

INDEX

This index has been issued with the eighteenth revision of HDC dated 3-87. Any errors in content should be reported to the Hydraulic Analysis Branch (ATTN: WESHS-H). The "I" notation after some numbers refers to the introduction to that particular set of HDC charts.

A

Abecasis, 111-25/1
Antivortex plate height, 230-1
Abiquiu, 221-1/3I, 221-1/3
Abrupt contractions, 228-4/1
Absolute pressure, 000-2I
Absolute roughness, 111-18/2
Absolute roughness height, 703-1I
Abutment, 111-3/1I
Abutment contraction, 111-5I
Abutment effects, 111-11I, 111-13,
 111-13/1, 111-14, 111-14/1
Abutment radius, 111-3/1I, 111-3/2
Abutment walls, upstream, 623I
Abutment, rectangular, 623I
Adam Beck (tunnel), 224-1I, 224-1
Air concentration, 050-3
Air demand, 050-1I, 050-1, 050-1/1I
Air discharge, 050-2I, 050-2
Air entrainment, 050-3I, 050-3,
 111-18I, 111-18/4
Air temperature rise, 704I, 704
Air velocity, maximum, 050-2
Airy's law, 712-1I
Alberta structural plate pipe test,
 224-1/2I
Altitude, 000-1I, 000-1, 000-2I,
 000-2
Altus (model curve), 311-6I, 311-6
Anderson's adjusted curve, 228-1I,
 228-1
Approach channel, 111-3/3I, 111-14,
 111-14/1, 122-1I, 122-1, 703-1I,
 703-1
Approach channel invert, 122-3/9I
Approach depth, 140-1/8, 310-1I
Approach depth-design head ratio,
 122-4I

Approach depth-effects, 122-1I,
 122-1
Approach depth-radius, 140-1I
Approach velocity, 122-3/9I,
 122-3/9
Aprons (sloping), 124-1I
Aqueduct, rectangular, 631I
Arkabutla, 221-1/1I, 221-1/1
Armanet, 331-1/1I, 331-1/1, 331-2,
 331-2/1
Atmospheric pressure, 000-2I,
 001-1I, 111-7I, 212-1I

B

Backwater, 010-1
Baffle, 722-1I
Baffle, hanging, 722-1I
Bank roughness, 631-4I
Bank slope, 631-4I
Barometric pressure, 000-2I,
 000-2, 534-2I, 534-2/1
Bed roughness, 631-4I, 631-4
Bend, horizontal, 534-2/1
Bend coefficient equation, 534-2I
Bend loss coefficient(s), 228-1I,
 228-1, 228-2I, 228-2, 228-2/1,
 228-6I
Bend loss coefficients, triple,
 228-6I, 228-6
Bend pressure, minimum, 534-2I,
 534-2, 534-2/1
Bend pressure head, 534-2/1
Bend radius, 534-2/1
Blakely Mountain, 221-2I

Bonneville tests, 224-1/2I,
224-1/2
Boundary layer thickness, 111-18I,
111-18, 111-18/2, 111-18/4,
111-18/5
Boundary shear, 703-1I
Boundary shear distribution,
703-1I, 703-1
Boundary shear stress, average,
703-1
Boundary shear stress, local,
703-1
Bridge pier, 010-6I
Bridge pier losses, 010-6I, 010-6,
010-6/1, 010-6/2, 010-6/3,
010-6/4, 010-6/5
Brushed-concrete flumes, 631I
Bulkhead slots, 221-2I, 221-2
Bulk modulus, 001-1I, 001-4
Bull Shoals Dam, 221-1I
Bureau of Reclamation, 111-20I
Butterfly valves, 331-1I, 331-1,
331-1/1, 331-2, 331-2/1, 331-3

C

Cavitation, 000-2I, 050-1I,
228-3I, 311-6I, 534-2I, 534-2/1,
111-25
Cavitation erosion, 212-1I
Cavitation pressures, 534-2I
Cavitation safety curves, 111-25I,
111-25, 111-25/1
Center Hill (type 1--high), 112-6,
112-6/1
Center Hill (type 1--low), 112-6,
112-6/1
Centrifugal force equation, 112-7I
660-1I
Channel cross section, 623I
Channel curve geometry, 660-2I,
660-2, 660-2/1
Channel curve(s), 660-1I, 660-1,
660-2I, 660-2/3
Channel curves, spiral, 660-2I
Channels, artificially roughened,
050-3I
Channels, circular, 010-2I, 010-4

Channels, concrete-lined, 631I
Channels, curve, 660-2/4
Channels, natural, 010-2I
Channels, rapid flow, 660-2I
Channels, rectangular, 010-4,
112-3I, 112-3, 112-4, 112-5,
610-8I, 631I, 631-4I, 660-1I
Chelan (station), 224-1I, 224-1
Chezy coefficient, 631-1I, 631-1
Chezy equation, 631I
Chief Joseph (model curve),
311-6I, 311-6
Chute, rectangular, 123-7I
Chute, sloping, 124-1I
Chute blocks, 722-1I
Chute flow, 010-1, 050-3I, 050-3
Chute slabs, 122-5I
Circular sections, 224-8I, 224-8,
224-9, 225-1I
Clapotis, 310-1I, 310-1
Clarence Cannon, 111-3/3I,
111-3/3, 111-14I
Colebatch equation, 631-4I
Coast survey, 000-1I
Composite coefficient, 224-6,
224-7
Composite head loss coefficients,
228-6I
Composite roughness, 631-4I,
631-4, 631-4/1
Concrete pipe, precast, 224-1I,
224-1
Conduit, straight, 224-3I,
224-3/1I
Conduit diameter, 228-5I,
230-1/1, 332-1I, 340-1
Conduit discharge, 224-7I, 224-7
Conduit control, 230-1I
Conduit flow, 221-1/2I, 228-6I
Conduit pressure, 534-2I, 534-2/1
Conduit pressure gradient, 221-2/2
Conduit(s), circular, 050-1I,
221-1/2I, 221-1/3I, 224-1I,
224-2I, 224-1, 224-5, 224-6,
224-7, 225-1I, 228-6I, 534-2I,
722-4I
Conduits, flood-control, 224-1I,
224-1/1I, 225-1I, 228-1I
Conduits, horseshoe, 224-10I,
224-10

