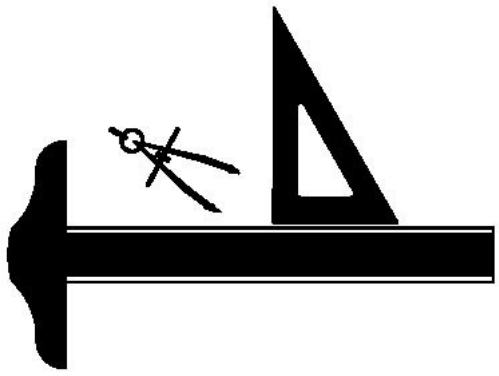
No. _____

Department of Public Works

BALTIMORE COUNTY DESIGN MANUAL

Adopted by County Council Resolution 63-10
August 2, 2010



James T. Smith, Jr.
County Executive

Edward C. Adams, P.E.
Director

Steven A. Walsh, P.E., Chief
Bureau of Engineering & Construction

County Council
of
Baltimore County

Court House
Towson, Maryland 21204

410-887-3196
Fax: 410-887-5791

August 3, 2010

Ed Adams, Director
Department of Public Works
111 W. Chesapeake Avenue
Towson, Maryland 21204

Dear Mr. Adams:

Attached please find a copy of Resolution 63-10 to adopt the Baltimore County Design Manual.

This Resolution was approved by the County Council at its August 2, 2010 meeting and is being forwarded to you for appropriate action.

Sincerely,

Thomas J. Peddicord, Jr.
Legislative Counsel/Secretary

TJP:dp
Enclosure

COUNTY COUNCIL OF BALTIMORE COUNTY, MARYLAND
Legislative Session 2010, Legislative Day No. 13

Resolution No. 63-10

Mr. John Olszewski, Sr., Chairman
By Request of County Executive

By the County Council, August 2, 2010

A RESOLUTION of the Baltimore County Council to adopt the Baltimore County Design Manual.

WHEREAS, the Baltimore County Department of Public Works has revised and updated the Baltimore County Design Manual which is intended to guide the design of public works projects in the County; and

WHEREAS, on June 17, 2010, the Baltimore County Planning Board voted to recommend approval of the Department of Public Works Design Manual with amendments as recommended by an ad hoc Baltimore County Planning Board Committee; and

WHEREAS, the Planning Board transmitted the Manual to the Council on June 23, 2010; and

WHEREAS, Section 32-4-404 of the Baltimore County Code requires the County Council to adopt the Manual with any amendments it deems appropriate; and

WHEREAS, the County Council has reviewed the Manual and the proposed amendments; now, therefore

BE IT RESOLVED BY THE COUNTY COUNCIL OF BALTIMORE COUNTY, MARYLAND, that the Department of Public Works Design Manual is hereby adopted with the amendments as recommended by Planning Board, and subject to further amendments deemed appropriate by the County Council; and

BE IT FURTHER RESOLVED, that the Baltimore County Design Manual shall be effective as of the date of adoption of this Resolution.

Proposed Amendments to the Baltimore County Design Manual
Councilman Olszewski
(By Req.)

1. On page 1 of the General Instructions section of the Manual, after the second paragraph under "I. General Information", insert the following:

   "The objective of this Design Manual is to provide a sound, workable guide for the standardization of all designs prepared for public (and private, as applicable) construction projects in Baltimore County. In using this document, the Design Professional shall not be relieved of the responsibility of applying his own knowledge and professional judgement toward the designs.

   Waivers or Variances

   Waivers or variances of these design guidelines may be approved, by the Director of Public Works or his designee, on the basis of a justification/analysis which will include but not be limited to life cycle costs, maintenance requirements, context sensitive considerations or other local considerations."

2. On page 1 of the "Water Main Design Standards" section of the Manual, in paragraph B., strike beginning with the third sentence down to and including the end of the paragraph.

3. On page 3 of the "Wastewater Collection and Pumping" section of the Manual, in paragraph G., strike beginning with the third sentence down to and including the end of the paragraph.

r06310.wpd

READ AND PASSED this ***2ND*** day of ***AUGUST,*** 2010.

