massDOT
Massachusetts Department of Transportation
Highway Division

Number: E-20-003
Date: 02/20/20

ENGINEERING DIRECTIVE

Patricia Leavenworth (signature on original)

CHIEF ENGINEER

Location and Design of Stormwater BMPs

General

The purpose of this Engineering Directive is to provide guidance regarding the selection of site locations for stormwater Best Management Practices (BMPs) and to minimize potential hazards when siting a stormwater BMP within the "clear zone" of a roadway.

An important objective of highway projects is to mitigate the hydrological and water quality impacts caused by discharges of water from impervious highway surfaces. Highway projects must comply with applicable Federal and State stormwater regulations. Given the configuration of highway corridors, areas adjacent to roadways are often uniquely suitable locations for siting stormwater BMPs because of the ease of access and inspection, minimization of piping infrastructure, and cost-effectiveness. The most common retrofit stormwater BMP is a water quality swale with check dams, which is particularly well-suited to the highway environment for the following reasons:

- Relatively easy to construct
- Relatively easy to inspect and maintain
- Linear configuration that can run parallel to a highway, so they readily fit into a project
- Supports the goal of "Low Impact Development" by increasing residence time, promoting infiltration, and settling sediments out of suspension
- Achieves the highest level of stormwater treatment for the least cost, especially relative to closed systems (e.g., drainage piping, and subsurface infiltration components)

However, when conventional BMPs are located within the clear zone of a roadway they can present potential hazards for errant vehicles.

The Federal Highway Administration defines a clear zone as an unobstructed, traversable roadside area that allows a driver to stop safely, or to regain control of an errant vehicle that has left the roadway. The minimum required width of a clear zone is based on risk, relative to traffic volumes, speeds, and roadside slopes and curvature. Clear zone widths can be derived using national roadside design guidance (e.g., the latest version of *AASHTO's Roadside Design Guide*).

Guidance for Locating and Designing Stormwater BMPs

As stated above, one of the objectives for any project is to keep the clear zone free of any obstructions or appurtenances (e.g., stormwater BMPs). With this in mind, the designer should conduct a site/safety review as early in the design process as possible, including a review of any existing underground and above ground utilities that could be impacted by the work. In general, utility relocations should be avoided. Although BMPs should be located outside the clear zone to reduce risk whenever possible, there may be space constraints beyond the clear zone in some locations that require consideration of other options. In these circumstances, the designer should first consider off-site locations (which may require right-of-way acquisition), and the creation of isolated areas that could accommodate combined stormwater drainage collected from wide areas (lengths) of highway and installed outside of the clear zone.

