BrDR CMP Culverts Conceptual Design

RADBUG Meeting, 2019

Background

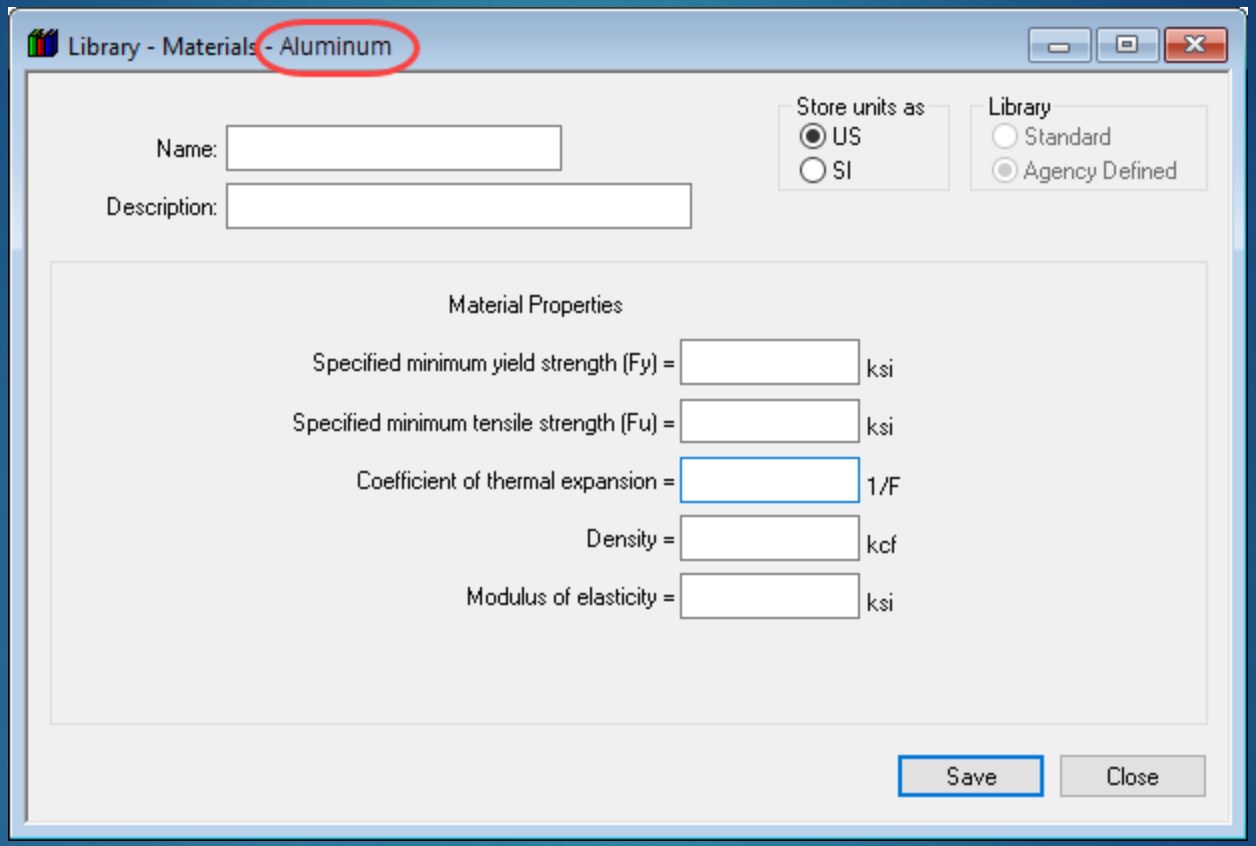
- Action Item 2018-BrDR-065

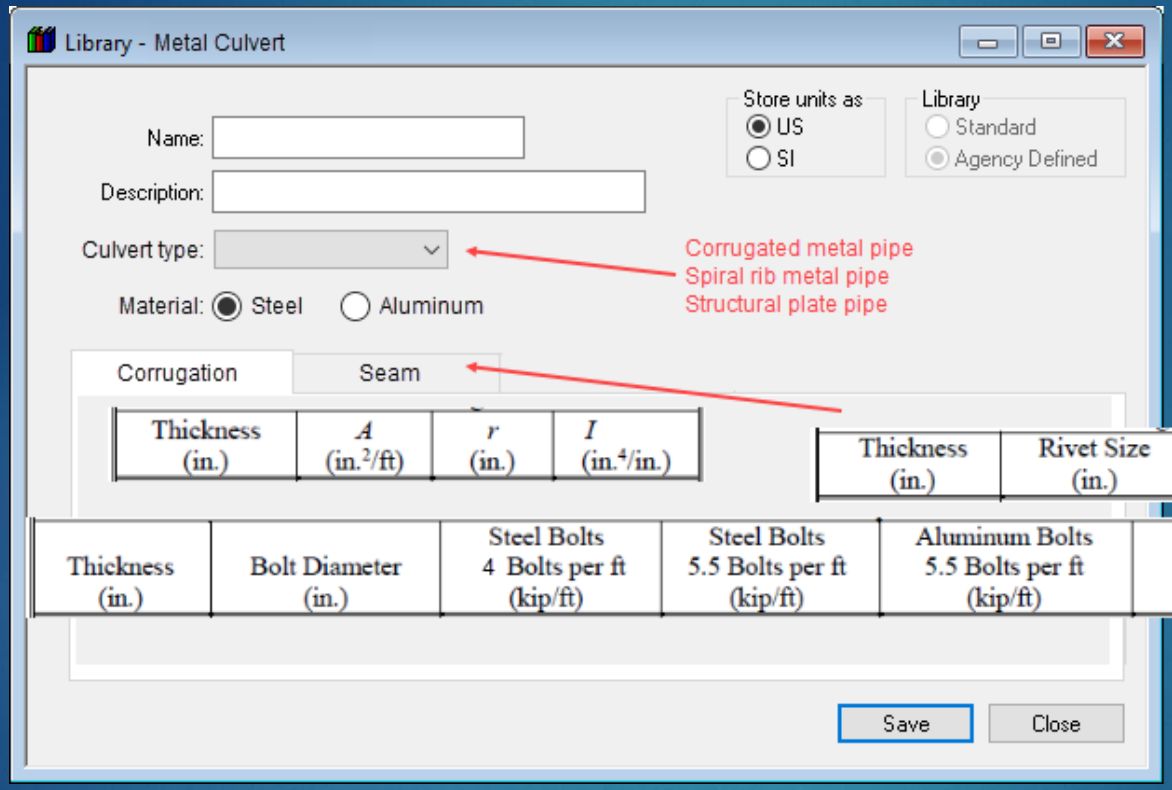
  Baker to estimate the level of effort to incorporate an enhancement into BrDR to support the Ohio corrugated metal pipe spreadsheet (provided by the User Group)

