

CHANGE LOG



PROJECT DEVELOPMENT AND DESIGN GUIDE

CHAPTER NO./TITLE 8. Drainage and Erosion Control

EFFECTIVE DATE January 1, 2025

SECTION	CHANGE
General	Updated agency name to MassDOT throughout.
General	Various minor grammatical changes and nomenclature changes for consistency within this chapter and throughout the PDDG.
General	Added hyperlinks to external resources.
General	Updated references to the <i>MassHighway Storm Water Handbook</i> to the <i>MassDOT Stormwater Design Guide</i> , and added new references to the <i>MassDOT Stormwater Design Guide</i> throughout.
8.1 Introduction	Updated references to AASHTO guidance documents. Updated references for Stormwater Standards to the appropriate regulations (310 CMR 10: Wetlands Protection Act and 314 CMR 9: 401 Water Quality Certification).
8.2 Procedures: Drainage Law and the Designer's Responsibility	Updated drainage law references including 310 CMR 10: Wetlands Protection Act and 314 CMR 9: 401 Water Quality Certification. Updated language on the Massachusetts Stormwater Standards for clarity. Moved language on Section 401 Water Quality Certificate from bottom of legal requirements list to #3 in list to be in better sequence with other state regulations. Clarified language on the EPA National Pollutant Discharge Elimination System (NPDES) permits, both the MS4 Permit and the Construction General Permit. Updated Figure 8-1: Floodway Schematic. Removed "The Floodway: A Guide for Community Permit Officials, FEMA" since it is an obsolete document. Replaced it with three National Flood Insurance Program references. Added reference to 44 CFR 60.3 for floodplain management criteria for work in flood-prone areas.
8.2 Procedures: Documentation Necessary for Drainage Design	Clarified requirements when designing a new or replacement storm drain system. Also, removed soils data as part of the design of infiltration drainage systems (because design of infiltration BMPs is in the <i>MassDOT Stormwater Design Guide</i> , not here) and estimated flow velocity and depth at existing drainage outfalls during time of survey (not typically recorded during survey or used for design). Added relevant information to gather during designer field investigations including evidence of erosion or presence of energy dissipation devices and verification of watershed limits.
8.3 Hydrology	Added introductory language.

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8.3 Hydrology: Design Storm Frequency	Added language guiding the designer to coordinate with MassDOT to determine if climate change projections or increased rainfall intensities or depth should be considered during the design. Updated Table 8-1: Recommended Design Flood Frequency for Storm Drain Systems. Clarified language on the peak rate analysis so it does not conflict with anticipated changes to MassDEP's Stormwater Standard #2. Added new Table 8-2: Hydraulic Design, Scour Design and Scour Check Flood Selection Guidelines. This table is consistent with 2024 MassDOT <i>LRFD Bridge Manual</i>.
8.3 Hydrology: Method of Estimating Peak Discharge	Added introductory language to Methods of Estimating Peak Discharge section and pointed the reader to references for a comprehensive understanding of the three hydrologic methods MassDOT uses. Added Table 8-3: Typical Applications of Acceptable Hydrologic Methods Added Table 8-4: Limitations for Hydrologic Methods Removed content on the USGS (Wandle) Method. Added to the descriptions for USGS Regression Equations, The Rational Method, and The NRCS Method. Specifically for the NRCS Method, included guidance on rainfall depths and distributions based on NOAA Atlas 14. Added references to the FHWA Hydraulic Engineering Circular No. 22 (HEC #22) "Urban Drainage Design Manual"
8.3 Hydrology: Effects of Storage	Added references to HEC #22 and removed outdated content on detention storage facility design.
8.4 Hydraulic Design	Added introductory language.
8.4 Hydraulic Design: Definitions	Moved definitions from individual subsections in Section 8.4 to the beginning of this subsection.
8.4 Hydraulic Design: Roadside Drainage (Open Channels)	Added guidance about using the MassDOT <i>Stormwater Design Guide</i> to consider turning drainage channels and median swales into linear stormwater control measures. Added reference for guidance on using the Manning Equation, removed channel capacity examples. Added specificity on gradients for specific channel linings: minimum grade is 0.005 ft/ft for paved channels and 0.01 ft/ft for grassed channels. Revised channel linings section to include expectation for use of engineering judgement, with references to guidance documents. Removed Exhibit 8-31: Characteristics of Channel Linings.

