Culverts - Basic Structural Considerations

https://m.youtube.com/watch?v=NTbhyHNA1Vc

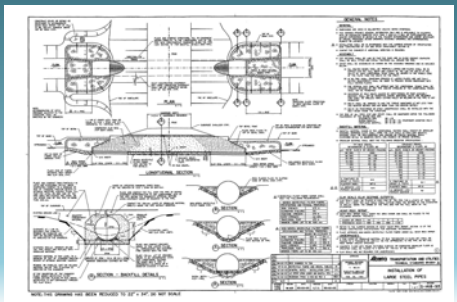
Introduction

- ~ 6000 bridge size culverts in Alberta
- Two types of culverts:

➢ Rigid Structures (concrete or timber)

➢ Flexible Structures (corrugated metal)

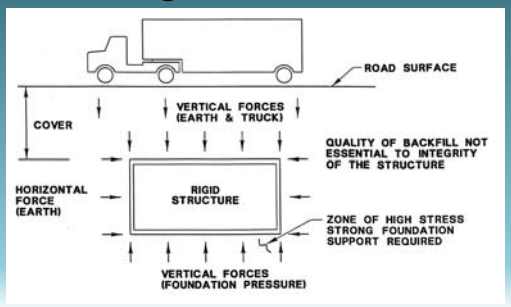
Std. Drawing S1418



Rigid Structures

- Concrete (5%) – either box or pipe
- Timber (1%) - no longer being built
- No noticeable deflection under loads
- Concrete is a durable material
- Concrete is relatively expensive

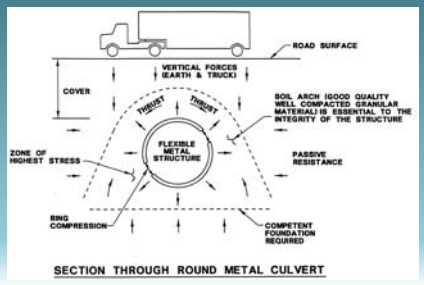
Rigid Structures



Flexible Structures

- Metal Culverts comprise 94%
- Fabricate to almost any shape
- Relatively cheap
- Backfill & Installation CRITICAL
- Susceptible to structural problems
- Prone to corrosion, abrasion

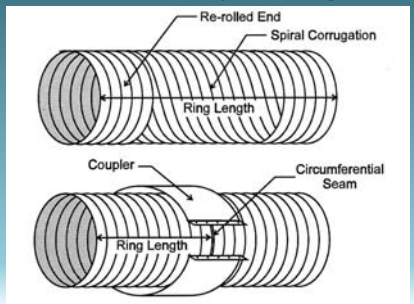
Flexible Structures



SECTION THROUGH ROUND METAL CULVERT

Basic Structural Considerations

CSP (field jointing)



Flexible Culverts

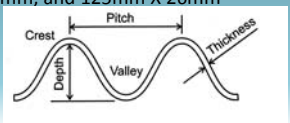
- Two Types:
  - ➢ Corrugated Steel Pipe (CSP)
  - ➢ Structural Plate Corrugated Steel Pipe (SPCSP)

Corrugated Steel Pipe (CSP)

- Complete rings fabricated in plant
- Rolled helical sections, re-rolled ends
- Joined by couplers
- Bridge sizes range from 1500 to 3600
- Common sizes 1800 to 3000 (in 200mm increments)
- Length to suit transportation (2.5 to 15.0m)

CSP Properties

- Common Thickness
  - 2.8mm, 3.5mm, 4.2mm
- Common Profiles
  - 68mm (Pitch) x 13mm (depth)
  - 76mm X 25mm, and 125mm X 26mm



Structural Plate Corrugated Steel Pipe (SPCSP)

- Flat plate is corrugated & punched
- HD galv. then curved to shape
- Five thickness – 3, 4, 5, 6, and 7mm
- Profiles - pitch x depth
  - ➢ 152 x 51
  - ➢ 380 x 140
  - ➢ 400 x 150
- Plates bolted together

SPCSP (cont.)

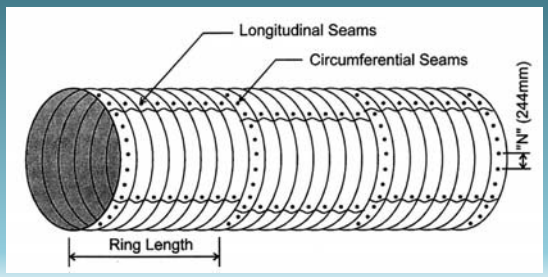
- Plate lengths
  - 3050mm (10 ft)
  - 3670mm (12 ft)
- Plate width 5N, 6N, and 9N

N is the circumferential bolt spacing
N = 3pi (244mm or 9.6")
N/ring = 4(dia. in feet)
(i.e. 10ft dia = 40N)

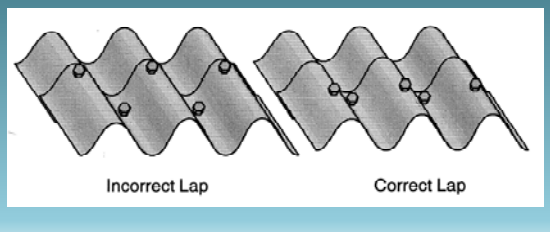
SPCSP - some recent products

- Atlantic Industry's 'Bolt-a-Plate
  width 1067, length 3N to 16N
- Twister Pipe's 'MP 200'
  pitch 200, depth 55mm
- SuperCor, and Bridge Plate
  (pitch 380, depth 140)
- New coating systems

SPCSP (field bolting)



SPCSP (longitudinal lapping)



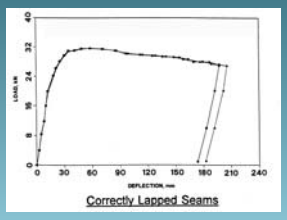
Properly Lapped Seam

Bolt in valley is nearest visible edge

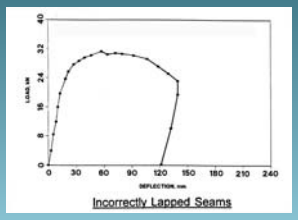
Improperly Lapped Seam

Bolt in valley is farthest from visible edge

SPCSP (seam strength tests)



Correctly Lapped Seams



Incorrectly Lapped Seams

Both types of laps can carry about the same load
Correctly lapped seams are more ductile - don't normally develop cracks

Questions??