BY ORDER

Thomas J. Peddicord, Jr.
Secretary

ITEM: ***RESOLUTION 63-10***

June 23, 2010

The Honorable John Olszewski, Sr.
Chairman, Baltimore County Council
County Courthouse
400 Washington Avenue
Towson, MD 21204

Re: The Department of Public Works, Design Manual

Dear Councilman Olszewski:

At its regular meeting on June 17, 2010, the Baltimore County Planning Board voted to recommend approval of the Department of Public Works Design Manual with amendments as recommended by an ad hoc Baltimore County Planning Board Committee on June 3, 2010. A copy of the Amendments is attached along with a reference copy of the Design Manual. The draft Manual may also be viewed on the Public Works website.

By way of background, the Manual dictates the engineering criteria used in the design of county infrastructure (water, sewer, storm drains, roads, structures and public buildings) and is a comprehensive rewrite of the previous version, last adopted in 1985.

Thank you for considering the Board's recommendation. Please contact me at extension 3211 if you have any questions.

Sincerely,

Arnold F. 'Pat' Keller, III
Secretary to the Board

AFK:bjw
Enclosures

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c: Members, Baltimore County Council
Thomas Peddicord, Jr., Legislative Counsel/Secretary
Mary P. Allen, County Auditor
Fred Homan, Administrative Officer
John Beverungen, County Attorney
Edward C. Adams, Jr., Director, Public Works
William Korpman, Deputy Director Public Works
Steve Walsh, Chief, Engineering & Construction Bureau, Public Works
David Snook, Public Works
Edward J. Gilliss, Chair, Planning Board
Kathy Schlabach, Chief, Strategic Planning, Office of Planning

Amendments to the Department of Public Works
Baltimore County Design Manual
As approved by the Baltimore County Planning Board on June 17, 2010

Additions are shown in ***bold italics***, deletions in ~~strike-through~~. [Office of Planning comments provided in brackets.]

GENERAL INSTRUCTIONS CHAPTER

[1. Provide a more detailed explanation of the context-sensitive solution (CSS) approach. Additionally, DPW will provide a policy statement in a letter regarding public input into the road design process.]

Context-Sensitive Solutions

Context-sensitive solutions are an approach that considers ***how transportation facilities should fit into the physical setting, so that the social, economic, aesthetic, historic and natural environment of a community can be preserved or enhanced to the greatest degree possible while maintaining safety and mobility. It considers, and incorporates as appropriate, all modes of transportation, including walking, cycling, and transit.*** It ***includes*** public involvement and input, and encourages creative thinking to achieve a ***design that meets all of the community's transportation needs in a manner that adds multi-faceted value.***

~~During the earliest phase of a project, a determination by all involved Departments shall be made regarding facets of the work that shall be designed without application of standard methods and standards of Design. A clear statement of agreement between Departments regarding context-sensitive measures to be used for the project shall be executed no later than at the end of the project's study phase, in order to control costs during preliminary and final design.~~

A successful context-sensitive solution .....

ROADS AND STREETS CHAPTER (TEXT)

[2. On page 1, after the sentence referring to CSS, add the following sentence to make it clear that CSS can be applied to any roadway design, but must be applied to the types of roads that are not shown in a design plate. These include collectors, arterials, and boulevards.]

All projects may be subject to review for context-sensitive solutions and sustainable design practices. Context-sensitive solutions may be required for traffic ways that are not depicted in a design standard or plate.

[3. On page 3, add the following to include bicycle consideration:]

II. Design
A. Preliminary Considerations

The design of traffic ways includes general layout, alignment, grades, grading, paving widths, paving material, and drainage facilities. Sufficient rights-of-way should be set aside in the early stages of layout to provide for future increases in pavement widths, the addition of sidewalks, ***bicycle facilities*** and roadside improvements. When determining alignments and grades of traffic ways, the designer must consider the requirements for utilities, including adequate storm drainage, and he must take into account any unusual aspects of the design such as railroad crossings, etc.