Conduits, in-line circular, 228-5I,
 228-5
 Conduit(s), noncircular, 224-1I,
 224-2I
 Conduits, rectangular, 228-3I,
 228-6I, 228-6, 534-1I, 722-4I
 Conduit(s), rectangular concrete,
 221-1I,
 Conduits, steel, 224-1/1I, 224-1/1
 Conduit shape effects, 224-1/1I
 Conical transitions, 228-4I, 228-4
 Constant friction damping, 060-2I,
 060-2
 Contraction, weir end, 111-3/1I
 Contraction coefficient, abutment,
 111-3/1I, 111-3/1, 111-3/2I,
 111-3/2, 122-1/2I
 Contraction coefficient, discharge,
 111-3/2I
 Contraction coefficient, end, 711I
 Contraction coefficient, pier,
 111-3/1I, 111-3/1, 111-3/2I,
 111-3/2, 111-5I, 111-5, 111-6,
 122-1/2I, 122-2I, 122-2
 Contraction coefficient(s), 050-2I,
 111-5I, 228-4, 228-4/1, 320-1I,
 320-3I
 Contractions, square-end, 711I
 Control gates, 320-1I, 320-1
 Control structure head loss,
 221-1/3
 Convergence effects, 331-1I
 Corrugated metal pipe, 224-1/2I,
 224-1/2, 224-1/3
 Crest, ogee, 010-1
 Crest, spillway, 111-3I, 111-3,
 111-5, 111-11, 111-12, 111-12/1,
 111-13, 111-13/1, 111-14,
 111-14/1, 111-17I, 111-17,
 111-18/1, 111-19/2, 111-20,
 122-1/1I, 122-3I, 122-3,
 122-3/2, 122-3/3, 122-3/9I,
 122-3/10, 311-1I, 311-1, 311-2,
 311-3, 311-4, 311-6I, 311-6,
 311-6/1
 Crest axis, spillway, 122-2
 Crest curve, 311-1I
 Crest gates, 310-1I, 310-1/1,
 310-1/2
 Crest geometry, 111-19/2
 Crest length, standard, 111-18/1
 Crest location, 111-19
 Crest piers, 111-5I
 Crest pressures, 111-16 thru
 111-16/2, 111-24 thru 111-24/10,
 311-6I, 311-6
 Crest radius, 140-1/8
 Crest radius, sharp, 140-1I,
 140-1, 140-1/1, 140-1/6
 Crest shape, ogee, 122-4I
 Crest shape factors, 122-3/1
 Crests, low ogee, 122-3I thru
 122-5
 Critical depth, 010-1, 010-2I,
 010-6I, 010-6, 010-6/1 010-6/2,
 010-6/3, 010-6/4, 010-6/5,
 111-4, 112-3, 112-5/1, 123-2,
 123-3, 123-4, 123-5, 224-9,
 610-5, 610-5/1, 610-6, 610-6/1,
 610-6/2, 610-7, 610-8I, 610-8,
 623I, 623, 624, 624-1, 660-2/3
 Critical-depth control, 112-5/1I
 Critical depth curves, 610-5,
 610-5/1, 610-6, 610-6/1,
 610-6/2, 610-7
 Critical depth-diameter ratio,
 224-8I
 Critical depth formula, 224-8I
 Critical flow, submerged, 111-4

D

Dam, navigation, 312I, 320-8I
 Dams, low-ogee-crest, 312-I
 Darcy resistance factor, 224-2I
 Darcy-Weisbach friction factor,
 224-3I, 224-3/1I
 Deep approach-crest control, 140-1
 Deflection angle, curve, 660-2/3
 Deer Flat, 224-1I, 224-1
 Deflection angle(s), 228-1I,
 228-2I, 534-2/1
 Deflection angles, 60-deg, 703-1I
 Denison Dam, 221-1I, 221-1,
 224-1I, 320-1
 Denison (conduit), 224-1I, 224-1
 Denison model, 225-1I, 225-1
 Denver conduit #3, 224-1I, 224-1

Depth-design head ratio, 111-7I
Depth of flow in chute, 123-6
Depth-wavelength ratios, 310-1I
Design head-approach channel depth ratio, 122-3/9I
Discharge calibration curves, 625-1
Discharge coefficient, elliptical crest spillway, 111-2I
Discharge coefficient, low-ogee-crest, 122-1/1I
Discharge coefficient, spillway design head, 122-1/2I
Discharge coefficient, submerged flow, 111-4, 320-8I
Discharge coefficient, valve, 330-1/1
Discharge regulation curves, 320-8I
Displacement thickness, 111-18/2
Downpull, 320-2I, 320-2
Downstream seals, 320-2I
Drag coefficient, 112-2/1I
Drain invert, 722-1I
Drop height, 623I, 624, 624-1
Drop inlet, two-way, 230-1I
Drop structure(s), 623I, 623, 624, 624-1, 625-1I, 625-1

