Systems are as follows:

CASS Interface at Emergency Egress Doors

- CASS Interface at Emergency Egress Doors, Page 4, 1st Paragraph
  Replace "State Police" with "Airport Police".

Access Controlled Egress Doors

Eliminate references to delayed egress. All electronic crash bars shall remain direct wired to the mag-lock.

- Access Controlled Egress Doors, Page 28, 2nd Paragraph
  Delete "Any time the crash bar is depressed, a local alarm (piezzo buzzer) will sound. This is intended to discourage accidental/nuisance use of the system. This local alarm will sound until the system is reset."

- Notification Appliance Circuits shall be Class-A, Style-Z – Examples: speakers, horns, bell, lights, tactile, and visible text displays.

If the above requirements conflict with any other codes or regulations, it should be brought immediately to the attention of the Manager, Design Services Section.

If you should have any questions regarding this matter, please contact me at 410-859-7093.

Distribution:

Mr. Lynn Bezilla (MAA)
Mr. Ian Bricknell (TAMS)
Mr. Emory Carrigan (MAA)
Chief Woody Cullum (MAA)
Mr. Gary Davies (MAA)
Mr. Charles Flood (MAA)
Ms. Sandy Hansen (FAA)
Mr. Ray Heverling (MAA)
Mr. Bill Lins (MAA)
Mr. Ali Logmanni (MAA)
Mr. Steve Lucchesi (URSGWC)
Ms. Suzette Moore (MAA)
Mr. Chirantan Mukhopadhyay (Parsons)
Mr. Alex Noorani (MAA)
Mr. Stephen Sheehan (MAA)
Mr. Charles Steen (MAA)
Mr. William Tsai (MAA)
Mr. Ron Walden/Building Permit Committee (MAA)
Mr. Reginald Weaver (Baker)

BC/jao

cc: Mr. Mike West

AIRPORT WIDE STANDARD

FOR INTERFACE OF

FIRE ALARM, LIFE SAFETY AND SECURITY SYSTEMS

FIRST EDITION
November 10, 1998

BWI
BALTIMORE / WASHINGTON
INTERNATIONAL AIRPORT

Prepared By

URS GREINER, INC.
4 North Park Drive, Suite 300
Hunt Valley, Maryland 21030

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

INTRODUCTION

The purpose of this airport wide standard for the interface of fire alarm, life safety and security systems is to provide general and specific guidance to planners, designers, construction managers, contractors, tenants, and maintenance service providers for the renovation and new construction of areas at Baltimore/Washington International (BWI) Airport. The intent of this standard is to supplement established and accepted codes, standards, and regulations. Any conflicts between this standard and other regulations, codes, or standards should be brought to the immediate attention of the Maryland Aviation Administration (MAA) Fire Marshall and the MAA Director of Engineering.

The requirements of this standard should not be modified or revised without the written approval of the MAA Fire Marshall and the MAA Director of Engineering.

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 which is in place and which has 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 MD Department of Transportation shall follow the criteria, as stated in the most recently adopted legislation in Annapolis, and contained in the Code of Maryland Regulation's Subtitles 11, 5, 26 and the Maryland Fire Laws or as currently modified. 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.

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.

NOTE: All designs which are not in conformance with the Federal DOT standards, or current BOCA building code and State fire laws shall be re-submitted (to the local State Fire Marshall's office) for an appeal, or be redesigned to meet code prior to being released for construction.

Review of Standards: This standard will be reviewed annually by a committee made up of representatives from MAA Office of Planning and Engineering, Office of Airport Operations, Fire Prevention Division, Security, Maintenance, Procurement and others as designated.

APPROVAL SHEET

The Airport Wide Standard for Interface of Fire Alarm, Life Safety and Security Systems, First Edition, November 10, 1998 is approved as indicated by the following signatures.

Mr. ~~Steven~~ Stephen Sheehan
Associate Administrator, Office of Airport Operations

Mr. Michael West
Associate Administrator, Office of Planning and Engineering

Captain Woody Cullum
Fire Marshall

Ms. Sandra Hansen
Manager, BWI Federal Security Office

Mr. Alex Noorani
Director, Division of Engineering

AMENDMENT RECORD

Amendments to this standard are issued by MAA Office of Planning and Engineering upon approval.

Amendment Number	Date of Issue	Title/Remarks

EXISTING SYSTEMS

Existing Fire Detection and Alarm System

The primary fire alarm system serving the Baltimore/Washington International (BWI) Airport is the Honeywell DeltaNet Graphic Central System installed in 1990.

The Honeywell DeltaNet Graphic Central System receives signals from the following subsystems located throughout the airport:

- Honeywell DeltaNet FS-90 Plus Fire Alarm Control Panels (FACP)
- Honeywell W940 FACP's

The signals report to a Honeywell Graphic Central Monitoring Computer located in the BWI Central Dispatch Center (CDC) and the "watchroom" at the Aircraft Rescue and Firefighting Station (ARFF).

A second fire alarm system serving BWI is the Honeywell Delta 2000 system installed in 1976, which is presently located in the Airport physical plant. Because of its age and system limitations, the points reporting to the Delta 2000 are continually being converted to the DeltaNet FS-90 panels under ongoing terminal improvements projects. The signals for the Delta 2000 system report to the CDC and ARFF via a separate monitoring printer.

- Delta 2,000 points should be converted to Honeywell Graphic Central to the maximum extent possible as projects are being designed.

- During the project scoping, the Consultants should meet with the Fire Marshal, MAA Project Engineer, MAA HVAC Systems Chief to review the remaining Delta 2,000 points within or adjacent to the project site to scope/determine the points to be converted.

Existing Controlled Access Security System (CASS)

A microprocessor based security system is in operation and is currently maintained by Lockheed Martin. The objective of this system is to prevent unauthorized personnel entry into designated secured areas.

- Access to a secured area through a CASS equipped door is done by swiping a properly coded card/badge through a card reader or by entering an approved numeric code at the card reader's keypad. With system approval, the door's locking mechanism is released allowing passage.

- A CASS equipped door is monitored for door position at all times. If the door is opened with approval (card reader/key pad) but is held open for more than the allowed preset time, an alarm is issued and the policing authority and CDC personnel are alerted. If the door is opened without approval (forced open) an alarm is issued and the policing authority and CDC personnel are alerted.

- Equipment configurations on secured doors vary somewhat throughout the airport, with the standard configuration for a single door used for emergency egress as follows:

  — A combination card reader/key pad, crash bar, magnetic lock, door status contacts and a white audio/visual alarm device on the non-secured side of the door.

  — A green "Push to Enter" pushbutton on the secured side of the door.

- At present, the domestic terminal (except Pier D) has no crash bars. The doors are equipped with door knobs or push plates. On these doors the magnetic lock is released by pulling down on a hinged lexan cover mounted adjacent to the door. The lexan cover is clearly labeled, stating "Pull Down for Emergency Egress".

- Secured doors are divided into groups of 6 to 8 and each group is connected to an Access Control Unit (ACU) which is typically located in the nearest telephone closet. In the domestic terminal the ACUs are connected via fiber optic link to the master server located in the Information Systems Room (ISR) in Pier C adjacent to the CDC. A remote work station in the CDC and in the Security Office are interfaced with the master server in the ISR for the domestic terminal. In the New International Pier (NIP), the ACUs are connected to a sub-host server located in the NIP. This sub-host server is in turn connected to the master server in the ISR via fiber optic link. There is also a remote work station in the CDC for the NIP portion of CASS.

CASS Interface at Emergency Egress Doors

Emergency egress doors equipped with CASS in the NIP and some recently renovated areas of the domestic terminal are configured as follows:

- Doors are equipped with the standard equipment configuration as mentioned earlier in this section. During an emergency egress situation, the crashbar is engaged and the local alarm is activated and the magnetic lock is released allowing the door to open. CASS reports to CDC and State Police as mentioned earlier.

In the NIP where large groups of doors are clustered together for use as emergency egress, only one door is configured with a card reader/keypad, mag-lock, etc., and all other doors are equipped only with door position contacts and a sign stating "For Emergency Exit Only". This allows large volumes of people to exit quickly. When one of these doors is opened, the local alarm will sound and the State Police and CDC personnel will be alerted.