[4. On page 12, revise the first two sentences of the Sidewalks and Pedestrian Ramps section to require sidewalks in the urban part of the county. If a sidewalk in an urban area is waived, provisions must be made so they can be added later at minimal expense. There are numerous examples where sidewalks have been waived because it was thought they would not be needed. Later, the appearance of "goat paths" where pedestrians have worn down the grass surface indicates that they should have been provided.]

O. Sidewalks and Pedestrian Ramps

~~Sidewalks will normally be required where standard combination curb and gutter is built, where Community Plans require sidewalk and where otherwise considered necessary by the BCBEC. The presence of existing or future amenities such as bus stops, over/underpasses, designated and marked school crossings or other foot traffic generators will be considered factors toward requiring sidewalks along adjacent streets.~~ ***Sidewalks are required in the urban areas of the county, and may be required in rural centers. Required sidewalks may be waived by DPW if it can be demonstrated that no foot traffic will need to be accommodated by the proposed use, or to connect the proposed use to the surrounding area. However, if the construction of a required sidewalk is waived, a graded, unobstructed right-of-way area for the sidewalk and street trees must still be provided, in the event the sidewalk is needed in the future.***

[5. On page 13 and 14, revisions to the bikeway section are suggested to help clarify the intent and be consistent with the county's pedestrian and bicycle access plan.]

R. Bikeways

Bikeways may be designated as Class I (***Shared use*** ~~bike~~ paths ~~independent of roads~~ ***separate from the paved roadway***), Class II (***on-road*** bike lanes ~~alongside roads~~) or Class III (designated bike routes ***on*** ~~along~~ existing roads, where road width will not allow a Class II bike lane).

On ***new roads, and*** roads designated in the "Baltimore County Pedestrian and Bicycle Access Plan" (BCPBAP***) or other adopted community plan,*** every effort shall be made for all new construction, ~~and~~ major reconstruction***, and resurfacing*** projects to incorporate adequate pavement and shoulder widths to accommodate safe, shared use of the road section by pedestrians, bicyclists and motorists. ***Where such roads are resurfaced but not widened, restriping of roadways to help accommodate bicycle use should be done where feasible.***

Bikeway Standards and Characteristics

Note: All bikeways should be in conformance with the latest edition of the AASHTO Guide to the Development of Bicycle Facilities.

	Class 1 (~~Bike~~ ***Shared Use*** Path)	Class II (Bike Lane)	Class III (Designated Bike Route)
Defining Characteristic:	Separate from vehicular traffic***; uses sidewalk area on one side of road (also referred to as a sidepath)*** ~~exclusive R/W~~	~~Widened area along road shoulder~~ ***Striped and marked area on the road designated for bicycle use***	***Road signs and markings that indicate shared use of the paved roadway (may include sharrows, bicycle boulevards).*** Designated to provide continuity along bike routes
Relation to vehicular traffic:	Separated by minimum 5' clearance or barrier per GDBF	Adjacent to vehicular traffic; design intersections to encourage cooperation; carry bike lanes across interchanges where possible	Driving lanes shared with motorized vehicles
Width:	***8' min, preferred*** 10'***-12'***	~~Min. 4', preferred 5'~~ ***preferred*** ~~shoulder; 10' wide traffic lanes preferred~~	Existing width ~~10' wide traffic lanes preferred~~
Clearance to obstacles:	2' horizontal adjacent to path; 8' vertical	Highway clearances apply; Place bike-safe drain grates	
Signing & Marking:	MDMUTCD	MDMUTCD	***MDMUTCD;*** ~~"Bike Route – Share the Road"~~
Sectional Design:	Open Section	Open or closed section (open preferred)	
Geometrics:	25 mph design speed or per GDBF; avoid steep slopes (ADA criteria); stopping sight distance per GDBF	Road geometry governs	Existing road geometry
Paving:	Adequate section for load; 2% cross-slope for drainage	***Standard Road Section;*** Use road shoulder section ***when shoulders are marked as bike lanes***, ~~min. 4', preferred 5' width.~~	Standard road section
Motorized vehicle use:	Banned except for maintenance vehicles; provide barrier posts at access points	Emergency stopping only. Unlicensed ***motor*** vehicles banned.	Shared with licensed vehicles; unlicensed ***motor*** vehicles banned.
Directions:	2 way	1 way (with motor vehicles only)	
Comments:	***Appropriate for traffic ways with limited driveway and road crossings and posted speeds of 35' or more.*** ~~No p~~ ***P***lacement in road median ***must be approved by the county but is generally discouraged.***	Typical Application: BCPBAP	~~Should provide for thru and direct travel in bike demand corridors; adjust signs & signals for greater priority to bicyclists; street parking removed or restricted; surface imperfections corrected & controlled.~~

