

Glossary of Terms

GLOSSARY OF HYDRAULIC TERMS (Chapters 2 and 3)

A	cross-sectional area of flow, square feet
A	drainage area, acres
AHW	allowable headwater depth at culvert entrance, feet
C	coefficient of runoff which is a function of the characteristics of the drainage area
C_1	constant in Manning's Formula for full flow
D	height of culvert opening or diameter of pipe, inches or feet
d_c	critical depth, feet
H	head loss, feet (the difference between the elevation of the entrance pool surface and the outlet tailwater surface)
HW	headwater depth at culvert inlet measured from invert of pipe, feet
h_o	vertical distance between the culvert invert at the outlet and the hydraulic grade line, feet
k_e	entrance head loss coefficient
i	rainfall intensity, inches per hour
L	length of culvert, feet
n	Manning's coefficient of roughness
Q	flow in sewer or culvert discharge, cubic feet per second
R	hydraulic radius, equals area of flow divided by wetted perimeter, feet
R	inside vertical rise of elliptical, arch pipe, or boxes, feet or inches
S	inside horizontal span of elliptical, arch pipe, or boxes, feet or inches
S	slope of sewer, feet per foot
S_o	slope of culvert, feet per foot
TW	tailwater depth at culvert outlet measured from invert of pipe, feet
V	velocity, feet per second

GLOSSARY OF LOAD TERMS (Chapter 4 and Appendix B)

A	a constant corresponding to the shape of the pipe
A_{LL}	distributed live load area on subsoil plane at outside top of pipe, square feet
A_s	area of transverse steel in a cradle expressed as a percentage of the area of concrete in the cradle at the invert
B_c	outside horizontal span of the pipe, feet
B'_c	outside vertical height of the pipe, feet
B_d	width of trench at top of pipe, feet
B_{dt}	transition width at top of pipe, feet
B_f	bedding factor
B_{fe}	bedding factor, embankment
B_{fLL}	bedding factor for live load
B_{fo}	minimum bedding factor, trench
B_{fv}	variable bedding factor, trench
B_t	maximum width of excavation ahead of pipe or tunnel, feet

C	pressure coefficient for live loads
C_c	load coefficient for positive projecting embankment installations
C_d	load coefficient for trench installations
C_n	load coefficient for negative projecting embankment installations
C_t	load coefficient for jacked or tunneled installations
c	thickness of concrete cover over the inner reinforcement, inches
c	coefficient of cohesion of undisturbed soil, pounds per square foot
D_i	inside diameter of pipe, inches
D_o	outside diameter of pipe, inches
D	inside diameter of circular pipe, feet or inches
D -load....	the supporting strength of a pipe loaded under three-edge-bearing test conditions expressed in pounds per linear foot per foot of inside diameter or horizontal span
$D_{0.01}$	the maximum three-edge-bearing test load supported by a concrete pipe before a crack occurs having a width of 0.01 inch measured at close intervals throughout a length of at least 1 foot, expressed as D-Load.
$D_{ult.}$	The maximum three-edge-bearing test load supported by a pipe, expressed as D-load.
d	depth of bedding material below pipe, inches
d_c	deflection of the vertical height of the pipe
E	modulus of elasticity of concrete, pounds per square inch (4,000,000 psi)
e	base of natural logarithms (2.718)
$F.S.$	factor of safety
H	height of backfill or fill material above top of pipe, feet
HAF	horizontal arching factor, dimensionless
H_e	height of the plane of equal settlement above top of pipe, feet
h	thickness of rigid pavement
I_f	impact factor for live loads
K	ratio of active lateral unit pressure to vertical unit pressure
k	modulus of subgrade reaction, pounds per cubic inch
L	length of A_{LL} parallel to longitudinal axis of pipe, feet
L_e	effective live load supporting length of pipe, feet
M_{FI}	moment at the invert under field loading, inch-pounds/ft
M_{FIELD}	maximum moment in pipe wall under field loads, inch-pounds/ft
M_{TEST}	maximum moment in pipe wall under three-edge bearing test load, inch-pounds/ft
μ	coefficient of internal friction of fill material
μ'	coefficient of sliding friction between the backfill material and the trench walls
N	a parameter which is a function of the distribution of the vertical load and vertical reaction
N_{FI}	axial thrust at the invert under field loads, pounds per foot
N_{FS}	axial thrust at the springline under a three-edge bearing test load, pounds per foot
N'	a parameter which is a function of the distribution of the vertical load and the vertical reaction for the concrete cradle method of bedding
PL	prism load, weight of the column of earth cover over the pipe outside diameter, pounds per linear foot

p	wheel load, pounds
p	projection ratio for positive projecting embankment installation; equals vertical distance between the top of the pipe and the natural ground surface divided by the outside vertical height of the pipe
p'	projection ratio for negative projecting installations; equals vertical distance between the top of the pipe and the top of the trench divided by the trench width
p_o	live load pressure at the surface, pounds per square inch or pounds per square foot
$P(H,X)$	pressure intensity at any vertical distance, H , and horizontal distance, X , pounds per square inch or pounds per square foot
π	3.1416
q	the ratio of total lateral pressure to the total vertical load
R	inside vertical rise of elliptical, arch pipe, or boxes feet or inches
R_s	radius of stiffness of the concrete pavement, inches or feet
r	radius of the circle of pressure at the surface, inches
r_{sd}	settlement ratio
S	inside horizontal span of elliptical, arch pipe, or boxes feet or inches
S_L	outside horizontal span of pipe (B_c) or width of A_{LL} transverse to longitudinal axis of pipe, whichever is less, feet
s_d	compression of the fill material in the trench within the height $p'B_d$ for negative projecting embankment installations
s_f	settlement of the pipe into its bedding foundation
s_g	settlement of the natural ground or compacted fill surface adjacent to the pipe
$T.E.B.$	three-edge bearing strength, pounds per linear foot
t	pipe wall thickness, inches
u	Poisson's ratio of concrete (0.15)
VAF	vertical arching factor, dimensionless
W_c	fill load for positive projecting embankment installations, pounds per linear foot
W_d	backfill load for trench installations, pounds per linear foot
W_E	earth load, pounds per linear foot
W_L	live load on pipe, pounds per linear foot
W_n	fill load for negative projecting embankment installations, pounds per linear foot
W_p	weight of pavement, pounds per linear foot
W_T	total live load on pipe, pounds
W_t	earth load for jacked or tunneled installations, pounds per linear foot
w	unit weight of backfill or fill material, pounds per cubic foot
w_L	average pressure intensity of live load on subsoil plane at outside top of pipe, pounds per square foot
x	a parameter which is a function of the area of the vertical projection of the pipe over which active lateral pressure is effective
x'	a parameter which is a function of the effective lateral support provided by the concrete cradle method of bedding