E

Earth dam outlet works, 221-2I, 221-2, 221-2/1, 221-2/2, 221-3I, 221-3, 221-3/1
Earth dam tunnel, 221-1
East Branch, 221-1/2I, 221-1/2
Eddies, 722-1I
Effective depth, 310-1/2
Effective pressure, 310-1/2
Effective roughness, 631-4
Effective roughness height, 631, 631-1
Elevation, end sill, 623I
Elevation, gate seat, 312
Elevation, gate sill, 320-8I
Elevation, stilling basin apron, 320-8I
Elliptical crest spillway-design, 111-20

End sill, 112-5/1I, 112-5/1, 623I, 624, 712-1I
End sill height, 623I, 623, 624, 624-1
Energy-depth curves, 123-2I, 123-2, 123-3, 123-4, 123-5, 123-6
Energy dissipator, bucket-type, 112-6I, 112-6, 112-6/1, 112-6/2
Energy dissipator, stilling well, 722-1I, 722-1
Energy dissipation, 112-5/1I, 124-1I, 722-1I, 722-4I
Energy dissipation, optimum, 623I, 722-1I
Energy dissipators, 112-7I, 112-7, 112-8I, 112-8, 224-1I, 722-1I, 722-1, 722-2, 722-3
Energy dissipators, fixed, 722-1I
Energy dissipators, flip bucket, 112-8I
Energy dissipators, riprap, 722-4I, 722-5, 722-6, 722-7
Energy dissipators, hydraulic jump, 722-1I
Energy dissipators, ski-jump, 112-8I
Energy flux, 111-18I
Energy head-abutment radius ratio, 111-3/2I
Kinetic energy correction factor, 111-2II
Energy loss, flow, 631I
Energy loss(es), 010-7I, 111-18I, 221-1/1I, 228-4I, 331-3, 631I, 733-1I
Energy method, 010-6I, 010-6/1, 010-6/2, 010-6/4, 010-6/5
Enid prototype, 225-1I, 225-1
Enid (tunnel), 224-1I, 224-1
Entrance losses, 224-3I
Excavation line, average, 224-1/6
Excavation line, minimum, 224-1/6
Exciting force, 060-2
Expansions, abrupt, 228-4/1

F

Flap gates, 340-1I, 340-1
Flip bucket, 111-18I, 122-5I
Flip bucket pressure curve,
dimensionless, 112-7I
Flip buckets, spillway, 112-7I,
112-7
Flip bucket throw distance, 112-8I,
112-8
Flood-control channels, 712-1I
Flood-control outlet works,
224-1/1I
Flood-control tunnel interior
transitions, 228-4I
Flood-control tunnels, 228-1I
Flow, rapid, 660-1I, 660-1
Flow, tranquil, 660-1I, 660-1
Flow control outlet works, 228-5I
Flow control valve, 330-1I
Flow depth, 112-5/1, 112-6I,
631-2, 631-4I, 660-2I
Flow depth to critical depth ratio,
631I
Fluid properties, 001-1I, 001-1,
001-2, 001-3
Fort Peck (tunnel), 224-1I, 224-1
Fort Randall, 111-3/3I, 221I,
221-1, 221-1/2I, 221-1/2, 221-2I,
224-1/1I, 320-2/1, 320-2/2
Fort Randall model, 225-1I, 225-1
Fort Randall tunnel, 224-1/1
Free air anomaly, 000-1I
Freeboard, 624
Free discharge, 312I, 340-1I, 711I
Free discharge for rating curve,
320-7
Frequency, forcing, 060-1I, 060-1,
060-1/1, 060-2
Frequency, natural, 060-1I, 060-1,
060-1/3, 060-1/4, 060-1/5, 060-2
Frequency, vortex trail, 060-1/1
Friction design graph, 224-5
Friction factor, 224-5, 224-6
Froude number(s), 050-1I, 050-2,
112-I, 112-2/1I, 112-2/1,
112-5/1I, 112-5/1, 112-6I,
124-1I, 631I, 631-2, 660-1I,
660-2/3

G

Gaden, 331-1/1, 331-2
Garrison, 221-2I
Garrison 1957, 224-1/1I
Garrison model, 225-1
Garrison penstock, 224-1/1
Gate bottom, 320-2I
Gate coefficient, 320-2/3
Gate-controlled discharge, 312I
Gate height, 310-1/2, 320-2
Gate lip, 311-1I, 311-2
Gate lip shapes, 320-1I, 320-1
Gate projection, 060-1/1
Gate radius, 311-3, 311-6I, 320-4I
Gate slot losses, 224-3I
Gate seat, 311-1, 312I, 320-7
Gate seat location, 311-6I,
311-6/1, 312I
Gate sill(s), 320-4I, 320-8I
Gate slots, 212-1I, 212-1,
212-1/1, 212-1/2, 221-2, 320-2I,
320-2/3
Gate top seal, 320-2I
Gate trunnion, 311-3
Gate valve, ring-follower type,
330-1I
Gate valve, simple disk, 330-1I
Gate valves, 330-1I, 330-1,
330-1/1
Gate vibrations, 060-1I, 060-1,
060-1/1, 060-1/2, 060-1/3,
060-1/4, 060-1/5
Gate well water surface, 320-2/2,
320-2/3
Gavins Points, 111-3/3I
Geodetic survey, 000-1I
Gravity, 000-1I, 000-1
Gravity forces, 320-2I, 320-2,
320-2/3
Ground roller, 623I