DESIGN PLATES CHAPTER

[6. Typographical error in R-A, Note 6:]

See Design Plate ***R-C*** where pedestrian/bike path shall be placed behind curb.

[7. Add note to Detail R-D to indicate it can be…]

used only by exception

[8. Delete Note 3 on Detail R-F.

~~3. Neck down to 32' road width at intersections. Reduce road width to 30' at mid-block neck-downs.~~

[9. Revise Note 1 on Plates R-L-2 and R-L-3 to clarify that only parallel parking is not permitted, since the road is not wide enough for both parallel parking and the perpendicular that is shown.]

On-street parallel parking is not permitted.

BALTIMORE COUNTY, MARYLAND
INTEROFFICE CORRESPONDENCE

Date: March 25, 2010

To: Fred Homan
Administrative Officer

From: Edward C. Adams, Director
Department of Public Works

Subject: DPW- Design Manual Approval

Under authorization of the Baltimore County Code, Section 32-4-404, the Department of Public Works has prepared, and intends to issue a revised Design Manual. The Design Manual was last revised by County Council Resolution No. 100-85 on November 18, 1985. Design Manuals previously adopted are superseded upon adoption of this Design Manual, with the exception of projects that are already substantially designed upon the date of adoption of a new Design Manual by the County Council.

Since the time of the last adoption of a Design Manual, considerable changes have occurred to design and construction methods, materials and technology. The Design Manual is being upgraded to officially incorporate "new" technology such as CAD and GIS methods while reviewing and, as necessary, revising and updating design methods and standards that remain applicable. Standard Specifications and Details for Construction have been upgraded independently; the Standard Specifications in 2000, the Standard Details in 2000 and again in 2007.

This Design Manual incorporates much new material, including:

- A new CAD drafting section and standards for drafting that incorporate this technology;
- The Department of Permits and Development Management, Bureau of Land Acquisition has contributed an updated Land Acquisition section;
- A new Land Surveys section that addresses the adoption of the NAD 83 horizontal and vertical datums;
- The Water Main section now addresses corrosion control issues.
- Additions to the Sanitary Sewer section that address low pressure sewers, evaluation and rehabilitation of existing sewers, and for the first time in many years, the design of wastewater pumping stations.
- Floodplain analysis and study standards have been incorporated into the Storm Drainage section, with many new and revised Design Plates and checklists to aid the designer.
- The Streets and Roads section has been upgraded to include Rural Roads standards and considerably revised street section plates, including cul-de-sacs and pedestrian ramps.
- A new section for Flexible Pavement design has been added.
- The Structures Design section has been upgraded to include material to address proprietary modular retaining walls and their issues.
- For the first time, a section has been added for Public Buildings design.

- A section listing abbreviations and terminology has also been added.
- References to Sustainable Design and Context Sensitive Solutions in the design process

The objective of this Design Manual is to provide a sound, workable guide for the standardization of all designs prepared for public (and private, as applicable) construction projects in Baltimore County. In using the enclosed materials, the Design Professional shall not be relieved of the responsibility of applying his own knowledge and professional judgement toward the design and successful construction of projects in Baltimore County. Where necessary, and subject to approval of the involved Departments and agencies, deviations from the established, written standards shall be used where these deviations are in accordance with desired ends and are approved by the Director of Public Works or his designee. In addition to the Design Manual standards, all applicable design standards and regulations associated with Planning, Zoning, Environment, contracts, etc. shall be incorporated into design of capital and developer projects for the citizens of Baltimore County.