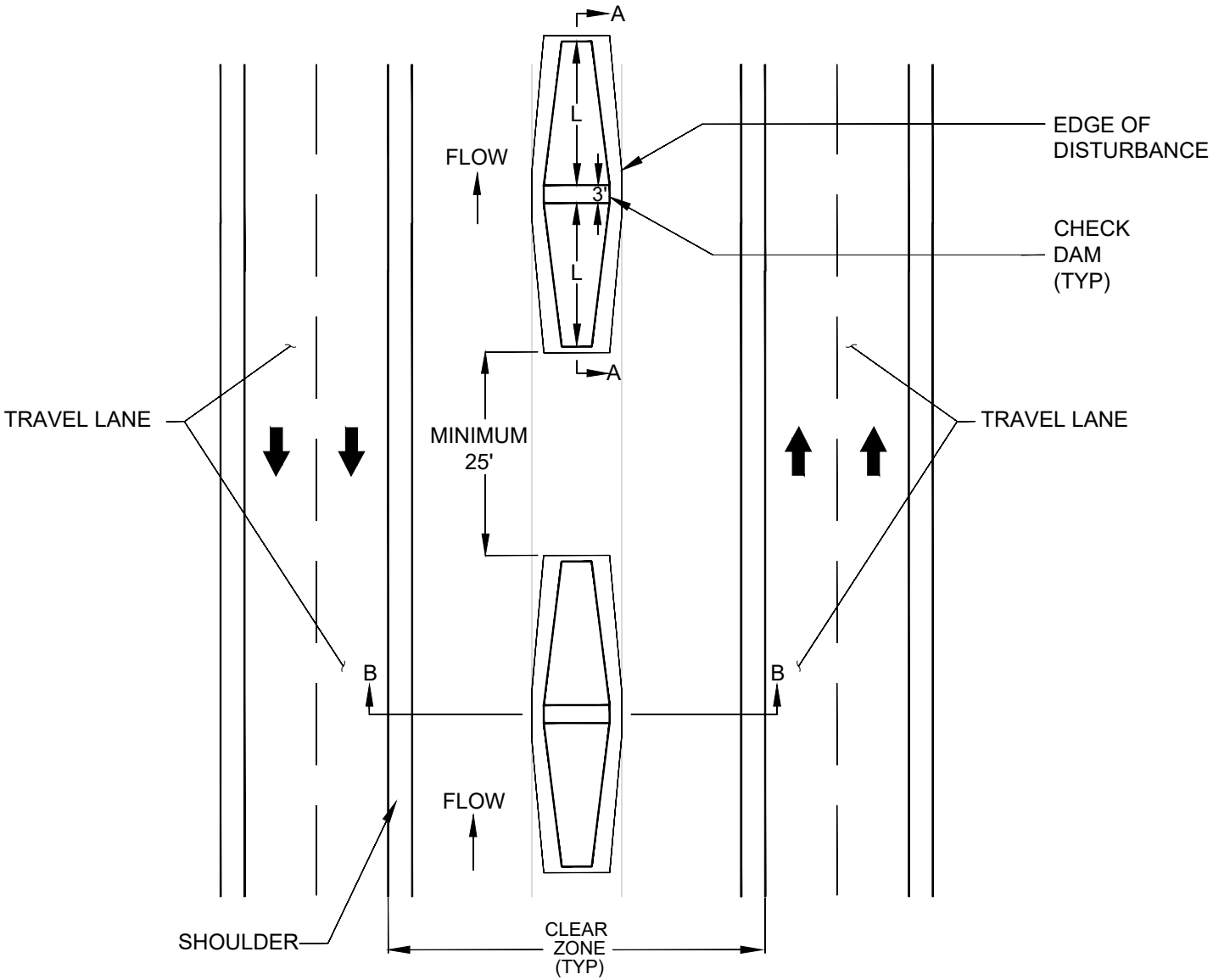
Designers should refer to the most current version of the *MassDOT Storm Water Handbook for Highways and Bridges* for design criteria for all stormwater BMPs. In addition to these criteria, if the aforementioned alternatives for locating stormwater BMPs outside the clear zone are deemed impracticable, then the designer must make any stormwater BMPs within the clear zone traversable by minimizing the size and slope of the feature so as to minimize risk to the vehicle operator. In these cases, designers shall also adhere to the following design requirements:

- Longitudinal slope for check dams of 12H:1V or flatter
- Final dressing material (e.g., cover for check dam) of loam and seed
- No structures that protrude 6 inches or greater from grade (e.g., outlet control structures, headwalls, yard drains)
- Cannot exceed a height, or ponding depth, of 2 feet
- No permanent standing water, drawdown within 72 hours after rainfall event; test pits or similar investigations may be required to inform this requirement
- Spacing between check dams shall be as indicated in the *Storm Water Handbook*, with a minimum distance of 25 feet between the toes-of-slope

Refer to the attached drawings for further clarification and additional details.

If, based on best engineering judgment, a "non-traversable" BMP (i.e., does not meet all of the design criteria listed above and shown on the attached drawings) must be located in the clear zone, then a guardrail or other appropriate highway barrier system must be used to protect errant vehicles from making contact with the non-traversable BMP.

