

Appendix 6-A

Symbols and Acronyms

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If you require assistance accessing this information or require it in an alternative format, contact the Michigan Department of Transportation's (MDOT) Americans with disabilities Act (ADA) coordinator at [Michigan.gov/MDOT-ADA](https://www.michigan.gov/MDOT-ADA).

Symbols

Symbol	Definitions	Units
A_c	Flow area of approach cross section obstructed by embankment	sft
a	Pier width	ft
a'	Length of abutment projected normal to flow	ft
b	Width of bridge opening	ft
D_m	Effective mean diameter of bed material	ft
D_{50}	Median diameter of bed material	ft
Fr	Froude number	-
g	Gravitational acceleration	ft/s ²
h_i^*	Height differences at various locations along the channel	ft
h_1	Backwater	ft
h_T	Total headloss on Figure 6-1	ft
h_b	Headloss caused by bridge on Figure 6-1	ft
K_1	Correction factor for pier nose shape (p. 7.3, HEC-18)	-
K_1	Coefficient factor for abutment shape (p. 8.7, HEC-18)	-
k_1	Bed material transport exponent (p. 6.10, HEC-18)	-
K_2	Correction factor for angle of attach (p. 7.3, HEC-18)	-
K_3	Correction factor for bed condition (p. 7.3, HEC-18)	-
L	Length of pier (HEC-18)	ft
L	Lengths along channel at various points	ft
n	Manning's roughness coefficient	ft
NWS	Normal water surface	ft
ρ	Density of water	slugs/ft ³
Q	Flow	cfs
Q_a	Flow in region a of Figure 6-1	cfs

Symbol	Definitions	Units
Q_b	Flow in region b of Figure 6-1	cfs
Q_c	Flow in region c of Figure 6-1	cfs
Q_e	Flow obstructed by abutment and approach embankment	cfs
S_0	Channel slope	ft/ft
S_1	Slope of energy grade line	ft/ft
V	Velocity	fps
V_c	Critical velocity for incipient motion of sediment	fps
V_e	Velocity of flow obstructed by abutment and approach embankment	fps
V^*	Shear velocity	fps
V_i	Velocity at various locations along channel	fps
W	Width of channel	ft
w	Fall velocity of bed material	fps
WS	Water surface	-
y_a	Average depth of flow on floodplain	ft
y_c	Critical depth	ft
y_i	Depth of water along various points of the channel	ft
y_n	Normal depth	ft
y_s	Depth of scour	ft
y_o	Existing depth in contracted channel before scour	ft
α	Amplification factor for live-bed/clear water conditions	-
α_i	Area of flow in subsection of channel (Figure 6-1)	sft

Acronyms

1D	One Dimensional
2D	Two Dimensional
AASHTO	American Association of State Highway and Transportation Officials
ADT	Average Daily Traffic
AEP	Annual Exceedance Probability
ARI	Annual Recurrence Interval
BOBS	Bureau of Bridges and Structures
CFD	Computational Fluid Dynamics
CFR	Code of Federal Regulations
EFA	Erosion Function Apparatus
EGLE	Michigan Department of Environment, Great Lakes, and Energy
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FIS	Flood Insurance Study
GSN	Geotechnical Scour Number
HDS	Hydraulic Design Series
HEC	Hydraulic Engineering Circular
HEC-RAS	Hydraulic Engineering Center's River Analysis System
HGL	Hydraulic Grade Line
MCL	Michigan Compiled Laws
LTD	Long-Term Degradation
MiSIM	Michigan Structure Inspection Manual
MDOT	Michigan Department of Transportation
MS4	Municipal Separate Storm Sewer System

Acronyms

NREPA	Natural Resources Environmental Protection Act, Michigan Act 451, Public Act of 1994, as amended
NAVD88	North American Vertical Datum of 1988
NBI	National Bridge Inventory
NBIS	National Bridge Inventory System
NFC	National Functional Class
NFIP	National Flood Insurance Program
NRCS	Natural Resources Conservation Service
OHWM	Ordinary High Water Mark
RQD	Rock Quality Designation
SMS	Surface-Water Modeling System
USACE	United States Army Corps of Engineers
USGS	United States Geological Survey
VPD	Vehicles per day
WSPRO	Water Surface Profile Computation Model