Every consulting professional engaged by Baltimore County to perform design upon County-funded projects and every consulting professional preparing Development projects for review by the Department of Public Works is required to be both knowledgeable about and in physical possession of this Design Manual. This Manual will be available as a download from the County web site (free) and as a printed manual (at a cost set to cover printing costs), through the Division of Construction Contracts Administration following County Council approval.

In all likelihood, revisions and supplements will be required for this Design Manual at a later time. Comments and recommendations regarding this Manual are appreciated by the Department of Public Works and should be forwarded to the Chief of Design, Bureau of Engineering & Construction. The Design Manual is the culmination of several years of preparation by County staff members and review by various County Departments, professional organizations and interested citizens. Our thanks go out to all who participated in and thereby contributed to this effort.

Recommended For Approval:

By: _____ 3/25/10

Edward C. Adams, Jr., Director Date
Department of Public Works

By: Timothy Kotroco 3/24/10

Timothy Kotroco, Director Date
Department of Permits & Development Management

APPROVED FOR LEGAL FORM AND SUFFICIENCY
(Subject to execution by the duly authorized administrative official and Chairman of the County Council, as indicated)

03/26/10

Office of the County Attorney Date

Approval of Legal Form and Sufficiency does not convey approval or disapproval of the substantive nature of this transaction. Approval is based upon typeset document. All modifications require re-approval.

Approved to proceed with submittal to Planning Board and County Council:

4/6/10

Frederick J. Homan
County Administrative Officer
Date

ECA:SAW

W/ Attachment

cc: Engineering Administration File
Bruce Keller
Dave Snook

BALTIMORE COUNTY
MARYLAND

SECTIONS	STATUS
Title Page	
Introductory Letter	
Section Listing	
Design Chronology	
01-General Instructions	Updated Section
02-CADD	NEW SECTION
03-Surveys	NEW SECTION
04-Land Acquisition	Updated Section
05-Water Supply	Updated Section
06-Sewer	Updated Section
07-Storm Drain	Updated Section
08-Roads & Streets	Updated Section
09-Paving Design	NEW SECTION
10-Structures	Updated Section
11-Public Buildings	NEW SECTION
12-Terminology	NEW SECTION

PUBLIC WORKS DESIGN CHRONOLOGY
IN BALTIMORE COUNTY

1924	Metropolitan District established by action of General Assembly. ▪ Chief Sanitary Engineer of Metropolitan District built and maintained sanitary sewer & water supply facilities and supervised design & construction of storm drains within the Metropolitan District. ▪ Highway Department under a Roads Engineer constructed and maintained County roads and associated drainage. ▪ Other Departments established for Sanitation and Building Inspection.
1943	General Assembly created Public Works Department (DPW) for Baltimore County, allowing for unified administration of all County engineering, construction and maintenance work. This organization began to function in 1948 under the directorship of Nathan L. Smith. Component departments included Metropolitan District, Highways, Sanitation, Buildings and Zoning.
1946	First Design Manual (?) – No County-wide design standards existed prior to this date. Little known about this document.
10/1/48	Design Manual – Primarily addresses design of storm drains, sanitary sewers, included Standard Detail plates also. Copy In Department archives.
6/25/49	Baltimore City, Baltimore County and State Roads Commission establish research program with Johns Hopkins University Department of Sanitary Engineering for determining capacities of storm drain inlets.
1951	Design Manual revised. Changes unknown.
1951	Right-of-Way Division instituted in DPW to acquire land and easements for public purposes.
1952	Bureau of Engineering created within DPW; assigned responsibility for planning, design and surveys of all roads, water sewer and storm drainage projects.
1952 – 1953	Development of first aerial photo-based 200-scale topography for use in project mapping and design.