Attachments: Schematic drawings of traversable BMP

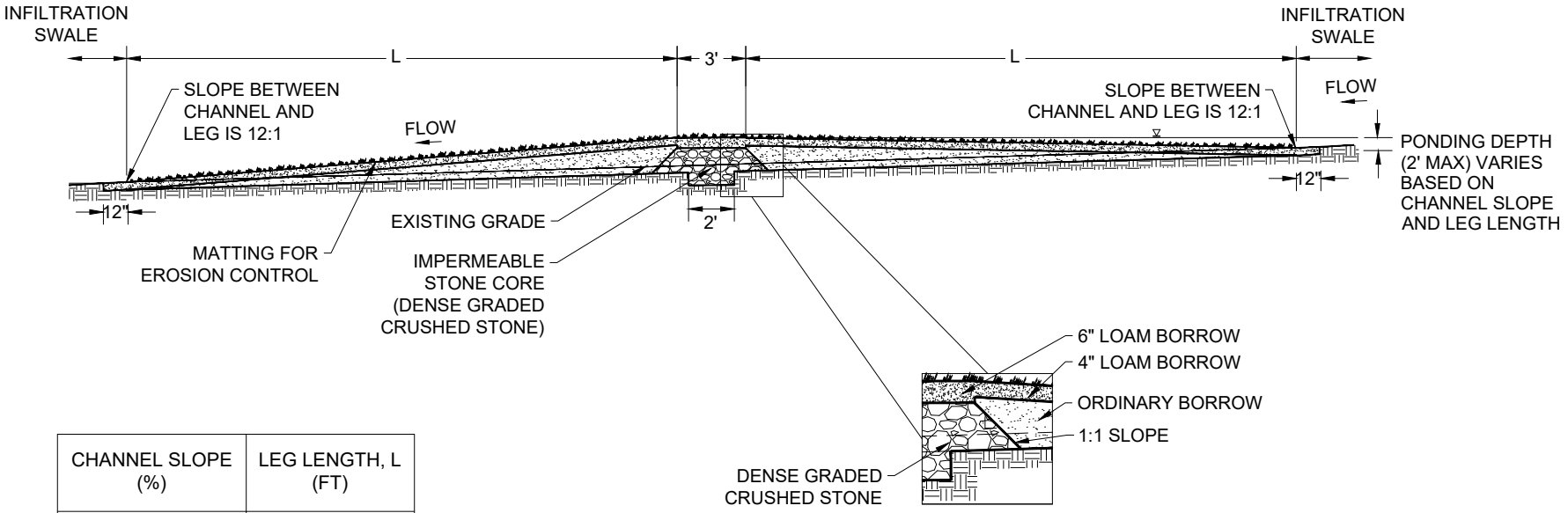


PLAN VIEW

STORMWATER BMP (CHECK DAM) WITHIN THE CLEAR ZONE

NOT TO SCALE

DO NOT USE FOR CONSTRUCTION DETAILS



CHANNEL SLOPE (%)	LEG LENGTH, L (FT)
0 - 2.8	24
>2.8 - 5.0	36

NOTES:

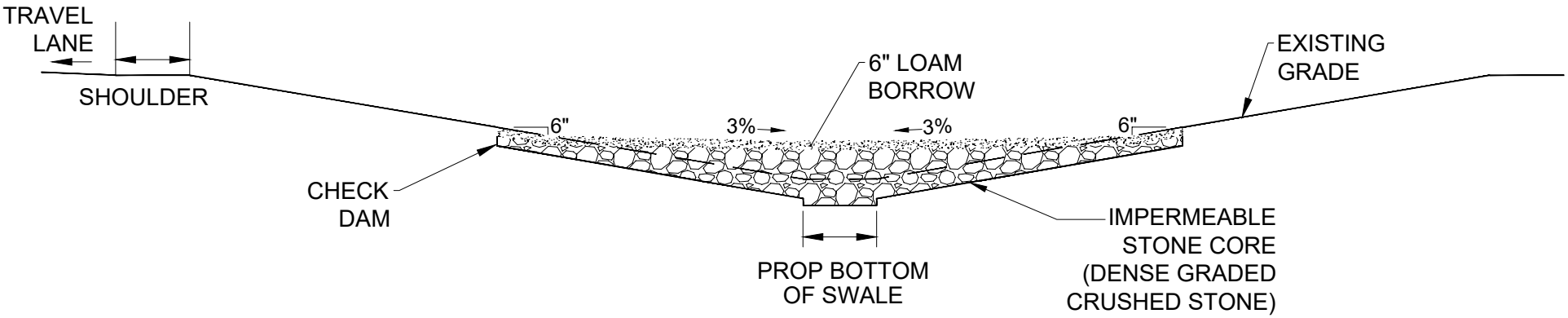
1. MAXIMUM CHANNEL GRADE FOR INFILTRATION WITH CHECK DAMS IS 5%.
2. THE SLOPE BETWEEN THE CHANNEL AND CHECK DAM LEGS IS ALWAYS 12:1.

SECTION A-A

STORMWATER BMP (CHECK DAM) WITHIN THE CLEAR ZONE

NOT TO SCALE

DO NOT USE FOR CONSTRUCTION DETAILS



SECTION B-B

STORMWATER BMP (CHECK DAM) WITHIN THE CLEAR ZONE

NOT TO SCALE

DO NOT USE FOR CONSTRUCTION DETAILS