H

Hartwell, 112-7
Head fluctuation, 534-2/1
Head discharge, high, 312I

- Head gate, low, 312I
 Head loss coefficient curve,
 733-1I
 Head loss(es), 010-7, 221-1/1I,
 224-1/5I, 228-1, 228-2, 228-2/1,
 228-4I, 228-4, 228-6I, 228-6,
 330-1, 331-3, 340-1I, 340-1,
 534-1I, 534-1, 733-1I, 733-1
 Head losses, flap gate, 340-1I
 Head losses, junction box, 228-5I
 Head loss coefficient(s), 010-7,
 228-4/1, 228-6I, 340-1I, 340-1,
 733-1I
 Head on crest-design head ratio,
 122-2
 Head orifices, low, 312I
 Headwater elevations, 112-1I
 Helical corrugation, 224-1/2I
 Hoist load, 320-2/3
 Hoover Dam model tests, 224-1/1I,
 224-1/1
 Horizontal apron, 124-1I
 Horizontal contraction ratio,
 010-6I, 010-6, 010-6/1, 010-6/2,
 010-6/3, 010-6/4, 010-6/5
 Horizontal intercept, 010-2I
 Horton-Einstein equation, 631-4I
 Howell-Bunger valves, 332-1I,
 332-1, 332-1/1
 Hugo, 111-3/3I
 Hydraulic depth, 224-10I
 Hydraulic diameter, 228-6I, 228-6
 Hydraulic diameter, conduit, 228-6I
 Hydraulic elements, 224-2I, 224-2,
 224-10I, 224-10
 Hydraulic forces, 320-2I, 320-2,
 320-2/3
 Hydraulic jump, 010-1, 050-1I,
 111-4, 112-1I, 112-1, 112-2,
 112-2/1I, 112-2/1, 112-5/1I,
 112-6I, 124-1I, 124-1
 Hydraulic jump equation, 112-3I
 Hydraulic load, 310-1/2
 Hydraulic radius-width-depth curves,
 123-7, 123-8
 Hydraulic torque, 331-3
 Hydraulic torque characteristics,
 331-1I
 Hydropower tunnels, 224-1/5I
 Hydrostatic pressure, 122-5I, 310-1
- I
- Hyperbolic functions, 310-1/1
- I
- Ice pressures, 704I, 704
 Impact basin, 722-2
 Incipient cavitation index, 000-2I
 Intake coefficient, 221-1, 224-3I
 Intake friction losses, 320-1I
 Intake gate passage, 221-2I
 Intake losses, 221-1I, 221-1,
 221-1/1I, 221-1/1, 221-1/2I,
 221-1/2
 Intake tower, 221-2I
 Intermediate basin width-drain
 diameter ratios, 722-1I
 Intermediate head ratios, 111-1II,
 111-16I
 International gravity formula,
 000-1I
 Isbash method, 712-1I, 712-1
- J
- Jet, 050-1/1I, 112-7I, 112-8I,
 225-1I
 Jet, diverging hollow conical,
 332-1I
 Jet, entering, 112-6I, 722-1I
 Jet, falling, 623I
 Jet, free, 112-6, 122-4I
 Jet, free discharging, 225-1I
 Jet, free falling, 122-3/9I
 Jet impact location, 624-1
 Jet stray, 050-1/1
 Jump entrainment, 050-1/1
 Junction box, 228-5I, 228-5
- K
- Kanopolis, 320-1
 Kaysinger Bluff, 111-3/3I, 111-3/3

Kinematic viscosity, 001-II,
224-1, 224-1/1, 224-1/2, 224-5,
228-6I, 228-6, 63II, 63I
Kittitas data, 050-3I, 050-3

L

Latitude, 000-II, 000-1 .
Lemos, 311-6I, 311-6, 311-6/1
Lip angle, 112-6, 112-6/1
Lock culverts, 534-II, 534-1,
534-2I, 534-2, 534-2/1
Los Angeles district equation,
631-4I
Loss coefficient, inlet 230-1
Loss coefficient, valve, 330-1
Loss coefficient curves, 228-4I
Low flow outlets, 230-II, 230-1
Low-monolith diversion, 71II, 71I

M

Madden Dam, 320-1
Magnification factor, 060-II,
060-2
Manning formula, 610-II, 610-1,
63II, 631-4I
Manning's n, effective, 631-4I,
631-4
McPherson, 331-1/1
Mean trajectory, 624-1
Midtunnel control, 221-1/3I
Milan tests, 224-1/1I
Miter, single, 228-2, 228-2/1
Miter bends, 228-2I
Momentum method, 010-6I, 010-6/1,
010-6/3, 010-6/5
Monolith, 71II
Munich tests, 010-7I

N

Nappe, 111-II, 111-2/1
Nappe aerated, 140-1/2

Nappe, lower, 111-19I, 111-19,
112-7I, 122-1/2I, 624-1
Nappe, upper, 122-1/2I, 624, 624-1
Nappe profile, lower, 122-3I,
122-4I, 140-1/2
Nappe profile(s), upper, 111-11I,
thru 111-14/1, 111-23, 122-3/9I,
122-3/10
Nappe surface coordinates, lower,
140-1/3, 140-1/4, 140-1/5
Nappe trajectory, free, 624-1
Nappe trajectory, submerged, 624-1
Natural channels, 010-2I
Navigation dams, 312I, 320-8I
Negative pressure(s), 000-2I,
111-7I, 211-II, 311-6I
Neyropic tests, 224-1/1
Neyropic tests-cast iron, 224-1/1
Neyropic tests-rolled steel,
224-1/1
Neyropic (tests-precast concrete),
224-II, 224-1
Nonuniform flow, 010-II, 010-2I,
224-8I
Nikuradse's sand grain roughness,
224-1/5I, 224-1/6
Nonsubmerged flow, 311-II
Norfork type B, 320-2/1
Norfork type F, 320-2/1
Normal depth, 010-1, 010-2,
610-8I, 610-8
Normal depth curves, 610-8I
Nose shape effect, 111-5