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8.4 Hydraulic Design: Culverts	Clarified definition of a culvert versus a bridge. Added the following references: -<i>Hydraulic Design of Safe Bridges</i> , Hydraulic Design Series No. 7 (HDS #7), Federal Highway Administration, April 2012 -<i>Hydraulic Design of Energy Dissipators for Culverts and Channels</i>, Hydraulic Engineering Circular No. 14 (HEC #14), Federal Highway Administration, July 2006 -<i>Culvert Design for Aquatic Organism Passage</i> , Hydraulic Engineering Circular No. 26 (HEC #26), Federal Highway Administration, October 2010 -<i>Fish Passage in Large Culverts with Low Flows</i> , Federal Highway Administration, August 2014 -<i>Effects of Inlet Geometry on Hydraulic Performance of Box Culverts</i> , Federal Highway Administration, December 2006 Updated the list of relevant computer programs available for the hydraulic design of culverts. Updated Figure 8-3: Culvert Definition Sketch, Figure 8-4: Inlet Control, and Figure 8-5: Outlet Control based on FHWA HDS #5. Added two basic design criteria for culvert design: 1) Tailwater and 2) Inlet Protection and Seepage Removed subsection "Use of Hydraulic Engineering Circulars" since it was incorporated into other sections.
8.4 Hydraulic Design: Energy Dissipators	Clarified the types and descriptions of energy dissipators to be considered for use at culvert outlets. Clarified and expanded on design procedures to choose and design an energy dissipator, in accordance with HEC #14.

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8.4 Hydraulic Design: Storm Drain Systems	Throughout: Updated references and removed references that have been incorporated into HEC #22. Added "Designer Notes Regarding the Use of Modeling Software." Updated pavement drainage section: - Converted bulleted list of spread/design frequency requirements into a Table: Minimum Design Frequency and Spread. - Changed limits for interstates and collectors to include design speeds EQUAL to 45 MPH. - Added the following statement at the end of the table: Where the above guidance results in a tolerable spread of less than 6 feet, the minimum tolerable spread shall be 6 feet. Added Paved Waterways/Curb Cuts and Trench/Slotted Drains to MassDOT inlet types (along with descriptions of each). Added "Grate Types" subsection with descriptions of MassDOT standard grate types and removed references to rectangular bar grates since they are not MassDOT standards grates. Added "Inlet Placement" subsection with guidance on where inlets must be placed in order to capture water, prevent flooding and promote safety. Added "Gutter Spread" subsection. Updated Figure 8-7: Energy and Hydraulic Grade Lines for a Properly Designed Storm Sewer to source form HEC #22. Simplified and clarified Table 8-8: Recommended Cover Depth (Min. to Max.) by Reinforced Concrete Drain Pipe Class. Added Table 8-9: Minimum Required Slope to Achieve 3 ft/sec When Flowing 1/3 Full. Added reference to subdrainage section: FHWA NHI-05-037, <i>Geotechnical Aspects of Pavements</i>, Federal Highway Administration, May 2006. Added language to application section on subdrainage design to address high groundwater / buoyancy issues.
8.4 Hydraulic Design: Subdrainage Design	Updated references to appropriate FHWA documents. Clarified purpose of subdrainage system is to prevent damage to pavement box and prevent flotation of drainage structures.
8.4 Hydraulic Design: Stormwater Control Measures	Added new section for "Stormwater Control Measures" and pointed reader to the MassDOT Stormwater Design Guide for detailed information on the use, planning, retrofit, and design of stormwater control measures.

SECTION	CHANGE
8.5 Erosion Control During Construction	Clarified paragraph on the Construction General Permit. Clarified types of protective measures and replaced reference of hay bales with compost filter tubes or straw bales. Throughout: Removed outdated references. Removed dates from publications that periodically get updated and kept dates of one-time publications. Throughout: The figures in this section were reviewed against the most recent FHWA document on <i>Best Management Practices for Erosion and Sediment Control</i> (1995) and figures that were in this document were kept. Other figures were outdated and therefore were removed.
8.5 Erosion Control During Construction: Flow Diversion	Updated reference on where to find guidance in HEC #22 on open channel design. Removed paragraph on temporary berms since they are not included in the 1995 FHWA <i>Best Management Practices for Erosion and Sediment Control</i>.
8.5 Erosion Control During Construction: Sedimentation Checks	Removed Exhibits 8-69 and 8-70 on Baled Hay or Straw Erosion Checks since they are inconsistent with MassDOT Construction Standards. Referred reader to MassDOT <i>Construction Standard Details</i>. Clarified language on different sedimentation check options, and updated heading on hay bales to be compost filter tubes or straw bales.
8.5 Erosion Control During Construction: Sedimentation Basins	Clarified general rule that sedimentation basins used during construction should not be used for permanent infiltration basins due to siltation issues. Under Sedimentation Basin Design Criteria, added a bullet for guidance on sizing basins if used on a project under jurisdiction of the Construction General Permit.
8.6 References	Updated and added relevant references. Removed dates from publications that periodically get updated and kept dates of one-time publications.
8.7 Additional Resources	Added new section titled "Additional Resources" to include nomographs. Replaced 2006 PDDG figures sourced from HEC #5 with figures from HDS-5; replaced figures sourced from Oregon DOT with updated Oregon DOT figures from 2014.