CASS Interface with Fire Alarm System

The CASS system is totally segregated from the fire alarm system. No interface exists. If a fire alarm condition exists in an area, personnel will use the emergency egress doors as described above with release of the door's magnetic lock by the CASS system alone. If power to the CASS system is lost, battery back-up will allow for continued operation. If the outage is long enough to discharge the back-up batteries, the CASS system will fail with all doors being released.

Existing Public Address System

There are currently two types of public address system equipment at the airport. One is the AMSYS MARK IV which serves the domestic terminal. The other is the IED system which serves the New International Pier (NIP).

Both systems are microprocessor based public address systems with remote speakers located in holdrooms, public corridors, lobbies and restrooms. The speakers are connected to head end equipment via plenum rated cable in cable tray or in conduit (except in some older, unrenovated areas of the terminal where cable is strapped to structural steel above the ceiling). The head end equipment for the AMSYS system is located in a dedicated room in the lower level of Pier B at the main terminal. It contains the systems microprocessor(s), amplifiers, ambient noise adjustment equipment and microphone interface equipment. The head end equipment for the IED system is located in Room No. 1215 in the NIP. This room contains the systems microprocessor(s), amplifiers and microphone interface equipment (the IED system has no ambient noise adjustment capability). The IED and AMSYS PA Systems are controlled by personnel at the CDC via fiber optic links. The IED system fiber link is routed from its head end room to the AMSYS head end room and then to the CDC.

Normal Operations

The PA System at the airport provides a means to allow for general announcements to the entire airport (all-call) or to selected zones from the CDC. Paging/microphone stations exist throughout the concourses (piers) at ticket lift counters for use by airline personnel when making announcements within a specific holdroom. Announcements to selected zones are performed by entering a zone specific numeric code at a paging console keypad.

Emergency Operations

During emergency situations in the domestic terminal, (AMSYS portion) BWI FPD personnel can communicate with CDC personnel via radio or house phone and direct the operator to issue emergency/evacuation announcements to the entire airport (all-call) or to selected zones within the terminal. In the NIP, emergency/evacuation announcements can be issued via the IED System the same way as described for the AMSYS System, except that BWI FPD personnel also have a dedicated paging console/microphone located adjacent to the NIP's fire alarm control panel by which they can make announcements directly. BWI FPD personnel would enter a numeric code at the paging console keypad and make the announcement to the corresponding PA zone. A system hierarchy exists whereby all emergency announcements take precedence over all other PA System activity, allowing BWI FPD personnel to have control at any time.

Voice Evacuation System Requirements

No stand alone voice evacuation system exists at the airport. The public address system, although not Underwriter Laboratories (U.L.) listed as a fire alarm voice evacuation system is monitored 24 hours a day by airport communications (paging) personnel and CDC personnel. This system has been accepted by the State Fire Marshall for use as a voice evacuation system following the NFPA 101 Life Safety Code Section 8-3.4.1 Exception No. 2 (1994 Edition.)

DESIGN CRITERIA

Fire Detection and Alarm System

Fire Alarm Codes and Standards

Applicable Fire Alarm systems codes and standards include:

- National Fire Protection Association (NFPA) Article 72, National Fire Alarm Code, current edition.
- National Electric Code (NEC), current edition.
- Building Officials and Code Administrators Building Code (BOCA), Section 918, Fire Alarm Systems, current edition.
- Americans with Disabilities Act (ADA), 1990, Public Law 101-336.
- Underwriter's Laboratories (UL).
- Elevators, Dumbwaiters, Escalators and Moving Walks, Article 89, Section 49B and 64, Annotated Codes of Maryland, 1995.
- ANSI/ASME A121, Safety Code for Elevators and Escalators.
- ANSI/ASME A17.1 Safety Code for Elevators and Escalators.
- MAA Design Standard 98-8 (See Appendix D).

Many significant codes and standards have been instituted since the installation of the existing fire alarm systems and devices. When renovations affecting the fire alarm system are

identified, the scope of work should include bringing the area of renovation into compliance with the codes and standards referenced above.

Design Requirements of Local Authority Having Jurisdiction

The Consultants must coordinate with the BWI Fire Prevention Division during the design of fire detection and alarm systems. Submit relevant drawings and specifications to MAA OPE for transmittal to BWI FPD for review at each required submission. At a minimum MAA recommends meeting with the BWI FPD prior to 50% completion of design. General requirements of the BWI FPD include, but are not limited to, the following:

- Conductors and Circuit Type:
  - Initiating circuits shall be Class A only.
  - Indicating circuits shall be Class A or B.
  - Only cooper conductors shall be used. Conductor wire shall be solid. Stranded conductors will not be allowed.
- Conductor Size:
  - Initiating circuits shall be No. 14 AWG twisted pair. No. 16 AWG may be used for initiating circuits depending on electrical system design and manufacturer's requirements. No. 18 AWG shall not be permitted.
  - Indicating circuits shall be No. 12 AWG.
- Conductor Requirements:
  - Insulation - THHN or THHW (NEC Article 310, Table 310-16).
  - Voltage Rating - 600 volt.

- Temperature Rating - 90°C/194°F.
- No. 14 AWG shall have 6 turns per foot.
- No. 16 AWG shall have 10 turns per foot.

- Color Codes:

  - New work - shall comply with equipment manufacturer's requirements.

  - Existing - shall match existing color coding of wire.

- Conduit:

  - All wiring shall be in conduit complying with applicable NEC articles.

  - Identification of conduit and junction boxes will be done with red paint and wording that clearly identifies the installation as being a fire alarm system.

- Panel Connections:

  - Shall be on the left hand or right hand sides. No connections shall be done from the bottom.

  - Top mount connections shall be permitted only if waterproof connectors are used.

- Power Supply:

  - All systems shall be provided with a primary and a secondary power supply.

- Secondary power shall automatically supply the energy to the system within 30 seconds.

- Secondary power shall be from a storage battery capable of operating the complete alarm system in normal or supervisory (nonalarm) mode for a period of 24 hours and at the end of this period, have sufficient capacity to operate the system, including alarm-indicating devices in either alarm or supervisory mode for a period of 15 minutes. This requirement applies to new panel installations and any existing panels affected by renovation work.

- The batteries in all FACPs will be supervised.

- An engine-driven generator with automatic transfer switch arranged in accordance with NFPA-72 can be used for secondary power in lieu of storage batteries.

- Fire Alarm Panel Location:

  - Shall be determined by the Airport Fire Marshall only.

  - Shop drawings shall include a floor plan showing the location of the fire alarm panel.

- Fire alarm system zones shall follow fire protection sprinkler zones. Ideally two equally sized (20,000 square feet maximum) fire alarm zones shall be provided within one 40,000 square foot (maximum) sprinkler zone.

- All public toilet rooms shall be provided with ADA compliant strobes. No duct smoke detectors shall be provided for the toilet room exhaust fans.

- All duct type smoke detectors shall be provided with remote test switches and indicator lights with identification signage. The test switches shall be readily accessible and have readily visible (below ceiling) indicators. Smoke detectors shall be provided with two sets of contacts. One set for alarm and one set to shut down related HVAC equipment. All duct detectors shall be accessible for inspection, maintenance, repair and replacement.

- All existing sprinkler water flow switches and tamper switches, which are not connected to any fire alarm system shall be connected to the Honeywell DeltaNet fire detection and alarm system.

- The Honeywell DeltaNet Graphical Central Computer shall be programmed with a specific designation of the alarm location (for example, boarding bridge gate number).

- The BWI FPD and the MAA insurance underwriter (Royal Insurance) have stated that manual fire pull stations shall be provided per code or as required by AHJ.

- Individual fire detection devices shall be provided for each electrical room, elevator machine room, and elevator shaft, and similar spaces per code or as required by AHJ.

- Provide power signal booster panels for long/heavily loaded indicating device circuits as required. All booster panels shall be monitored for "Trouble" conditions.

- Install a dedicated MAA "IN-HOUSE" telephone adjacent to each FS-90 FACP. This requirement applies to new panel installations and any existing panels affected by renovation work. Design shall include an empty conduit between the proposed telephone location and the nearest telephone closet. Coordinate with Mr. Bill Lins, MAA, 410-859-7629, for MAA to install the telephone.

- Special Hazard Systems:

  — Certain areas including Computer Rooms, High Voltage Electrical Rooms or other areas as determined by the AHJ will be provided with Special Hazard Extinguishing Systems. These extinguishing systems consist of:

    - CO_2 Extinguishing Systems
    - Pre-Action Sprinkler Systems or others.
    - Other systems as approved by AHJ.