O

Oahe (dam), 221-1/3I, 221-1/3,
224-1I
Oahe prototype, 225-1T, 225-1
Oahe (tunnel), 224-1I, 224-1
Oakley, 111-3/3I
Ontario (power tunnel), 224-1I,
224-1
Open channel(s), 010-7I, 112-1,
112-2, 320-4I, 320-4, 320-5,
320-6, 320-7, 320-8I, 320-8,
320-8/1, 631-1

- Open channel flow, 010-1I, 010-1,
 010-2I, 010-2, 010-3, 010-4,
 010-5, 010-5/1, 010-5/2 010-5/3,
 010-6I, 010-6, 010-6/1, 010-6/2,
 010-6/3, 010-6/4, 010-6/5,
 010-7I, 010-7, 112-2/1I, 224-8,
 224-9, 610-1I, 610-1, 610-1/1,
 610-8I, 610-8, 610-9, 610-9/1,
 610-9/1-1, 631I, 631, 631-2,
 631-4I, 631-4, 631-4/1
 Open channel flow, subcritical,
 623I, 623, 624, 624-1
 Orifice control, 230-1I
 Orifice discharge, 311-1I
 Orifice equation, 320-1I
 Orifice equation, standard, 312I,
 320-8I, 331-1I
 Orifice loss coefficients, 733-1I
 Orifices, thin plate, 733-1I,
 733-1
 Osceola (type 1), 112-6, 112-6/1
 Outlet conduit, circular, 221-1/2I
 Outlet tunnel, circular, 221-1/2I
 Outlet works, 722-1I
 Outlet works tunnel, 224-3I
 Overbreak, 224-1/5I
 Overbreak thickness, 224-1/6
 Overflow crests, high gated,
 111-5, 111-6
 Overflow dams, high, 111 series,
 112 series
 Overflow dams, low, 120 series
 Overflow spillway crests (sloping
 upstream faces), 111-7I
 Overflow spillways, gated, 111-5I
- P
- Parallelepiped, rectangular, 320-2I
 Parallelepipeds, 703-1I
 Pendulum, 000-1I
 Penstock tee, 733-1I
 Physical constants, 000-1I, 000-1,
 000-2I, 000-2
 Pier bay (center line), 111-12,
 111-16/1
 Pier effect, 111-3/3I, 111-5I
- Pier height, baffle, 623I
 Pier heights, 122-3/9I
 Pier length effect, 111-6
 Pier section, 010-6I
 Pier shape, 010-6I, 111-5I
 Pier shape coefficient, 010-6I,
 111-22
 Pier width, 010-6
 Piezometer rings, 221-1/2I
 Piezometric head, 228-3, 534-2
 Piezometers, 111-16I
 Pine Flat, 111-3/3I, 112-7,
 211-1I, 211-1/2, 221-1I, 221-1,
 320-2/1
 Pine Flat (Norfork), 320-2/2
 Pine Flat (sluice), 224-1I, 224-1
 Pine bends, 228-3I, 228-3
 Polytechnic Institute of Milan
 steel pipe, 224-1/1
 Pool regulation curve, 320-8I
 Potential flow depth, 111-18/2,
 111-18/5
 Potential velocity, 111-18/2
 Pressure, minimum allowable,
 111-24I
 Pressure, spillway crests, 111-24I
 Pressure, static, 010-6I, 310-1I
 Pressure change coefficients,
 228-5I, 228-5
 Pressure coefficients, 212-1I,
 212-1, 212-1/1, 212-1/2
 Pressure contours, 320-2I
 Pressure differential, 331-2
 Pressure distribution, 112-7I,
 225-1I, 310-1I, 310-1/2, 330-1I
 Pressure-drop coefficients,
 211-1I, 211-1, 211-1/1, 211-1/2,
 221-2I, 221-2, 221-2/1, 221-2/2,
 221-3I, 221-3, 221-3/1
 Pressure-drop equation, 221-3I
 Pressure flow, 224-2I, 224-2,
 228-3I, 228-3
 Pressure fluctuations, 212-1I,
 228-3I, 534-2I
 Pressure gradient, friction,
 228-5I
 Pressure gradient elevation,
 221-3I