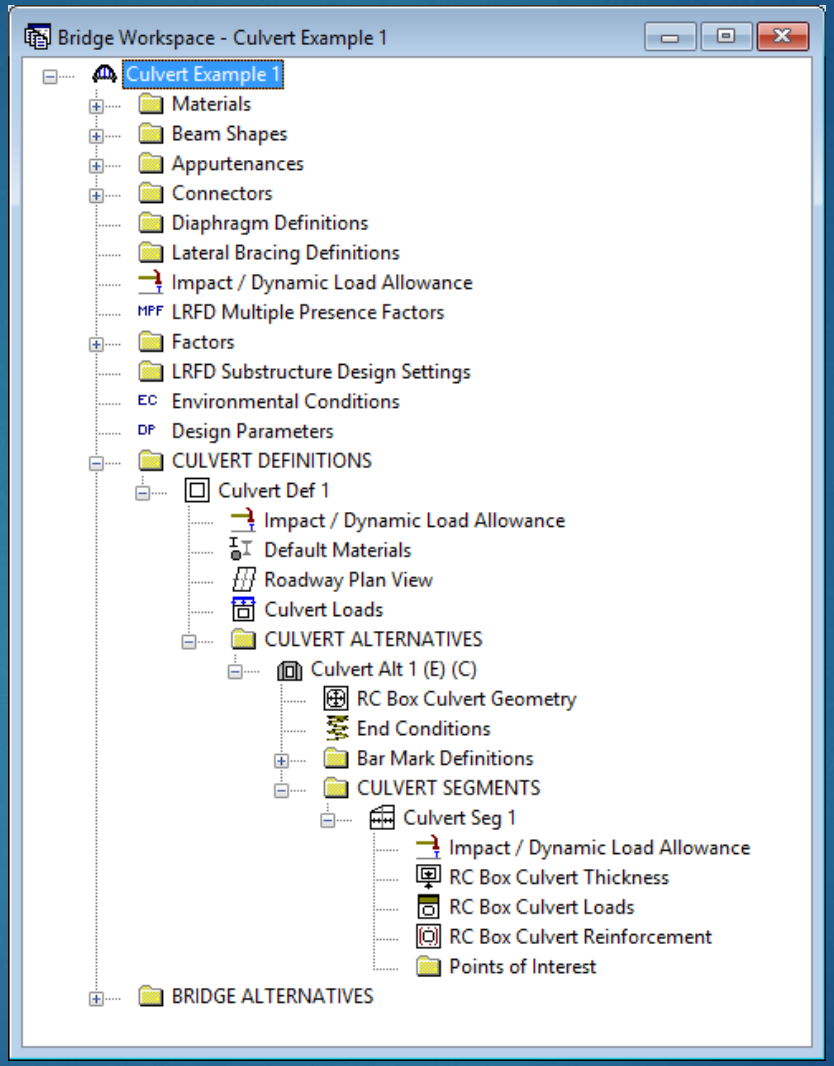
- Action Item 2018-BrDR-066

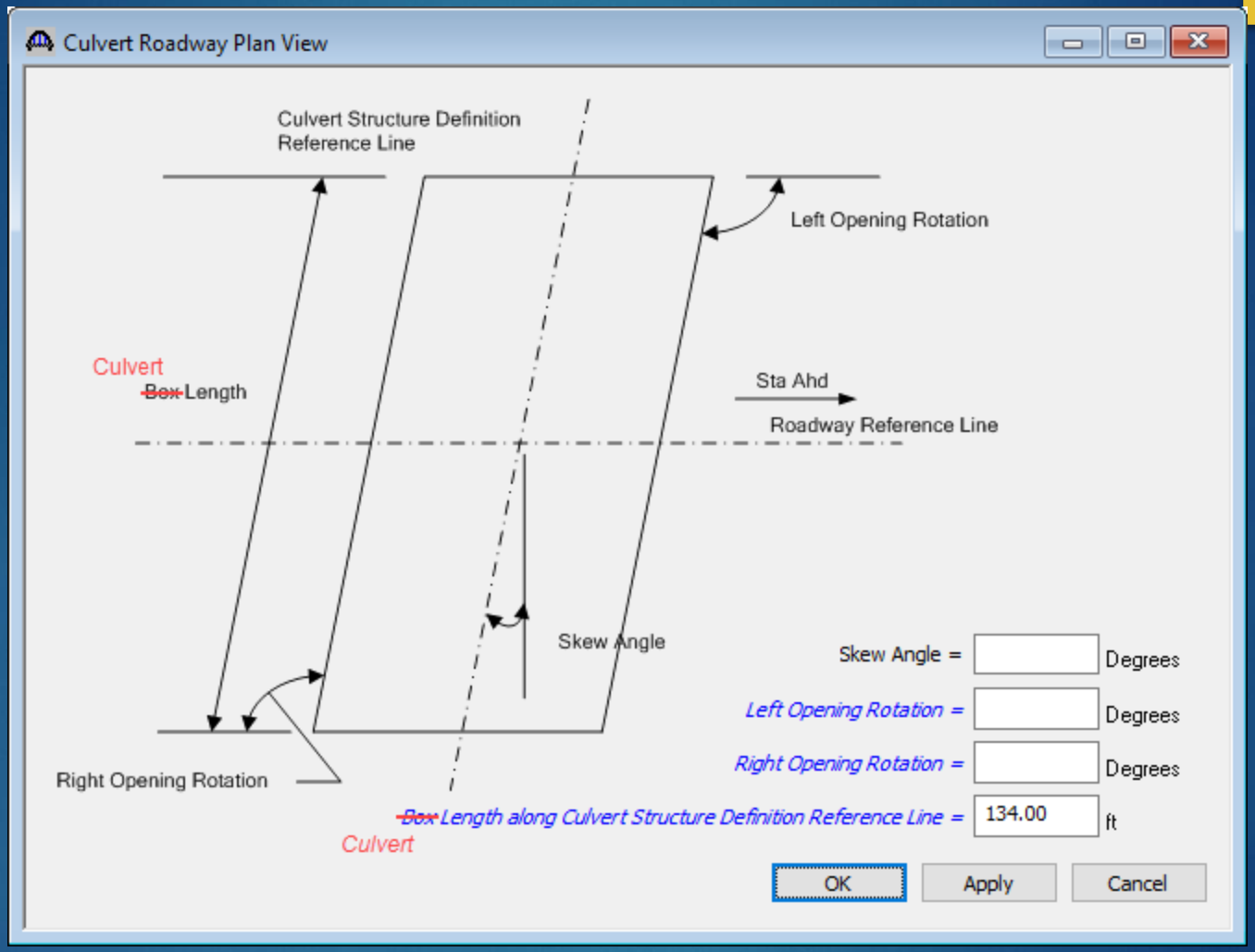
  Task Force to follow-up with RADBUG President on the level of effort and potential options to incorporate the Ohio corrugated metal pipe spreadsheet into BrDR