  — In all cases the Special Hazard Extinguishing Systems will be provided with a separate panel used for release of the extinguishing agent. The Airport Fire Marshall (AHJ) shall be the sole determiner of the type and quantity of initiating devices to be used to detect the emergency condition.

  — The Special Hazard Extinguishing System panels will be monitored by the Airport's Proprietary Receiving Station through a data gathering panel installed adjacent to the Special Agent panel. The AHJ will determine the type and quantity of alarms and/or trouble signals monitored by the Airport's Proprietary Receiving Station.

— The Special Hazard area must be monitored by addressable initiating devices. In this case the Special Hazard Panel will only be used for special functions and to release the extinguishing agent upon a signal from the local FS-90 fire alarm control panel. An interface shall be provided between the Releasing Agent Panel and the local FS-90 fire alarm control panel for selected control and monitoring functions.

- For MAA projects, the contract documents shall require all submittals for fire protection systems to be certified (stamped/sealed) by a fire registered protection engineer. The AHJ may require the fire detection system submittals to be certified (stamped/sealed) by a registered fire protection engineer because of the complexity of the system and interfaces with other building systems and/or the application of NFPA 72.

- For tenant projects being submitted under the building permit process, all construction documents shall be prepared by a design professional registered in the State of Maryland. The construction submittals pertaining to fire protection shall be reviewed, and certified (stamped/sealed) by a registered fire protection engineer working for the submitting party. The AHJ may require the fire detection system submittals to be certified (stamped/sealed) by a registered fire protection engineer because of the complexity of the system and interfaces with other building systems and/or the application of NFPA 72.

- MAA should be prepared to provide names of qualified FPE's to tenants. This is not a normal requirement for tenants.

- Provide door number nameplates for all doors within a project's area. If a fire alarm device is located in the room, the nameplate will have

a red background with white letters, otherwise it will have a black background with white letters. Room designations will be provided by MAA.

- The contract documents shall require that all sprinkler systems be installed by a licensed/certified installer in the state of Maryland.

- Provide signs for sprinkler control valves and inspectors test points. Provide signs on the exterior wall near wall hydrants and exterior sprinkler standpipes.

- Label to be provided by Honeywell, Inc. for all fire alarm addressable devices with its FACP address.

- Install a Knox Box as required by the AHJ. Location to be provided by the AHJ.

Fire Alarm Indicating Devices

- Notification Signals:

  — Terminal Building - all areas will be zoned as either a public area or a tenant area.

  — Public areas shall have visual devices (strobe lights) and audible devices (horns). Normal audible notification shall come from terminal-wide public address (PA) system. In the event of a failure of the PA System, horns will be activated manually from the CDC. All devices in this zone, horns and strobes, shall be activated separately via manual control from the CDC.

- Tenant areas shall have audio/visual (horn/strobe) notification. All devices in this zone shall be automatically activated by the associated FS-90 FACP.

- The limits of the tenant and public zones shall be determined by Airport Fire Marshall.

- All other buildings (non-terminal) shall have audio/visual notification in accordance with NFPA-72 and the applicable sections of NFPA-101, Life Safety Code.

- All areas within buildings equipped with audio notification devices (horns) shall follow ANSI S3.41, American National Standard Audible Emergency Evacuation Signal in accordance with NFPA-72.

- The fire alarm notification signal shall be distinctly different in sound from other signals, i.e., security alarms.

- Remote Annunciators shall not be provided unless otherwise required by the BWI Fire Marshall. An existing remote fire alarm command station annunciator is located in the 5th level Traffic Controller's Room (TRACON) and another in the Aircraft Traffic Control Tower (ATCT). Both annunciators are monitored by the Federal Aviation Administration (FAA).

- DeltaNet Central Color Graphic Computers shall be programmed and updated as required by expansions and modifications to the Fire Alarm System. Cost of programming and computer upgrades shall be included with project construction costs.

- Floor Plan Graphic Requirements:

— The Airport's Central Receiving Station uses color floor plans displayed on a Personal Computer to display alarmed device information to the Central Station Operator. These floor plans are a graphic representation of the building or area of the building with fire alarm initiating devices shown in their approximate location within the building or area.

— The Electrical Engineer for each construction or renovation project shall provide Electrical Floor Plans for installation into the Central Receiving Station System Personal Computer. These floor plans will be submitted both in paper form as well as in electronic form. The electronic form will consist of either 3.5" floppy disk or CD-ROM.

— The electronic form will be submitted to the Airport's Fire Marshall in the following format:

- AutoCAD (.dwg) Release 12, see the CAD Standards Manual in Appendix D.
- Floor Plan with walls, doors, windows shown (no line over line)
- NO BLOCKS
- All associated font and shape files that define drawing including X-References
- Fire Alarm devices only (no furniture or plumbing fixtures)

Fire Alarm Initiating Devices

- Addressable Interface Units (monitoring modules) shall be used to monitor indicating devices that are not otherwise equipped for multiplexed, addressable communication such as sprinkler valve tamper switches.

- Additional Signage not required by code but required by the AHJ, with a red background and white letters, shall be placed at all sprinkler valve tamper switches, water flow switches, duct smoke detectors and other locations where identification of devices is needed during an alarm situation. All signs shall be placed in readily visible locations so that the possibility of physical damage or tampering is minimized. Coordinate signage type, size and location with FPD and the MAA signage coordinator.

- Manual Pull Stations shall be installed per code unless specifically directed otherwise by the MAA FPD. Pull stations shall be addressable double action type without glass rod inserts. Provide waterproof lexan covers on pull stations located outdoors and in parking garages.

- Smoke Detectors shall be addressable photoelectric type. Provide ionization type for elevator lobbies.

- Duct Smoke Detectors shall be addressable photoelectric type.

- Heat Detectors shall be addressable combination rate of rise and fixed temperature type, within air-conditioned spaces. Unconditioned spaces or spaces with heating only shall utilize fixed temperature only type detectors.

- Pressure Switches for preaction systems, shall be supplied with addressable monitoring modules.

- Water Flow Switches for sprinkler systems, shall be supplied with an addressable monitoring module.

- Fire Extinguishing System Control Panels for fire suppression systems (such as carbon dioxide systems, halon systems, foam systems, etc.) shall be supplied with addressable monitoring modules.

Fire Alarm Supervisory/Control Devices

- Sprinkler Valve tamper switches shall be connected to a monitoring module to determine the valve's open or closed position. A closed position will initiate a trouble signal on the system.

- Panel Faults. FACP shall detect any faults in the wiring or devices and transmit a trouble signal to the DeltaNet Central Graphic Computer.

- Battery Status. Each FACP shall be capable of displaying the status of the battery backup power supply.

- Fire Extinguishing Systems. Monitoring modules shall be provided to monitor trouble and alarm status of fire suppression systems. Suppression systems will require the use of a UL listed agent release panel to perform those functions. All agent release panels shall be provided with sufficient auxiliary relay contacts to allow a Honeywell FS-90 Plus Panel to monitor all suppression hazards on a zone by

zone basis. A new FS-90 Plus Panel shall be provided, (unless sufficient points in an existing panel are authorized by FPD to be used), in addition to the agent release panel to facilitate this arrangement.

- Special provisions for exhausting noxious or hazardous atmosphere shall be designed on a per project basis. The design shall utilize HVAC systems and controls; zoning strategies and supplemental exhaust. Additional requirements include:

  — Provide a placard mounted next to the FACP which identifies each air handling unit (AHU) and the area that each unit serves. The graphic should show the entire project area.

  — BWI FPD personnel will talk directly to Central Utility Plant personnel via the "House" phone at the FACP. Using the placard/graphic BWI FPD personnel can direct Central Utility Plant personnel to put selected AHUs in full exhaust mode or full pressurize mode to allow smoke to be drawn out of the applicable portion of the building.

  — No interface between the building automation system and the fire alarm system will be provided.

- Control Modules. Elevator Controllers shall be provided with control modules for elevator recall functions, and shunt trip disconnect for elevator main power supply.