- Pressure gradient(s), 212-1,
 212-1/1, 212-1/2, 221-1/2I,
 221-1/3I, 221-2I, 225-1I,
 228-3, 228-6I, 331-3, 534-2I,
 534-2/1
 Pressure head, 320-2I, 534-2I
 Pressure head, bend, 534-2I
 Pressure head against boundary,
 112-7I
 Pressure on crest, vertical, 111-17
 Pressure resultants, 111-17I,
 111-17
 Pressure wave, 060-1/2, 060-1/5
 Pressure wave frequency, 060-1/2
 Pressure wave velocity, 060-1/2
 Proctor, 111-3/3I
 Prosser, 224-1I, 224-1
 Pump suction lines, 000-2I
- Q
- Quabbin (aqueduct), 224-1I, 224-1
 Quadrant, downstream, 111-1
 111-2, 111-7I, 111-9, 111-19I,
 111-19, 111-19/1, 111-19/2,
 122-3/2, 122-3/3, 122-3/5,
 111-20
 Quadrant, upstream, 111-1, 111-2/1,
 111-3I, 111-7I, 111-9, 111-18/1,
 111-19I, 111-19, 111-19/1,
 111-19/2, 111-20, 122-3/2,
 122-3/3
- R
- Rating curve(s), 111-3/3I, 111-21I,
 221-1/1I, 311-5, 312I
 Rating curves, submerged spillway,
 111-4/2
 Regulated outlet works, 050-1I,
 050-1, 050-1/1I, 050-1/1
 Reference pressure station, 212-1I,
 212-1, 212-1/1, 212-1/2
 Relative roughness, 224-1/5I,
 224-1/6, 631I
 Relaxation techniques, 111-20I
- Reservoir pool, 221-2/2, 312I
 Reservoir water surface, 221-3I
 Resistance coefficient, Chezy,
 631I
 Resistance coefficient, Darcy-
 Weisbach, 224-1/2I, 631I
 Resistance coefficients, Manning's
 n, 631-1
 Resistance coefficients, 224-1I,
 224-1, 224-1/1I, 224-1/1,
 224-1/2I, 224-1/2, 224-1/3,
 224-1/4, 224-1/5I, 224-1/5,
 224-1/6, 631I, 631, 631-2,
 660-2I
 Resonance, 060-1I, 060-1, 060-1/4,
 060-1/5
 Reynolds number, 111-21I, 224-1/3,
 224-1/5I, 224-5, 228-1I, 228-2I,
 228-3I, 228-4I, 228-6I, 228-6,
 534-2I, 631I, 631, 733-1I
 Riprap, 631I, 703-1I, 722-4I
 Riprap blanket, horizontal, 722-4I
 Riprap channels, 631I
 Riprapped banks, 631I, 631-4I
 Riprap protection, 112-5/1I,
 703-1I, 712-1I, 722-1I
 Roller depth, 112-6
 Roller heights, 112-6I, 112-6/2
 Roughness coefficients, 631-4I
 Rubble masonry, 631I
- S
- Sainflou wave pressure theory,
 310-1I
 San Gabriel (penstocks), 224-1/1I,
 224-1/1
 Sardis, 221-1/2I, 221-1/2
 Scour hole geometry, 722-4
 Scour holes, 722-4I
 Sea level, 000-1I, 000-1
 Seawater, 001-1
 Secondary roller, 623I
 Sequent depths, 112-5/1I
 Sequent depth curves (rectangular
 channels), 112-3I, 112-3, 112-4,
 112-5

- Sharp-crested-weir coefficients, 711I
 Sidewall effect, 050-3I
 Sill, longitudinal, 624
 Sill, low, 312I, 320-8I
 Sill height, 112-5/1I, 320-4I
 Sill submergence, 320-8I
 Sill submergence-gate opening ratio, 320-8I
 Simple curve geometry, 660-2/2
 Siphons, 230-1I, 534-2I
 Skin plate, 311-3, 320-2I
 Sleeve travel, 332-1
 Slide gates, 050-1I, 320-1I, 320-2I
 Slope, noncontinuous, 124-1I, 124-1/1
 Slope, mild, 010-1
 Slope, steep, 010-1
 Slope coefficients, 610-1, 610-1/1
 Slope function, 111-20, 311-4
 Slope roughness, side, 631-4
 Slopes, side, 712-1I
 Slot width-depth ratios, 212-1/2
 Sluice, horizontal, 211-1I, 211-1/2
 Sluice depth, 050-1I
 Sluice entrances, 211-1I, 211-1, 211-1/1, 211-1/2
 Sluices, rectangular, 534-2I
 Solar energy, 704I, 704
 Spavinaw (aqueduct), 224-1I, 224-1
 Speed of sound (water), 001-1I, 001-5
 Spillway, chute, 123-6, 123-7I, 123-7, 123-8, 123-9, 124-1I, 124-1, 124-1/1
 Spillway elliptical crest design, 111-25I
 Spillway, gated, 310-1/2
 Spillway, gated with piers, 111-3/1, 111-3/2
 Spillway, piers, 111-22
 Spillway, navigation dam, 320-8I
 Spillways "underdesigned," 111-25I
 Spillway abutment, 122-3/9I
 Spillway chutes, 123-2I
 Spillway crest(s), 111-3I, 111-3, 111-17I, 111-20, 122-1/1I, 122-3I, 122-3/9I, 122-3/10, 311-1I, 311-1, 311-2, 311-3, 311-4, 311-6I, 311-6, 311-6/1
 Spillway crest (concrete sections), overflow, 111-3/1I, 111-3/1, 111-20
 Spillway crest (embankment sections), overflow, 111-3/2I, 111-3/2
 Spillway crest (offsets and risers), 111-19I, 111-19, 111-19/1, 111-19/2
 Spillway crest head ratios, 122-4I
 Spillway design, 140-1/8, 111-25I
 Spillway design flow, 111-18I, 122-1/2I
 Spillway discharge, 111-3/3I, 111-3/3, 111-18I, 111-21, 112-6I, 122-4I, 311-2, 311-5
 Spillway energy losses, 111-18I, 111-18, 111-18/1, 111-18/2, 111-18/3, 111-18/4, 111-18/5, 112-7I, 112-8I
 Spillway face, 111-18I
 Spillway piers, 704I
 Spillway rating curve, 122-1/2
 Spillways, elliptical, 111-20 thru 111-25/3
 Spillways, gated, 140-1/4, 140-1/5, 140-1/6, 140-1/7, 140-1/8, 311-6I
 Spillways, low ogee, 122-5I
 Spillways, morning glory, 140-1I, 140-1, 140-1/1, 140-1/2, 140-1/3
 Spillways, shaft, 140-1I
 Spillways, unmodeled, 122-1/2I
 Spillway stilling basin(s), 112-1I, 112-1, 112-2, 112-2/1I, 112-2/1
 Spillway stability analysis, 310-1I, 112-3I, 112-3, 112-4, 112-5, 112-5/1I, 112-5/1
 Spiral curve geometry, 660-2/3
 Spiral curve tables, 660-2/2
 Spiral transitions, 660-1I, 660-2I
 Sprenger's coefficients, 228-6I
 Stable channel conditions, 623I

