Alberta

Freedom To Create. Spirit To Achieve.

Channel Capacity Calculator

Bridge Planning Practitioners Workshop

April 2012

Government of Alberta

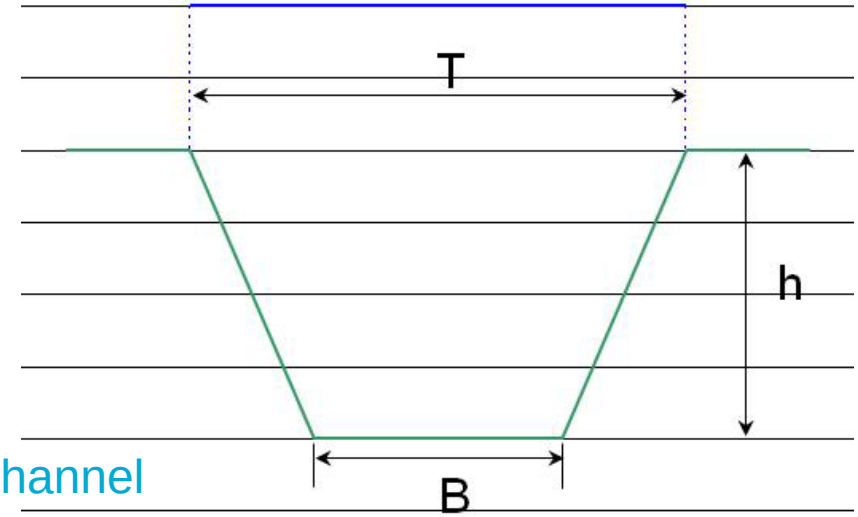
Transportation

Open Channel Flow

- Need design Y, V, Q for channel
  - Natural channel - no structure present
  - Will form boundary conditions for structure hydraulics
- Defined by application of Hydrotechnical Design Guide
  - Channel capacity, historic HW, runoff potential
  - Consistent with other sites on channel (HIS)
- Hydraulic Parameters
  - Typical Channel (B, h, T, s, roughness)

Boundary Conditions – Typical Channel

- Equivalent Trapezoidal shape
  - B = Bed Width
  - h = Bank Height)
  - T = Top Width
- Typical :
  - Evaluate many sections of nearby channel
  - Focus on relatively straight reaches
  - Avoid areas influenced by past construction
  - B, T – airphotos, survey, DEM, LiDAR
  - h – survey, DEM, site measurements, LiDAR, scale from photos
  - Many values published in HIS



Open Channel Flow - Slope

- Rise / Run along channel
- Determine from DTM (HIS Tool)
  - "Rise" must be clear (larger than bed irregularities)
  - Typically requires longer "Run" than is practical to survey
  - Channel survey expensive, awkward
  - Structure may have influenced profile within survey
- Sites with slope break near crossing:
  - Confirm based on channel changes e.g. plan form
  - HDG – focus on u/s channel (flow delivery)
  - Hydraulics – focus on d/s channel (backwater effect)

Open Channel Flow - Type

- No d/s hydraulic influence
  - Normal Flow ($S_f = S_o$)
  - Tool – “Channel Capacity Calculator”
- d/s hydraulic influence
  - Structure – e.g. weir, bridge, culvert, dam
  - Channel change – slope, width
  - Gradually Varied Flow (GVF) profile to crossing site
  - Tool – “Flow Profile”
- u/s hydraulic influence – rare (steep, short impact)

Boundary Conditions – Normal Flow

Channel Capacity Calculator

				h	Y_{cc}	Y_{spec}
S	0.00500		Y	2	3	2.2
B	5.0		A	15	25	17.0
h	2.0		d	1.3	2.3	1.5
T_h	10		V	1.7	2.5	1.9
Roughness	0.050		Q	25.5	61.9	31.7
HDG 'n'	0.050					

Boundary Conditions – Rating Curve