Alarm Signal Transmission Equipment

- Airport Terminal Buildings - The only transmission media acceptable to the BWI Airport Fire Marshall, the Authority Having Jurisdiction

(AHJ) for the transmission of fire alarm signals from the Terminal Building to the Airport's Central Receiving Station are:

— Copper Wire
— Fiber Optic Cable

Modems will not be used for signal transmission within the Terminal Buildings without specific prior approval of the Airport Fire Marshall. If used, modems must be compatible with Honeywell equipment.

The transmission media will not be a mixture of copper and fiber. The transmission media will be either copper wire from end-to-end or will be fiber optic cable from end-to-end. There will not be a mixture of these two media without approval of the Fire Marshall.

- MAA Owned or Operated Remote Buildings - The BWI Fire Marshall will be the sole determiner of whether an MAA Owned or Operated Remote Building shall transmit signals via modems. If the AHJ approves the fire alarm system signal transmission via modem communication, the following shall apply:

  — Modems will be supplied by the fire alarm equipment manufacturer and will be UL Listed for "Fire Alarm Signal Transmission" and be housed within the fire alarm control panel.

  — The modems supplied with the fire alarm system will be supplied with a secondary source of power either from storage batteries or from an Uninterruptible Power Supply (UPS).

— The Bell Atlantic signal equipment used to allow the fire alarm to be transmitted on the Bell Atlantic Telephone backbone will be supplied with a secondary source of power either from storage batteries or from an Uninterruptible Power Supply (UPS).

— The Airport's Communications Agency will install the necessary jumpers to provide a communications path within the Airport.

Fire Alarm System Training

The Contractor shall provide a minimum of onsite training as specified below for all panels, Graphic Central and related equipment installed. The trainer shall be fully qualified and certified to provide such training. A panel shall be considered new, if it did not previously exist in the system and does not replace an existing panel of the current system architecture. A panel shall be considered updated/upgraded, if 10% or more of the panel's addressable points are modified by the Contractor. The Contractor shall schedule the training at least 15 working days prior to the completion of the project and notify MAA Division of Maintenance-HVAC Section. Contractor shall provide training manuals for all students attending the training (10 students).

EQUIPMENT	INITIAL/NEW	UPGRADE
Per new fire alarm panel	8 hours	2 hours
Per Central Upgrade (such as converting from Graphic Central Software to XBSi Software)	40 hours	8 hours
Per system upgrade	40 hours	8 hours
Per annunciator	4 hours	2 hours
Per FS90 plus command center	4 hours	2 hours

Specific training requirements to be determined with MAA Maintenance on a per project basis.

Supplemental Requirements

- The condition of existing wiring shall be evaluated and reused wherever possible for renovation designs.

- Existing smoke detectors shall be replaced by addressable photoelectric or ionization (for elevator recall) type smoke detectors.

- Existing FS-90 Plus FACPs, if reused, shall be modified and upgraded as required. Provide all necessary additional power supplies, intelligent loop interface boards, communication boards, etc. If existing FS-90 Plus FACP is served by only one fire alarm intelligent loop (i.e., loop 'A'), then provide wiring for second loop (i.e., loop 'B') to the FACP.

- It is the designers responsibility to confirm which Delta Net 2000 points will be converted to FS-90 FACPs. Coordinate with MAA.

- New battery calculations shall be performed for all existing FACPs, if modified or if devices are added. If existing batteries are found to be inadequate, new batteries are to be provided. Backup battery power supplies shall be added to existing FACPs, if no batteries are present.

- Monitoring modules shall be added to existing fire extinguishing systems, duct smoke detectors, sprinkler water flow switches and valve tamper switches to make all devices addressable to the FACP.

- Location indicating devices shall be added at each existing sprinkler water flow and valve tamper switches and where otherwise requested, in a visible location below the ceiling.

- Provide a smoke detector at the top of each elevator hoistway as required by code.

- Provide a smoke detector for elevator recall function in each elevator machine room.

- Provide shunt trip circuit breakers (with time delay) for each elevator controller. The delay time will be designated by the inspector in the field after timing the elevator recall operation. Provide a heat detector for each elevator room, pit and top of shaft having sprinklers added under the project scope, in accordance with ANSI/ASME A121 which requires power to elevators to be interrupted prior to sprinkler heads discharging. Heat detectors shall have rated temperature setting below associated sprinkler head settings.

- Provide elevator recall smoke detectors at each elevator landing (lobby). Connect smoke alarms to elevator controllers via a fire alarm control module and connect the devices to the DeltaNet system.

- Confirm that all existing elevator recall and shunt trip initiating devices are connected to the FACP. If any existing devices are not connected to the FACP, provide an addressable monitoring module for the device and connect it to the appropriate FACP.

- Elevator systems shall be supplied with elevator recall control modules for associated smoke detectors, shunt trip breakers, and heat detectors.

- Provide Audio Visual devices as described in the previous section for "Fire Alarm Indicating Devices."

- Provide a sprinkler valve tamper switch and addressable monitoring module for each sprinkler system zone valve.

- Alarms or trouble signals shall be transmitted to the Graphic Central Fire Alarm system for acknowledgment of alarm trouble status.

- Monitoring modules shall be supplied for all Halon or CO_2 systems, foam systems or other, so that their status can be supervised by the FACP on a hazard zone by hazard zone basis. See related discussion of special extinguishing systems in the Section titled "Special Hazard Systems" for additional requirements.

- Smoke detectors shall be placed in electric rooms, telephone rooms, computer rooms, elevator lobbies, elevator machine rooms, the top of elevator shafts, and where otherwise requested. Heat detectors shall be placed in mechanical rooms, spaces prone to smoke detector false alarms, and spaces protected by fire extinguishing systems.

- Duct detectors shall be placed in HVAC units, ducts where the air distribution system has a capacity in excess of 2,000 cfm for supply ducts and 15,000 cfm for both supply and return ducts, per BOCA Section 309.0. Detectors shall shutdown units directly via auxiliary contacts, overriding the facility Building Management System. The duct detector rating must match the cfm of the duct and be tested in accordance with the air differential test of NFPA 72.

System Programming

- All projects shall provide plain English, unique designations for rooms, spaces, areas and equipment to enable easy identification of device locations.

- All Honeywell Central Graphic system programming will be performed by Honeywell, Inc. The device descriptions shall be formatted as follows:

  — First field, 4 spaces, describing the type of device.
  Examples: PULL, SMOK, HEAT, FLOW, TAMP, DUCT

  — Second field, 1 space, blank.

  — Third field, 6 spaces, describing the specific building or general area.

  Examples: PIER C, GARAGE, ARFF, DEICNG, LOUNGE, TUNNEL

  — Fourth field, 1 space, blank.

  — Fifth field, 6 spaces, describing the specific floor or level.

  Examples: LWRLVL, UPRLVL, 3RDLVL, 4THLVL, 5THLVL

  — Sixth field, 1 space, blank.

  — Seventh field, 13 spaces, describing the specific device location utilizing accepted landmarks and/or compass direction.

  Examples: STAIR@GATE#28, ENTRYDR@BLDG, SESTAIR #4ROWF

Examples of total descriptions would be as follows:

SMOK PIERDY UPRLVL STAIR@GATE #28
PULL DEICNG 15RT ENTRYDR@BLDG
FLOW GARAGE 1STLVL SESTAIR#4ROWF

— When providing device descriptions for the FS-90 FACP, use the above format with the following changes (character space on the FS-90 LCD display is limited).

INSTEAD OF	USE
FLOW	WFS
TAMP	VTS
LWRLVL	LL
UPRLVL	UL

Life Safety

- Provide egress lighting per BOCA, Section 1024 and NFPA 101, Section 5-9. Where not otherwise required by code, provide a dedicated emergency lighting fixture installed at each emergency exit door. The intent is to light the crash bar and door signage. Also, as directed by the AHJ, provide emergency lighting on the ramp side of emergency egress doors that exit to the air side. This lighting should be on the same circuit as the emergency lighting on the interior side of the door.

- Provide a CADD generated evacuation plan with a "you are here" designation and the egress paths clearly shown on a floor plan. Permanent signage, with the capability for changing inserts, shall be provided by the general contractor. See the sample in Appendix C. Provide a floor plan submittal showing the proposed locations of the evacuation plans(s) for approval by the Fire Marshall.

- Provide L.E.D. type exit sign as required by code. Signs shall have red lettering and a black box. Provide directional exit signs in the main corridor of the concourses (piers) to direct occupants to the exit stairs along the exterior holdroom walls.

- Self illuminated exit signs are not acceptable without prior approval of the Fire Marshall.