- Stage-discharge relation, 111-3/3I, 111-3/3
 St. Anthony Falls Hyd. Lab., 230-1
 Standard corrugations, 224-1/4
 Standard crest, 111-18/3, 122-1I, 122-4
 Standard crest location of critical point, 111-18/2
 Step method, 123-2I
 Stewards Ferry (Type 1), 112-6
 Stilling basin, rectangular, 722-3
 Stilling basin, standard-type 112-5/1I
 Stilling basin, trapezoidal, 722-3
 Stilling basin apron, 320-8I
 Stilling basin design, 722-2
 Stilling basin riprap, 712-1I
 Stilling basin floor, 623I, 624, 624-1
 Stilling basin(s), 111-18I, 111-18/4, 111-18/5, 124-1I, 124-1, 124-1/1, 224-1/1, 228-1I, 623I, 624, 712-1I, 712-1, 722-1I, 722-3
 Stilling basin walls, 124-1I
 Stilling well, 722-1
 Stockholm tests, 010-7I
 Stone stability, 712-1I, 712-1
 Storm drain, 722-4I
 Storm drain discharge, 722-5, 722-7
 Storm drain exit portals, 722-4I
 Storm drain outflow, 722-4I
 Storm drain outlets, 722-1I, 722-1, 722-2, 722-3, 722-4I, 722-4, 722-5, 722-6, 722-7
 Straight sidewall flare, 221-3
 Straub's adjusted curve, 228-1I, 228-1
 Strouhal number, 060-1I, 060-1/1
 Structural losses, 221-1/3
 Subatmospheric pressures, 050-1I
 Subcritical flow(s), 610-1I, 610-8I, 623I, 631I
 Subcritical velocities, 631I
 Submerged crest coefficients, 111-4I, 111-4
 Submergence effects, 111-4/2
 Submerged weir coefficients, 111-4I, 111-4
 Submerged flap gates, 340-1I
 Submerged flow coefficient, 71I
 Submerged weir to unsubmerged weir ratio, 71II
 Submergence (depth), 71II
 Supercritical flow(s), 111-4, 123-2, 123-3, 123-4, 123-5, 610-1I, 610-8I, 631I
 Superelevation, 660-1I, 660-1
 Suspended gate, 060-1/3
 Surface curve classifications, 010-1I
 Surface roller, 623I
 Surface tension, 001-1I, 001-3
 Surge height(s), 112-6I, 112-6/1
 Surge tank riser, 733-1I
 Surge tanks, 224-1/1I, 224-1/5I, 733-1I, 733-1
- T
- Tailwater, exit-channel, 122-4I
 Tailwater-critical depth ratio, 623I
 Tailwater depths, excessive, 112-6I
 Tailwater surface, 124-1I, 624-1
 Tailwater depth over sill, 320-8I
 Tailwater depth to weir head ratio, 71II
 Tailwater forces, 124-1I
 Tainter gate installation, 320-7
 Tainter gate(s), 111-1II, 122-3/9I, 310-1, 311-1I, 311-1, 311-2, 311-3, 311-4, 311-5, 311-6I, 311-6, 311-6/1
 Tainter gates in conduits, 320-3I, 320-3
 Tainter gates in open channels, 320-4I, 320-4, 320-5, 320-6, 320-7, 320-8I, 320-8, 320-8/1
 Tainter gates on low sills, 320-8I
 Tainter valves, reverse, 534-1I, 534-1
 Tangent chute, 122-3/9I
 Tangent section, 122-3I
 Temperature, water, 001-1, 001-2, 001-3, 001-4, 001-5, 631-2

Temperature effect, 001-1I, 001-1,
001-2, 001-3, 001-4, 001-5
Tennessee-Tombigbee waterway,
625-1I
Terminal wall, 112-5/1I
Theoretical values, 000-1I
Tionesta model, 221-1I, 221-1,
221-1/1I, 221-1/1
Toe curve(s), 122-3I, 122-3/9I,
122-4I, 122-5I
Toe curve pressures, 112-7,
122-5I, 122-5
Toe curve radii, 122-1/1I
Toe curve radius-total head
ratios, 122-5I
Topography, 140-1I
Torque coefficients, 331-1I, 331-2
Torque curves, prototype, 331-1I
Tractor gates, 050-1I, 320-1I,
320-2I
Transition losses, 224-3I, 228-4,
228-4/1
Transmissibility ratio, 060-1I,
060-1
Trapezoidal channels, 010-2I,
610-1I, 610-2, 610-2/1,
610-2/1-1, 610-2/2, 610-2/3,
610-2/3-1, 610-3, 610-3/1,
610-3/1-1, 610-3/2, 610-3/3,
610-3/3-1, 610-3/4, 610-3/5,
610-3/5-1, 610-4, 610-4/1,
610-4/1-1, 610-5, 610-5/1,
610-6, 610-6/1, 610-6/2, 610-7,
631I, 631-4I, 660-1I
Trashrack losses, 010-7I
Trunnion, 311-1I, 311-2
Trunnion, center, 311-2
Trunnion elevations, 111-11I,
122-3/9I, 311-6I, 320-4I, 320-7
Turbine draft tubes, 000-2I
Turbulent boundary layer, 111-18I,
122-3/9I
Turbulent flow, 111-18I, 112-1I,
Turbulent flow pressure, 534-2I
Turbulent fluctuations, 050-3I
Tunnel hydraulics, 224-1/5I
Tunnel muck, 224-1/5, 224-1/6

