APPENDIX B

NOTATION

Symbol	Term	Units
A	One-half the horizontal axis of an ellipse Area	ft ft^2
B	One-half the vertical axis of an ellipse	ft
C	Discharge coefficient Chezy's resistance coefficient	-- --
C_D	Baffle drag coefficient	--
d	Depth of flow	ft
d_1	Depth of flow at entrance to energy dissipator	ft
d_2	Hydraulic jump sequent flow depth	ft
d_3	Depth of flow above top of stilling basin end sill	ft
d_{TW}	Depth of tailwater	ft
d_P	Potential flow depth	ft
D	Conduit diameter	ft
E	Specific energy	ft
f	Darcy-Weisbach's resistance coefficient	--
F	Froude number	--
F_1	Froude number of entering flow	--
g	Acceleration due to gravity	ft/sec^2
G_o	Gate opening	ft
h	Height of stilling basin baffle Height of flip bucket lip	ft ft
h_b	Roller height	ft
h_e	Velocity head at flip bucket lip	ft
h_f	Energy loss due to friction	ft-lb/lb

Symbol	Term	Units
h_P	Horsepower	ft-lb/set
	Pressure head against the boundary of a flip bucket	ft
h_s	Height of stilling basin end sill	ft
h_T	Height of reservoir surface above a location on the spillway surface	ft
h_1	Difference in reservoir and bucket invert elevations	ft
h_2	Tailwater height	ft
h_{min}	Minimum height of flip bucket lip	ft
H	Total energy head	ft
	Distance from reservoir surface to center of gate opening height	ft
H_c	Head relative to the energy grade line at the exit portal of two-way drop inlet spillway	ft
	Maximum head on the spillway weir crest for which the gate controls discharge	ft
H_d	Spillway crest design head	ft
H_e	Total specific energy above spillway crest	ft
	Velocity head	ft
H_L	Spillway energy loss	ft
H_O	Reference head	ft
H_s	Spillway height, crest elevation minus stilling basin apron elevation	ft
H_T	Total head	ft
H_V	Vapor head of water	ft
k and k_s	Effective roughness height	ft
K	Spillway crest shape coefficient	--
	Stilling basin length coefficient	a-
K_a	Spillway abutment contraction coefficient	--
K_c	Conduit friction loss coefficient for two-way drop inlet spillway	--

Symbol	Term	Units
K_e	Entrance loss coefficient for two-way drop inlet spillway	--
K_o	Outlet velocity head loss coefficient for two-way drop inlet spillway	--
K_p	Spillway pier contraction coefficient	--
K_T	Total loss coefficient for two-way drop inlet spillway	--
L	Net length of spillway crest Length along spillway from start of the crest curve Crest length for two-way drop inlet spillway	ft ft ft
L_b	Length of stilling basin	ft
L_e	Effective length of spillway crest	ft
L_j	Length of hydraulic jump	ft
L_T	Length of tangent from the spillway tangent point to the spillway toe	ft
M	Maximum unit moment	--
n	Number of spillway piers Manning's resistance coefficient Spillway crest shape coefficient	-- $sec/ft^{1/3}$ --
p	Pressure	lb/ft^2
P	Absolute pressure Depth of spillway approach channel below the spillway crest	lb/ft^2 ft
P_B	Hydrostatic pressure exerted on stilling basin baffle unit width	lb/ft
P_L	Minimum distance from gate face to pier nose	ft
P_S	Hydrostatic pressure exerted on stilling basin end sill unit width	ft
P_T	Theoretical unit load on flip bucket surface	lb/ft^2
P_1	Hydrostatic pressure exerted by a unit width of flow entering a stilling basin	lb/ft

Symbol	Term	Units
P_3	Hydrostatic pressure exerted by a unit width of flow exiting a stilling basin	lb/ft
q	Unit width rate of discharge	$ft^3/sec/ft$
Q	Rate of discharge	ft^3/sec
r	Flip bucket radius	ft
r_{min}	Roller bucket minimum radius	ft
R	Hydraulic radius	ft
	Average unit resultant force acting on stilling basin sidewall	lb
R_a	Adjusted average resultant unit force acting on stilling basin sidewall	lb/ft
R_e	Reynolds number	
R_m	Average minimum static plus dynamic unit force at toe of hydraulic jump	lblft
R_s	Static unit force on stilling basin sidewall resulting from the sequent depth of the hydraulic jump	lb/ft
R_{a_+}	Adjusted maximum resultant instantaneous unit force acting on stilling basin sidewall	lb/ft
R_{a_-}	Adjusted minimum resultant unit force acting on stilling basin sidewall	lb/ft
R_+	Maximum instantaneous resultant unit force acting on stilling basin sidewall	lb/ft
R	Minimum instantaneous resultant unit force acting on stilling basin sidewall	lb/ft
s	Slope	ft/ft
	Slope of energy gradient	ft/ft
S	Slope of the spillway chute adjacent to the bucket	ft/ft
u	Potential flow velocity	ft/sec
V	Mean velocity	ft/sec

Symbol	Term	Units
V_B	Mean velocity at face of a stilling basin baffle	ft/sec
V_S	Velocity of surface flow	ft/sec
V_1	Mean velocity at entrance to energy dissipation	ft/sec
W_b	Width of spillway gatebay	ft
W_B	Width of stilling basin baffle	ft
X	Distance parallel to the horizontal coordinate	ft
X_H	Horizontal distance from flip bucket lip to jet impact location	ft
Y	Distance parallel to the vertical coordinate	ft
	Distance from stilling basin apron to resultant of unit force acting on basin wall	ft
Y_1	Flow depth normal to channel bottom	ft
	Vertical distance from flip bucket lip to jet impact location	ft
z	Distance from downstream end of pier to wave and spillway wall intersection	ft
Z	Height above a datum plane	ft
α	Energy correction coefficient	--
	Angle of pier end wave	degrees
	Flare angle	degrees
	Angle of rotation from start of flip bucket curve	degrees
α_T	Total deflection angle from start of flip bucket to the lip	degrees
β	Tainter gate opening angle (see Plate 6-l)	degrees
γ	Specific weight of water	lb/ft^3
δ	Turbulent boundary layer thickness	ft
δ_1	Displacement thickness	ft
δ_3	Energy thickness	ft
ΔE	Energy loss resulting from a hydraulic jump	ft
ΔL	Change in spillway chute length	ft

Symbol	Term	Units
ΔW	Change in spillway chute width	ft
θ	Slope of channel invert	ft/ft
	Interior angle between spillway face at a location and the horizontal	degrees
	Jet trajectory angle at the lip of a flip bucket	degrees
θ'	Jet trajectory impact angle	degrees
ν	Kinematic viscosity of water	ft^2/sec
ρ	Mass density of water	$lb\text{-}sec^2/ft^4$
σ	Cavitation index	--
ϕ	Angle between horizontal and flip bucket lip	degrees
	Angle between the horizontal and the floor at the beginning of the trajectory	degrees