- Provide fire extinguishers in public areas, electrical rooms, mechanical rooms and as required by NFPA 101. Provide extinguishers for tenant spaces with new or renovated construction.

Deliverables at Project Completion

At project completion, provide the following deliverables per the National Fire Protection Association Section 7-5.2 and 1-7.2 to the MAA Division of Maintenance within 30 days of system final approval by the MAA Fire Prevention and Inspection Division.

NFPA Code Reference 7.5.2 Permanent Records. After successful completion of acceptance tests satisfactory to the AHJ, provide a set of reproducible as-built installation drawings, operation and maintenance manuals, and written sequence of operation to the building owner or his designated representative.

NFPA Code Reference 1-7.2 Certificate of Completion. Every system shall include the following documentation, which shall be delivered to the owner or owner's representative upon final acceptance of the system.

A- An owners manual and installation instructions covering all systems equipment.

B- Record drawings.

C- A Certificate of Completion.

D- List of telephone numbers (including 24 hour emergency) and contact persons for all warranty issues.

The Contractor shall provide all hardware technology, software packages, software tools, equipment, cabling and manuals necessary to allow MAA staff to make modifications to the BWI Airport data base. Provide software in the format required by MAA.

Access Controlled Egress Doors

These requirements apply to typical access controlled emergency egress doors. The designer shall confirm any variance from this standard with MAA and FAA personnel.

- Magnetic locks will be mounted to the top of door/frames. Only when clearance issues prohibit the use of mag-locks, will the use of electric door strikes be considered. Electric door strikes are not acceptable without the prior approval of the Fire Marshall.

- Provide crash bar with door strike (this is not an electric door strike) and integral contacts to indicate when the crash bar has been depressed.

- Provide CASS system components via Lockheed Martin. They are typically the door controller, combination card reader/keypad, door status contacts, audio/visual device and the door locking device (mag-lock). Configure the system as follows:

— CASS shall defeat the mag-lock for all personnel who use the combination card reader/keypad. This is an approved non-emergency egress.

— Any time the crash bar is depressed, a local alarm (piezzo buzzer) will sound. This is intended to discourage accidental/nuisance use of the system. This local alarm will sound until the system is reset.

— The mag-lock will not release until a preset delay has expired. Depressing the crash bar starts the delay countdown.

— In the event of an emergency, personnel will depress the crash bar, the local alarm will immediately sound and the delay countdown will begin. When the delay has expired, the audio/visual device will sound, the mag-lock will be defeated and the CASS will alert the police and the CDC of the alarm condition. The security system audio/visual device shall be coded differently from the fire alarm system audio/visual device.

— The delay on release should be set to 15 seconds except for egress doors at the top of a stairwell which should be set to a maximum of 6 seconds. Designers should confirm this for every project.

- Signage should be placed on each egress door, stating "EMERGENCY EXIT ONLY, PUSH UNTIL ALARM SOUNDS, DOOR CAN BE OPENED IN 15 SECONDS".

- The upper level emergency egress stairwell door in all holdrooms will be the secured door (with CASS). Only approved exceptions will

allow the secured door to be on the lower level (ramp level). The designer, MAA Security, and the tenants shall decide which stairs will be utilized by airline personnel who may not have a BWI Security Badge, but need access to lower level operations areas.

- The door control microprocessor is to be provided with a battery backup power supply.

- Utilize three wire power transfer hinges for electric connection to electronic crash bars, and emergency door release devices mounted on doors.

- All door status contacts are to be interfaced with the local door control microprocessor that is designed to send an immediate local and a remote police department alarm of unauthorized access with a local reset. The microprocessor should be interfaced with the keypad/card reader access device and the secure side magnetic lock release device and be designed to distinguish the difference between an authorized and unauthorized access.

- All electronic crash bars are to be direct wired to the magnetic lock, not through the door control microprocessor to minimize chance of malfunction.

- All magnetic locks and access control electronics are to be on dedicated circuits and on a dedicated panel.

- Where egress doors are used in conjunction with operations, the release function from the secured side shall be coordinated with and approved by security.

Public Address System

- Extend or modify existing systems in the locations where they exist (IED system in the NIP and AMSYS in the domestic terminal).

- Projects that modify or add to public areas, areas of assembly, or areas presently served by the public address system shall include all necessary work to provide public address system coverage to the areas of the project. Provide instruction and maintenance manuals, as built drawings, and schematic one-line drawings for revisions to existing PA System and all new systems.

- Provide PA System training as required by the MAA project manager.

- Survivability of the public address system is critical since it provides voice evacuation to all public areas. All work must comply with applicable sections of NFPA 72.

- It is preferred that all public address system wiring be run in conduit to the extent possible. However, wiring may be run in cable tray. Long runs of wire strapped to roof structures above suspended ceilings is prohibited. Coordinate with MAA and the Fire Marshall for approval of routing method.

- All wire not in conduit, shall be plenum rated.

- For large renovation and new construction projects, create separate public address zones for dedicated use only by FRS personnel. Coordinate with the Fire Marshall for identification of the limits of such zones.

PROCUREMENT POLICIES

Fire Detection and Alarm System

- All MAA owned buildings shall have a proprietary Honeywell fire alarm system in accordance with NFPA-72.

  — The contract documents shall define the fire alarm allowance such that Honeywell, Inc. will be responsible for furnishing and installing all FACPs, wire, devices, final connections, programming, start up and testing.

  — The general contractor will be responsible for coordinating with Honeywell, Inc. and furnishing and installing all conduit and junction/device boxes for the proposed fire alarm system. Honeywell will be responsible for wiring and connecting their system as part of the allowance work.

- All non-MAA owned buildings on airport property shall have a fire alarm system meeting the requirements for Central Station as outlined in NFPA-72. This does not have to be a Honeywell system.

- The installation shall be certificated by Underwriters Laboratories, Inc. (UL).

- The installation shall be placarded indicating the central station by name and telephone number.

Security System

- CASS system empty conduit and device boxes shall be installed by the General Contractor.
- All CASS components and wiring will be furnished and installed by Lockheed Martin through an allowance. Lockheed Martin is the current airport wide CASS installer/maintainer.
- All CASS system wiring shall be in conduit.
- The system shall be U.L. listed.

Public Address System

- All public address system work in the domestic terminal will be performed by MAA's Maintenance Contractors. In the domestic Terminal this is Maryland Sound And Image and in the NIP this is Washington Professional Systems. All PA System work shall be funded through the respective project via cash allowance. All modifications and additions shall be coordinated with MAA and the designated maintenance contractor prior to completion of construction documents.

REQUEST FOR VARIANCE

If the designer wishes to request an exception to the standards 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 standards 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 Fire Marshall 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.

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

REQUEST FOR VARIANCE

Name: _____ Date: _____

Company: _____ Tel. No: _____

Project Name: _____ MAA Contract No: _____

MAA Building Permit No. _____

1. *Purpose of Variance Request.*

2. *Related Code References:*

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

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

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

BELOW THIS LINE IF FOR INTERNAL USE ONLY

A. *Fire Marshall Comments.*

B. *Director of Engineering Comments.*

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

_____ _____ _____ Yes _____ No
Fire Marshall Date

_____ _____ _____ Yes _____ No
Operations Manager Date

_____ _____ _____ Yes _____ No
MAA Director of Engineering Date

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

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 MAA OPE to have their name put on the distribution list for delivery of change pages/revisions to this standard.

APPENDIX I

TEMPORARY SUPPORT OF EXCAVATION

MARTIN STATE AIRPORT

BWI BALTIMORE/WASHINGTON INTERNATIONAL Thurgood Marshall AIRPORT

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 ϕ values for cohesive material where the sloping surcharge case must be considered. The value of the friction angle, δ, 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, ϕ, of the soil. The effect of the slope angles, β and β', 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 $K_{a1}\gamma'_1 h$ at any depth h (see Figures 1 and 4).

Where:

γ'_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, ϕ) 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 $(K_{p2} - K_{a2})\gamma'_2.d - K_{a2}\gamma'_1H$ at any depth, d, below the final excavation (see Figures 1 and 2).

Where:

γ'_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 $4s_{u2}-\gamma'_1H$ (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, $D_d = 1{\cdot}2\ D_o$ to $1{\cdot}4\ D_o$.

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, $D_d = 1{\cdot}2\ D_o$ to $1{\cdot}4\ D_o$.