U

Umatilla River, 224-1I, 224-1
Uncontrolled flow, 122-1/2I
Underdesigned spillways, 111-21,
111-25
Uniform channel, 010-1, 010-2I
Uniform channel sections, 631-4I
Unlined rock tunnels, 224-1/5I,
224-1/5, 224-1/6
Unstable channels, 722-1I
Unstable gullies, 722-1I
Upper nappe profiles, 111-11I,
111-11, 111-12, 111-12/1,
111-13, 111-13/1, 111-14,
111-14/1, 111-23
Upstream depth, 112-5/1I, 320-4I,
320-7
Upstream face, 111-17I, 221-2I,
624
Upstream face, sloping, 111-8,
111-9, 111-20, 122-3I, 122-3,
122-3/1, 122-3/2, 122-3/3,
122-3/4, 122-3/5, 122-3/9I,
122-3/9, 122-3/10, 122-4I,
122-4, 211-1/2, 221-2
Upstream slopes, 111-21
Upstream structure, 623I
Upthrust, 320-2I, 320-2/3
Upthrust on gate bottom, 320-2/1

V

Vacuum tank, 111-25I
Valve diameter, 331-1, 331-1/1,
331-2, 331-2/1, 331-3
Valve in pipe, 331-1, 331-2
Valve loss, required, 331-3
Valve loss coefficient, 534-1I,
534-1
Valve opening, 330-1, 331-2
Valve shape(s), 331-1, 331-2,
331-3
Vapor pressure, 000-2I, 001-1I,
534-2I
Vapor pressure (water), 001-2
Vapor pressure head, 534-2/1

Varied flow function, 010-2I,
010-5, 010-5/1, 010-5/2,
010-5/3, 123-2I
Velocity, average channel, 660-1I
Velocity, conduit, 228-5, 228-6,
340-1I, 340-1, 534-2I, 534-2/1
Velocity, culvert, 534-2I
Velocity, drain outlet portal
design velocity, 722-1I
Velocity, jet, 320-2/3
Velocity, point, 111-18/2
Velocity, shear, 050-3I
Velocity, terminal, 050-3I
Velocity distribution, 112-2/1I,
112-2/1
Velocity head, 000-1I, 010-6I,
123-2I, 211-1I, 221-1I, 221-1/1I,
221-2I, 221-2, 221-2/1, 221-3,
221-3/1, 228-1I, 228-6I, 330-1I,
623, 624
Velocity head, approach, 122-2I,
122-3I, 320-8I
Velocity head, bucket lip, 112-8
Velocity head, conduit, 212-1I,
212-1, 212-1/1, 212-1/2,
221-1/1I, 221-1/2I, 221-1/2,
221-1/3I, 221-1/3
Velocity head, gate passage,
221-1/1I, 221-1/1, 221-1/2I,
221-1/2, 221-1/3I, 221-1/3,
221-2/2
Velocity head, jet, 112-8I, 320-2/3
Velocity head, uniform conduit
section, 221-3I
Velocity in riser, 733-1I
Velocity versus stone diameter,
712-1I, 712-1
Vena contracta, 050-1I, 050-1,
050-2I, 050-2, 320-3I, 320-4I
Vertical distance-design head
ratio, 122-2
Vertical drop, 112-8I, 112-8
Vertical gate, 534-1I
Vertical intercept, 010-2I
Vertical lift gates, 312I, 312,
320-1I, 320-2I, 320-2, 320-2/1,
320-2/2, 320-2/3
Vertical limit, 000-2I
Vibrations, forced, 060-2I, 060-2
Victoria (Aqueduct), 224-1I, 224-1

Von Karman-Prandtl equation,
224-1/5I
Vortex trail, 060-1I, 060-1/1,
060-1/4

W

Wappapello, 221-1/1I, 221-1/1
Wasielewski curve, 228-1
Water (weight), 010-6I
Water passage, crescent-shape,
330-1I
Water passage, lens-shaped, 330-1I
Water-quality control tower,
111-11I, 111-14
Water surface, 111-18/2, 660-1I,
660-2/4
Water-surface profile(s), 010-2I,
111-23I, 122-3/9I, 123-2I, 123-6
Wave height, 310-1I, 310-1
Wave length, 310-1I, 310-1,
310-1/1
Wave length, design, 310-1/2
Wave pressure effects, 310-1/2
Wave pressure(s), 310-1I, 310-1,
310-1/1, 310-1/2
Weir, broad-crested, 111-3I, 711I
Weir control, 230-1I
Weir, 45-degree downstream
sloping, 122-3I
Weir, sharp-crested, 111-2/1,
111-3I, 111-3/3I, 111-4I, 111-9,
111-17I, 111-19I, 111-20I,
122-1I, 122-1/2I, 122-1/2,
122-3I, 122-3/1, 122-3/2,
122-3/3, 122-3/4, 122-3/5,
122-3/9I, 122-4I, 140-1I, 140-1
Weir, sloping, 111-7I
Weir, rectangular broad-crested,
711I
Weir, round, 122-1/2I
Weir, round-crested, 111-3I,
111-4I
Weir, vertical, 111-7I
Weir end contraction, 111-3/1I
Weir face, 122-4
Weir head, 122-3/9I, 623, 624,
711I

Weir nappe geometry, 122-3/1
Weisbach curve, 534-1I
Wetted perimeter, 224-2I, 224-2,
224-10I, 224-10, 631-2
Whitney (Type 1), 112-6, 112-6/1
Width-depth ratio, 050-3I
Wolf Creek (Type 1), 112-6,
112-6/1

Y

Yarnell pier-shape coefficient,
010-6/4
Youghiogheny, 221-1/3I, 221-1/3
Youghiogheny model, 225-1I, 225-1