1953	Responsibility for inspection & approval of new construction assigned to Bureau of Engineering.
1953	Architectural Design Approval Section established.
1955	New County Office Building opened. Building houses Executive Office and its Departments.
1955	Management consultant recommendations for organization of DPW result in transfer of regulatory and non-public works licensing functions to a newly created Department of Permits and Licenses. County-wide housekeeping functions were transferred to a new Office of Central Services. Zoning duties were moved to Office of Planning and Zoning. DPW now had 5 Bureaus, including Engineering, Land Acquisition, Public Services, Operations, and Administrative Services. The Bureau of Engineering consisted of six divisions including Design, Surveys, Research and Standards, Computation and Costs, Contracts and Inspection. The Design Division included Developers Design Approval, Architectural Design Approval, Record Drawings and Drafting, and Public Works Design Section: Water Group, Sewer Group, Storm Drain Group, Sewer and Water Extension Group, and Street, Road and Bridge Group.
1955	Design Manual, Standard Details – major revision to all sections, new books and binders issued. Now includes Highways, Structures, Bridges & Culverts, Water Supply, Land Acquisition, and Pumping Stations in addition to Storm Drains and Sanitary Sewer sections. Incorporates standard plates and design tables for new S-grate inlets, developed from JHU studies. Copy in Department archives, with revisions.
1955	Last private water system in Baltimore County at Eden Terrace incorporated into Metropolitan District system. All water supply is from Metropolitan District system or from private wells.
1956	*"Design of Storm Water Inlets"* published by Johns Hopkins University in cooperation with State Roads Commission and Baltimore County. The parallel bar S grate inlet developed as part of this project has the greatest capacity per unit cost compared to grate designs used prior to this time in Baltimore County. Copy in Department archives.
3/1/56	1955 Design Manual, Addendum 1 – Detailed changes to Sewage Pumping Design Section; changes to Roads & Streets

	Plate R-H; Detailed changes to Contract Specifications for Sewage Pumping Stations, including color coding for painting.
7/31/56	1955 Design Manual, Addendum 2 – Land Acquisition page L-2 revised; Right-of-Way linens to be 8.5” x 14” in size in all cases so that plat can be attached to deed. Multiple sheets to be used and numbered as required. Drawing scale to be as discussed in Design Manual. Location map to be on first sheet of multiple-plat highway project plats.
2/16/61	1955 Design Manual, Addendum 3 – Alley criteria added to Design Manual, Standard Details, Standard Specifications – An inlet is required when depth of stormwater in alley reaches 2". Related Standard Detail Plates R-31 and R-32 added, R-14 revised.
1964	Revised Design Manual and Standard Details issued. Major revisions to all sections, Pump Station Design section out, new books and binders issued. Copy In Department archives.
10/14/68	Sediment Control Program instituted in Baltimore County. Not incorporated as part of County Design Manual, administered in cooperation with Baltimore County Soil Conservation District.
6/29/70	Baltimore County Sediment Control Manual published separate from Design Manual. Sediment Control for both County and private projects is reviewed and approved by the Baltimore County Soil Conservation District to current time (7-09).
1971	Revised Standard Specifications (based on 1968 State Roads Commission Specifications) and Standard Details (1964, as revised) printed and bound in 5.5” x 8.5” format. 1964 Design Manual remains in effect. Copy In Department archives.
12-1-74	Storm Water Management Policy in effect based on 2 year (stream bank-full) storm and Soil Conservation Service methods. Reviews done by Developers Design.
6-11-79	Interim Baltimore County Stormwater Management Design Standards Adopted: SCS TR-55 RCN method used. ▪ Routing by TR-20, Storage Indication or by Shortcut Method. ▪ Ponds designed per SCS MD-2 and SCS 378. ▪ Plan requirements, Construction Specifications & Design Requirements established that have carried through to current time relatively unchanged.

Reviews done by Bureau of Engineering – Storm Drain Design.

12/3/79 Bill 199-79 – No structures shall be allowed within 100 year floodplain, which is based on more restrictive of flood insurance study or DPW study.

12/9/81 "Tentative" revision to County Storm Drain Design Criteria issued with softbound reprints of 1964 Design Manual, which otherwise remains in effect:

- (2.1.2) Watershed modeling – requires use of TR-55 or TR-20 for watersheds over 500 acres, where hydrographs or routing required, where there are many sub-areas with different characteristics, or where historic storms must be analyzed.
- (3.1.2.4) Irregular channel section water surface profiles developed using standard step method or HEC-2.
- (3.1.5.1) Losses through bridges analyzed using either HEC-2 or FHWA HDS No. 1 *"Hydraulics of Bridge Waterways".*
- (Table D-5) – Upgraded rainfall data (1897 to 1972)
- (Design Plate D-19) – Successor to Design Plate D-R –
  1. New minimum 1' freeboard – water surface elevation to reservation line
  2. Maximum flood level based on 100 year storm.