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 $0.65\ K_{a1}\gamma'_1$ 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:

$K_a = 1\text{-}m(2q_u/\gamma H)$ but not less than 0.25

$m = 1$ for overconsolidated clays

$= 0.4$ for normally consolidated clays

γ = 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 Contractors 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.

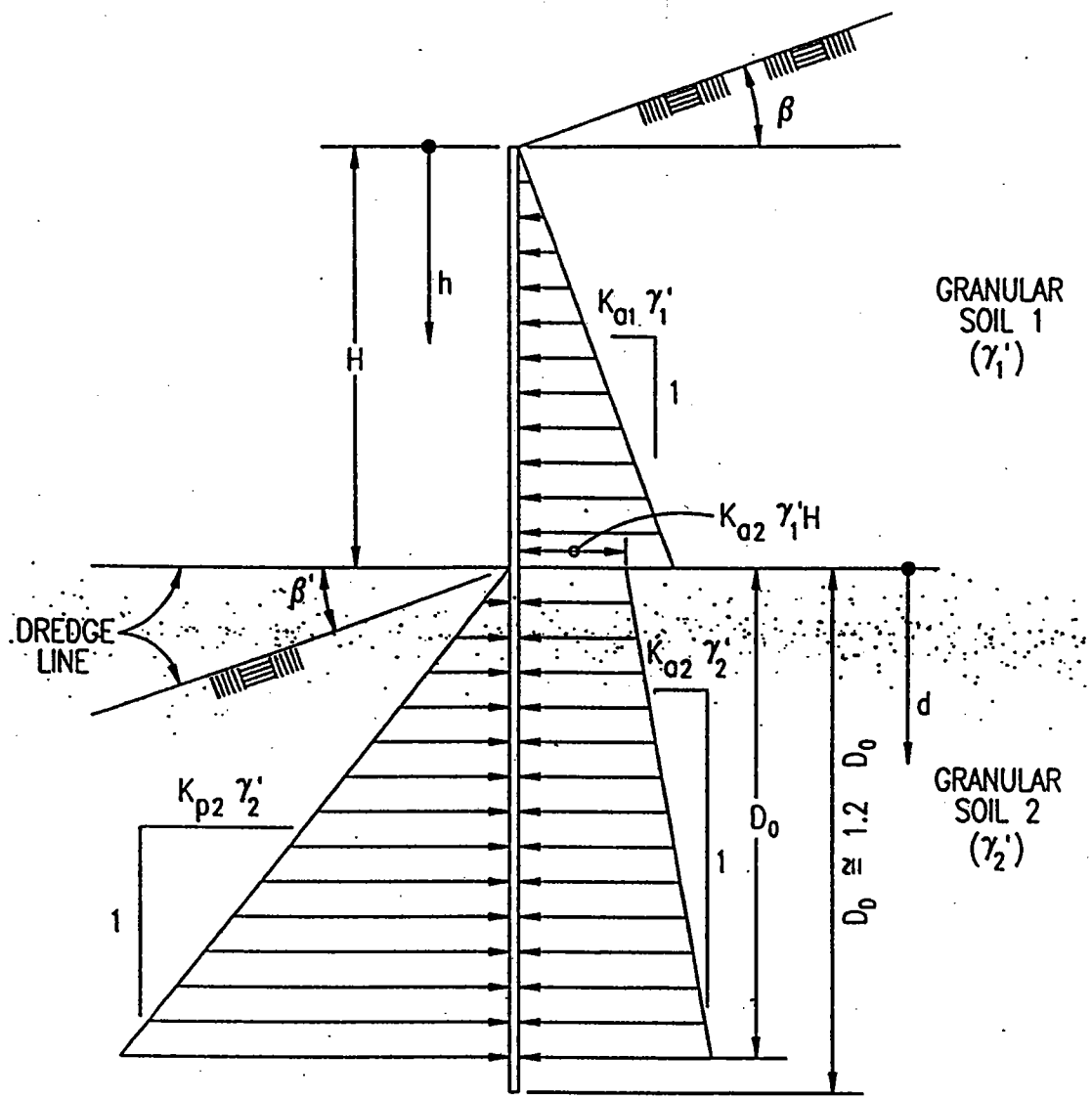
13. ADJACENT STRUCTURES

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.



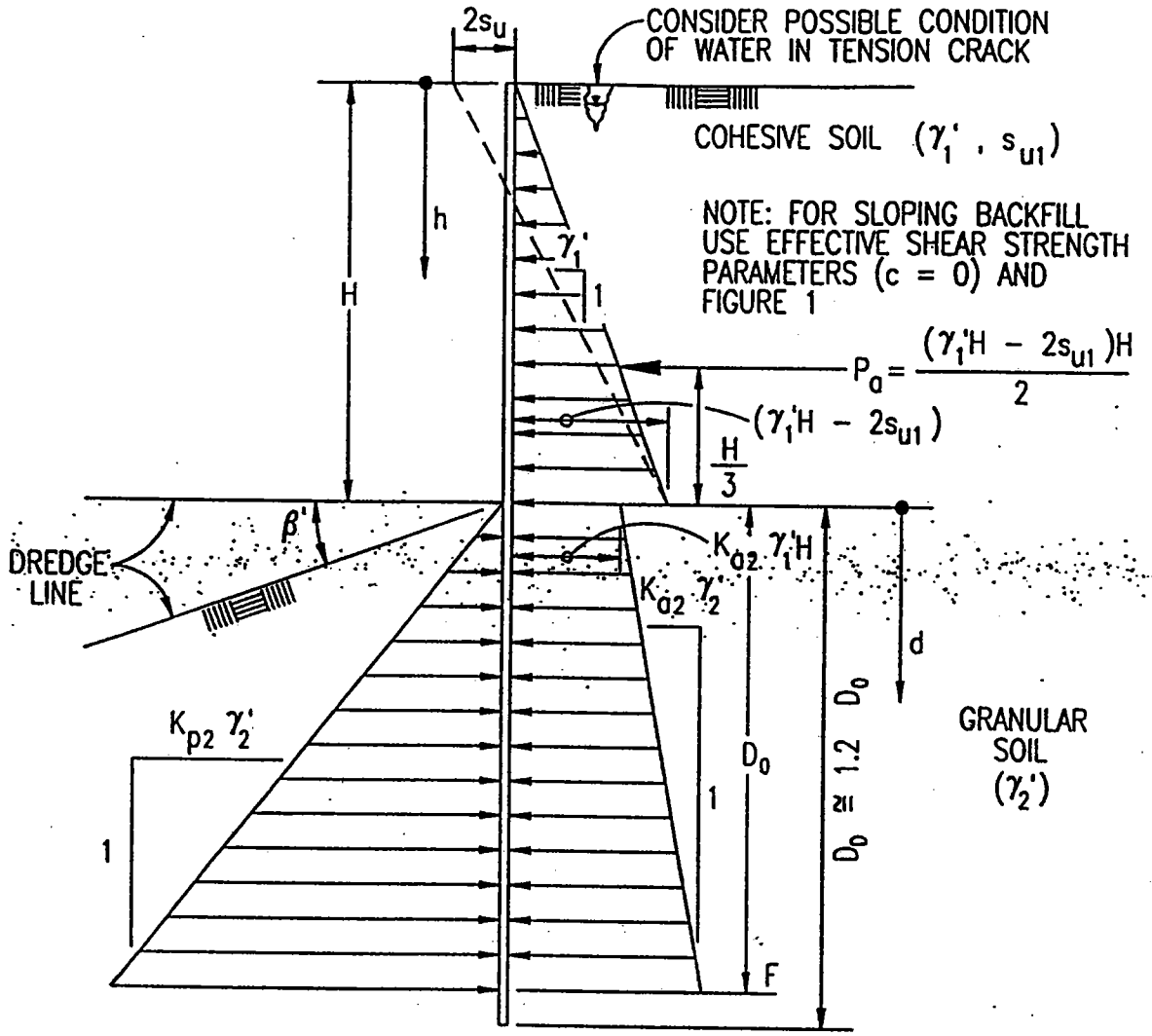
PRESSURE DISTRIBUTION

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 GRANULAR SOIL WITH EMBEDMENT IN GRANULAR SOIL

reiner NER, INC. ONSULTING ARCHITECTS/ENGINEERS TIMONIUM, 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.: 1



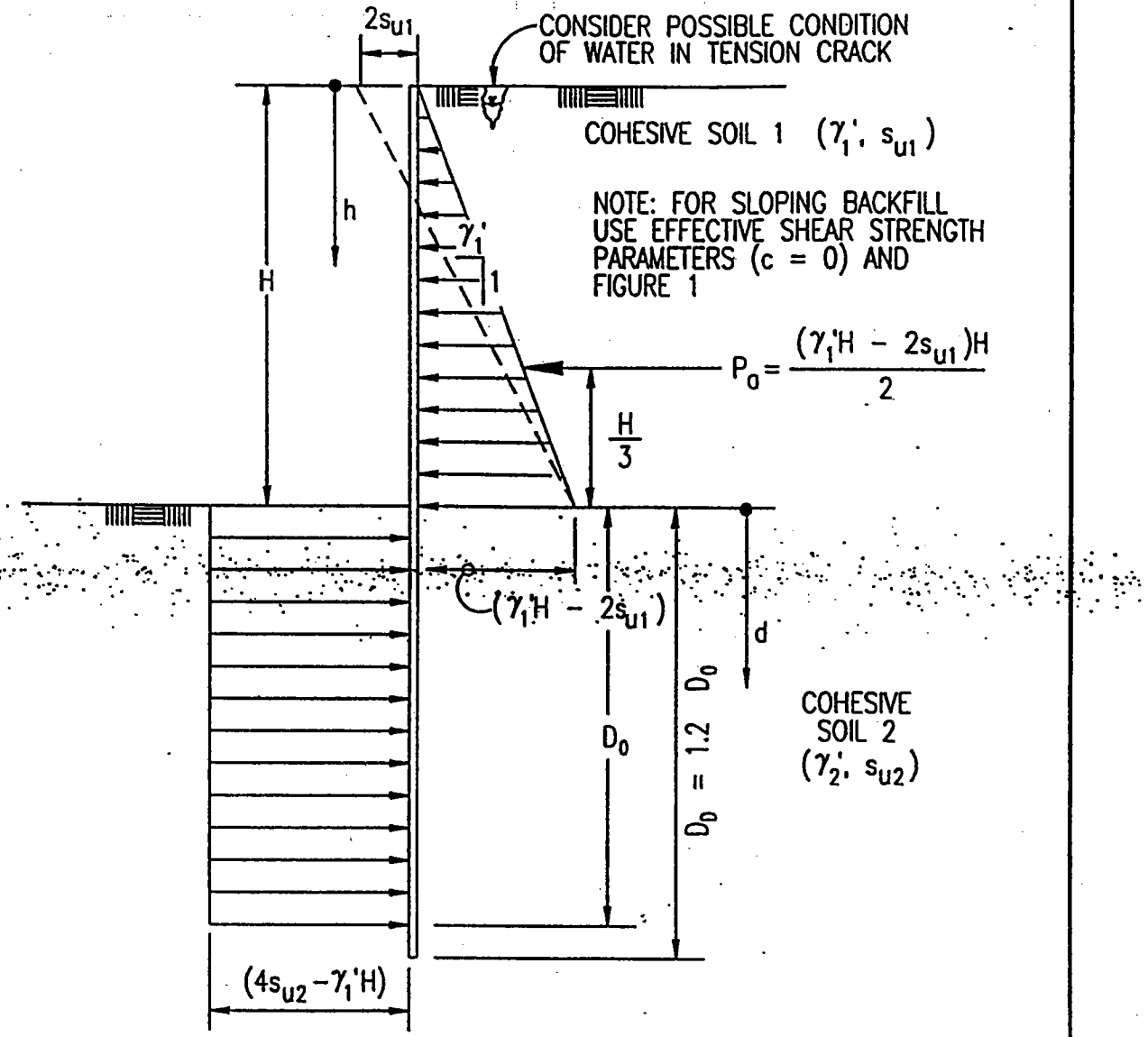
PRESSURE DISTRIBUTION

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

"einer), INC. ULTING ARCHITECTS/ENGINEERS MONIUM, 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.: 2



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 WALLS WITH CONTINUOUS VERTICAL WALL ELEMENTS – RETAINING COHESIVE SOIL WITH EMBEDMENT IN COHESIVE SOIL

"einer
ER, INC.
NSULTING ARCHITECTS/ENGINEERS
MONTUM, MARYLAND

BWI

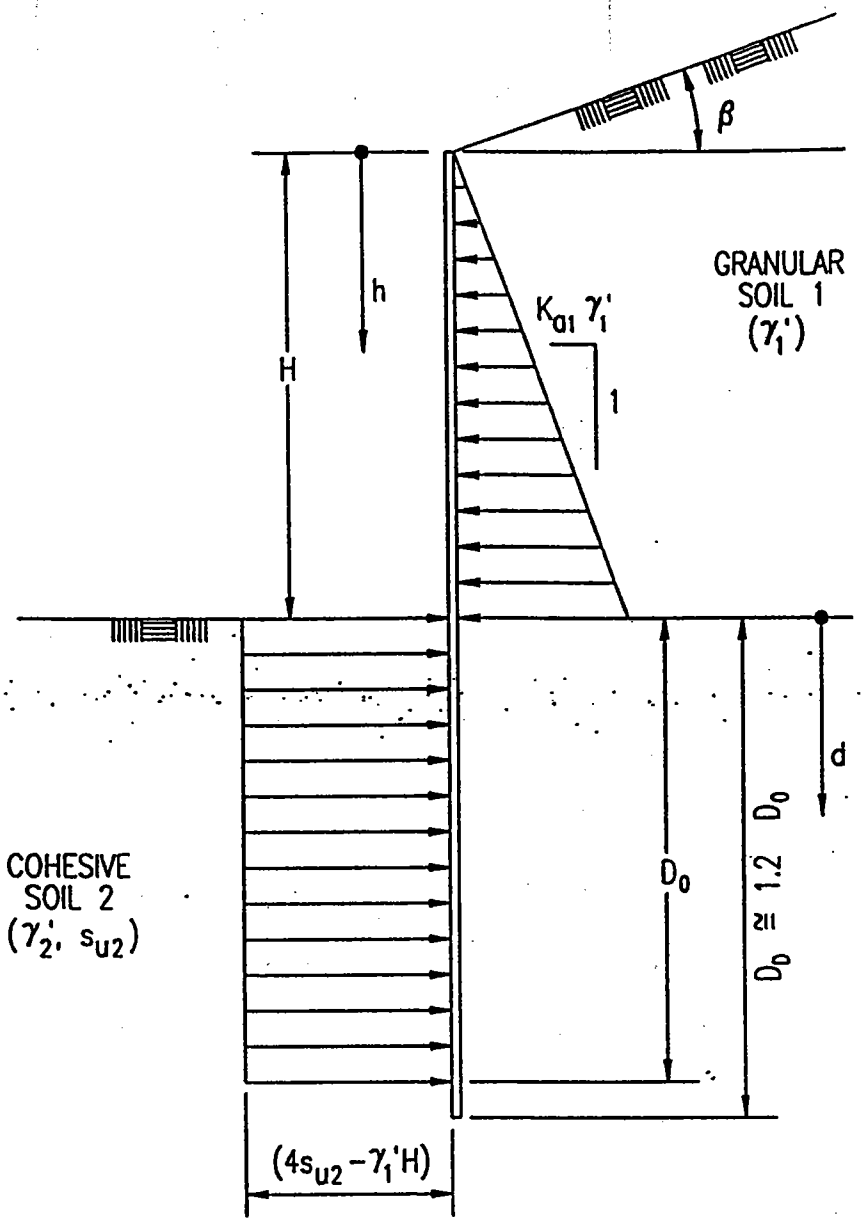
MARYLAND DEPARTMENT OF TRANSPORTATION
MARYLAND AVIATION ADMINISTRATION
DIVISION OF ENGINEERING

BALTIMORE/WASHINGTON INTERNATIONAL AIRPORT

TITLE: SIMPLIFIED EARTH PRESSURE DISTRIBUTION FOR TEMPORARY SUPPORT OF EXCAVATION

DATE: JULY, 1995 (REV. FEB. 1996)