Copy in Department archives.

6/11/82 Development Regulations – Defines 100 year riverine & tidal floodplain – tidal only refers to Federal Flood Insurance Study.

1/83 Design Manual – Major revisions to all sections, now includes Stormwater Management Policy and Design Section – new book and binders issued. Copy in Department archives.

7/16/84 Revised Stormwater Management program –

- (2.3.1) 2 & 10 year management (also 100 year in interjurisdictional watersheds)
- Route design storms per SCS 378 to meet spillway and freeboard requirements
- Introduction of infiltration requirements – first 1" of rainfall.

9/7/84 Revised SWM Policy (Baltimore County Code 1978 Title 2, Article VI, Division 9) Bill 105-84.

11/85 Design Manual Errata & Addenda (adopted 11/18/85, County Council Resolution 100-85):

1. Revised SWM Design Standards dated 11/85 replace 1982 Design Standards.

2. Changes to Plate D-19:
    - Change Building-to-Reservation setback from 50' to 20', now measured from riverine floodplain's freeboard line to closest of front, rear or side of residential, commercial, industrial or institutional building.
    - Now refers to "100 year riverine flood or 100 year tidal flood, whichever is greater".
    - Eliminates 1.5' horizontal distance from top of bank to reservation line.
3. Page W-17 (AWWA Standard for Cold Water Meters) added.
4. Pages W-1 through W-3 replaced.

1987	Transfer of Stormwater Management review responsibilities from DPW to new Department of Environmental Protection & Resource Management.
8-1-91	BCBE *"Recommendations and Procedures for Watershed, Floodplain and Waterway Crossing Studies"* – established 30 acre definition of regulated floodplain.
1991	Selected Standard Details revised to allow for use of precast components. Included sewer and drain versions of Type A, B Shallow and C manholes, new Doghouse Manhole.
2-93	Re-organization transfers Bureau of Land Acquisition and Development Plans Review from DPW to PADM (ZADM). Bureau of Public Services eliminated. Bureau of Engineering reorganized to include Construction Inspection functions. Out-sourcing of design efforts to consulting firms now done on an on-call basis as well as a project-specific basis.
5-93	CAD computer systems and methods introduced for use in capital projects design. Red Run Boulevard completed in late 1994 as first major in-house project using CAD methods. Initial CAD practices manual developed by users of County system.
1994 – 1999	Development and adoption of curved vane storm drain grates, a cast-iron bicycle-safe frame and grate system that will be used in lieu of hydraulically and structurally unsatisfactory reticuline grates and for earlier cast iron parallel bar grates.
3-30-94	Joint memo from Directors of Public Works and DEPRM banning use of corrugated metal pipe in County maintained drains and culverts except on a case-by-case basis where all other options are exhausted. Short product life, dramatic cases

of failures, ongoing problems and industry unresponsiveness were cited as reasons for disapproval.

2-10-99 GPS control (NAD-83, NAVD-88) introduced for use on projects done after July 1, 1999.

2-00 *Standard Specifications for Construction and Materials* rewritten based upon MdSHA 1993 Specifications. *Standard Details for Construction* redrawn using CAD. Electronic versions of both Specifications and Standard Details created.

- Pedestrian Ramp Std. Details introduced in response to A.D.A. regulations;
- Corrugated Metal Pipe references changed to allow use only for replacement purposes, with approval of BCBEC;
- Road sections placed in special section for eventual inclusion in a “new” Design Manual;
- Most concrete inlet and manhole structures now allow precast construction in lieu of brick and mortar or cast-in-place concrete;
- Addressed issue of pipe passing through corners of concrete structures;
- Replaced parallel bar and reticuline grates with curved vane storm drain grates.