FIGURE NO. 3



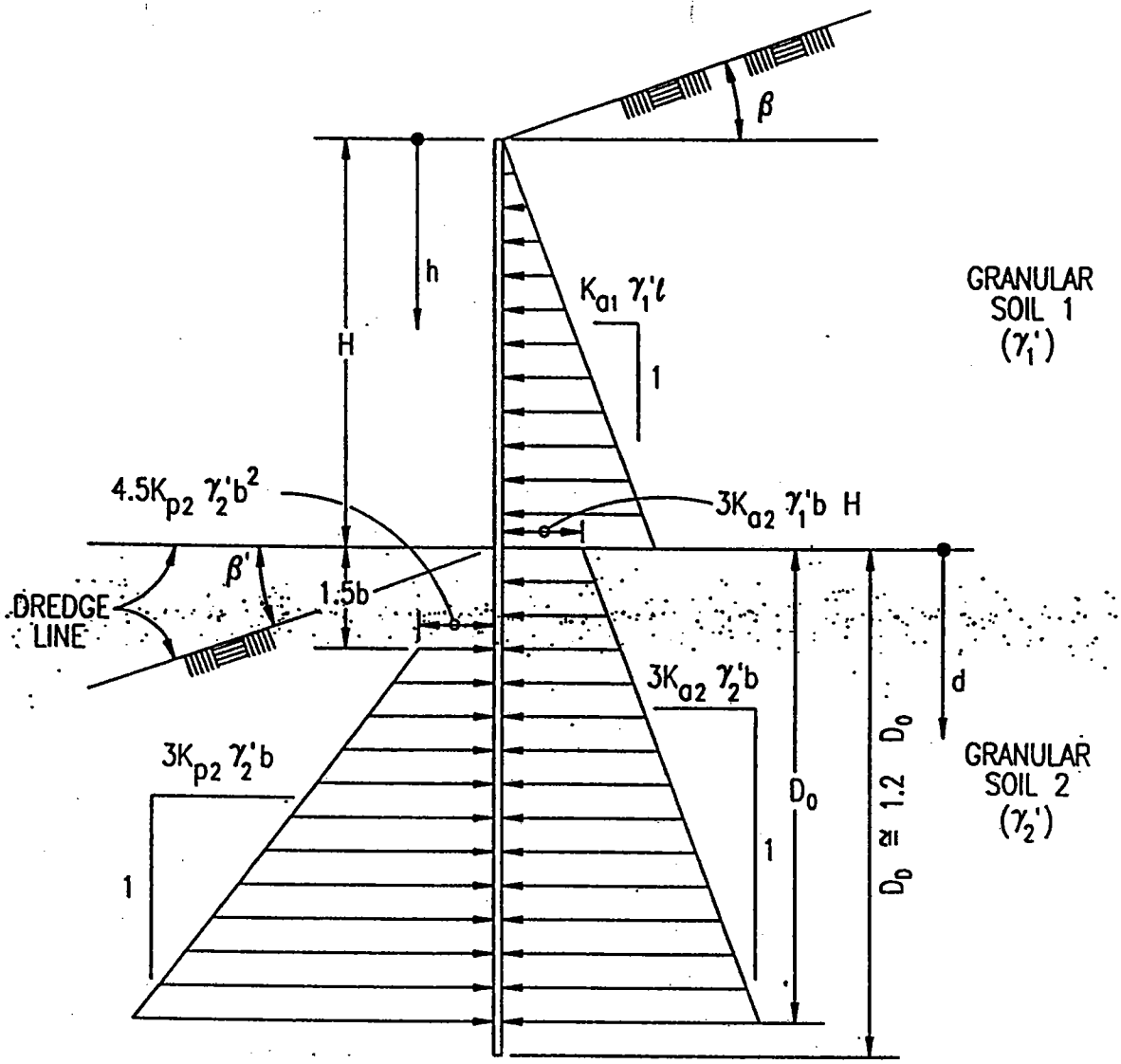
PRESSURE DISTRIBUTION

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 WALLS WITH CONTINUOUS VERTICAL WALL ELEMENTS – RETAINING GRANULAR SOIL WITH EMBEDMENT IN COHESIVE SOIL

einer HER, INC. CONSULTING ARCHITECTS/ENGINEERS THONIUM, 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. 4



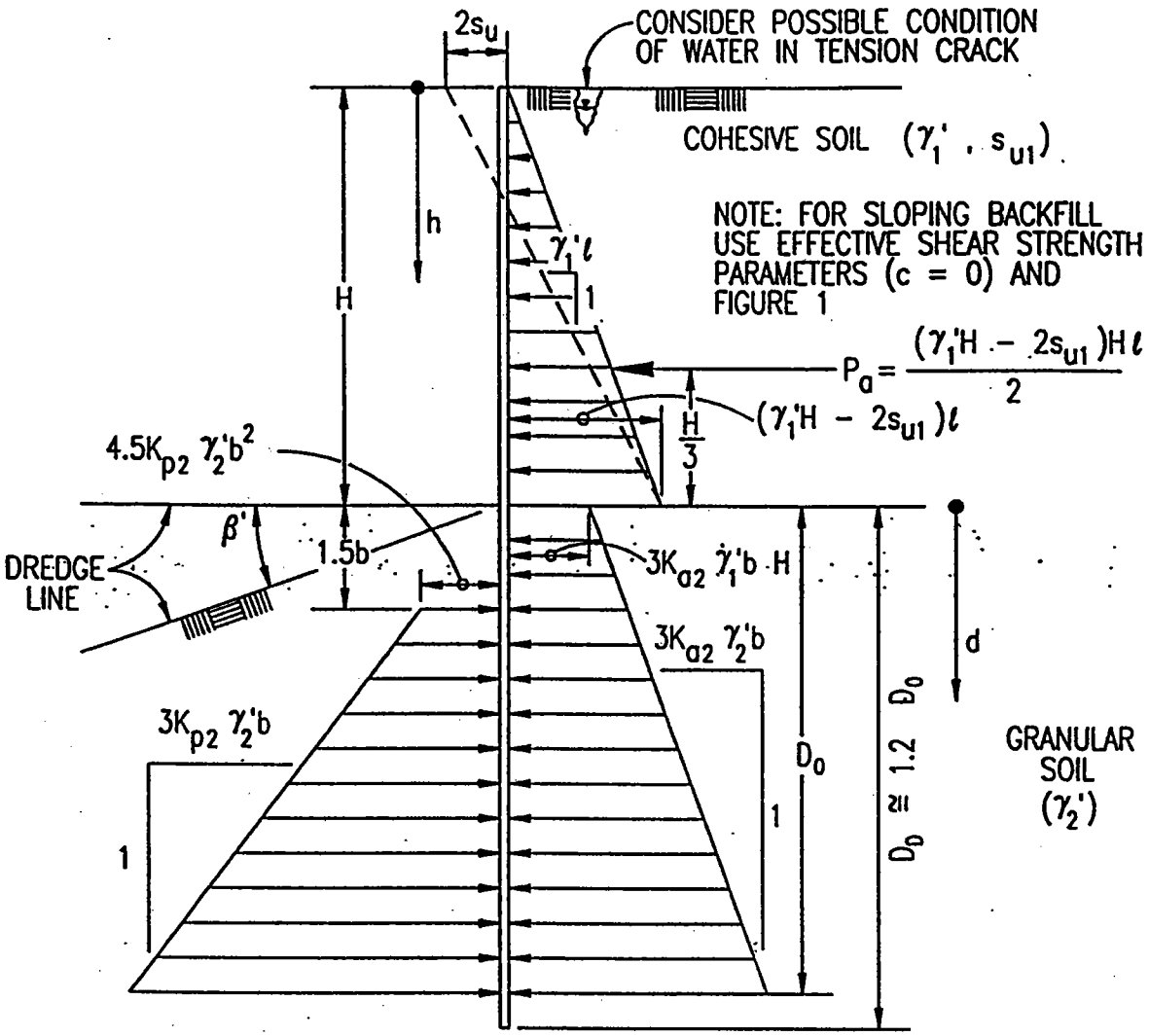
ℓ = CENTER TO CENTER SPACING OF DISCRETE VERTICAL WALL ELEMENTS
b = WIDTH OF DISCRETE VERTICAL WALL ELEMENT

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

einer R, INC. OLTING ARCHITECTS/ENGINEERS HAM, 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.: 5



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

Steiner
ER, INC.
CONSULTING ARCHITECTS/ENGINEERS
TIMONIUM, 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. 6