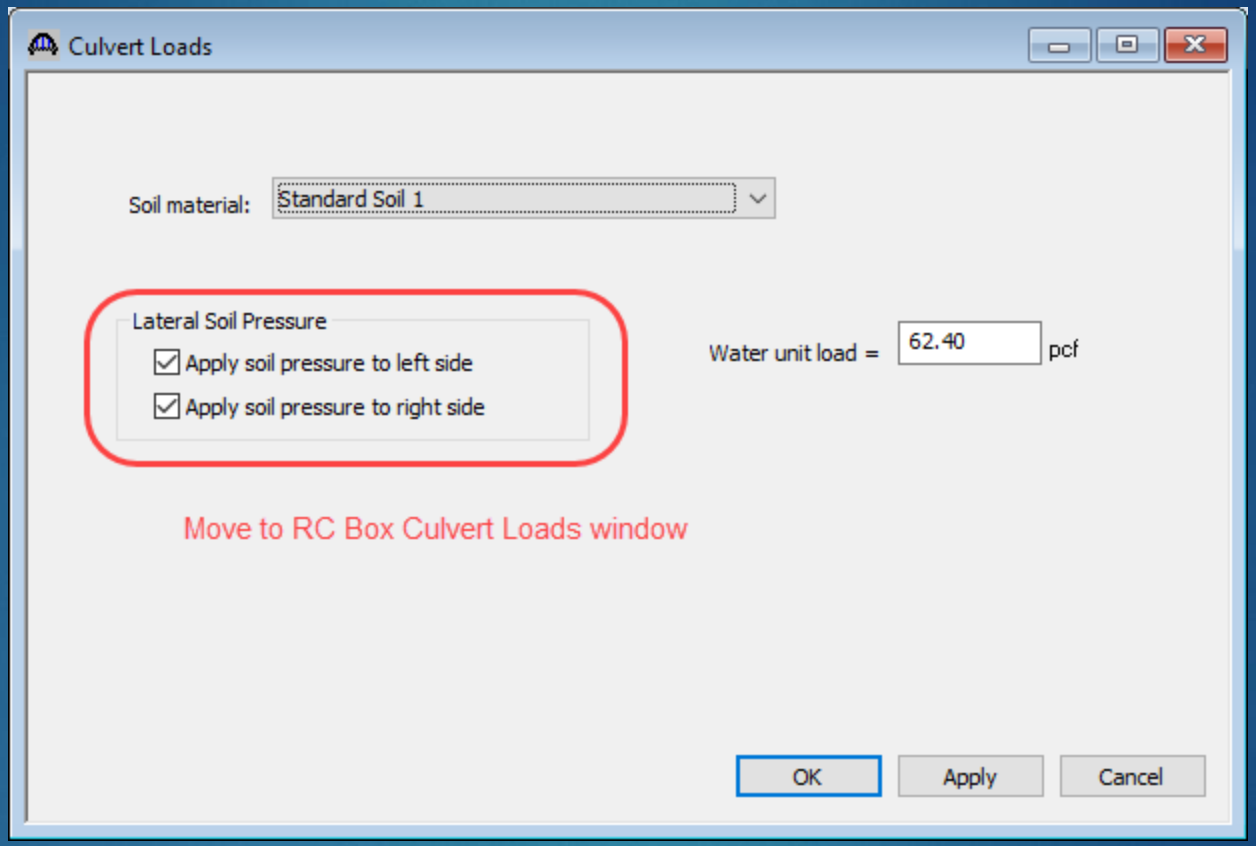
Mockups

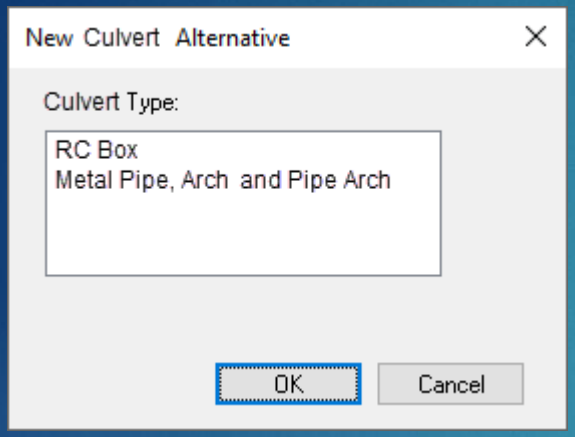

Library - Materials - Aluminum
Name:
Description:
Store units as
US
SI
Library
Standard
Agency Defined
Material Properties
Specified minimum yield strength (Fy) =
ksi
Specified minimum tensile strength (Fu) =
ksi
Coefficient of thermal expansion =
1/F
Density =
kcf
Modulus of elasticity =
ksi
Save
Close

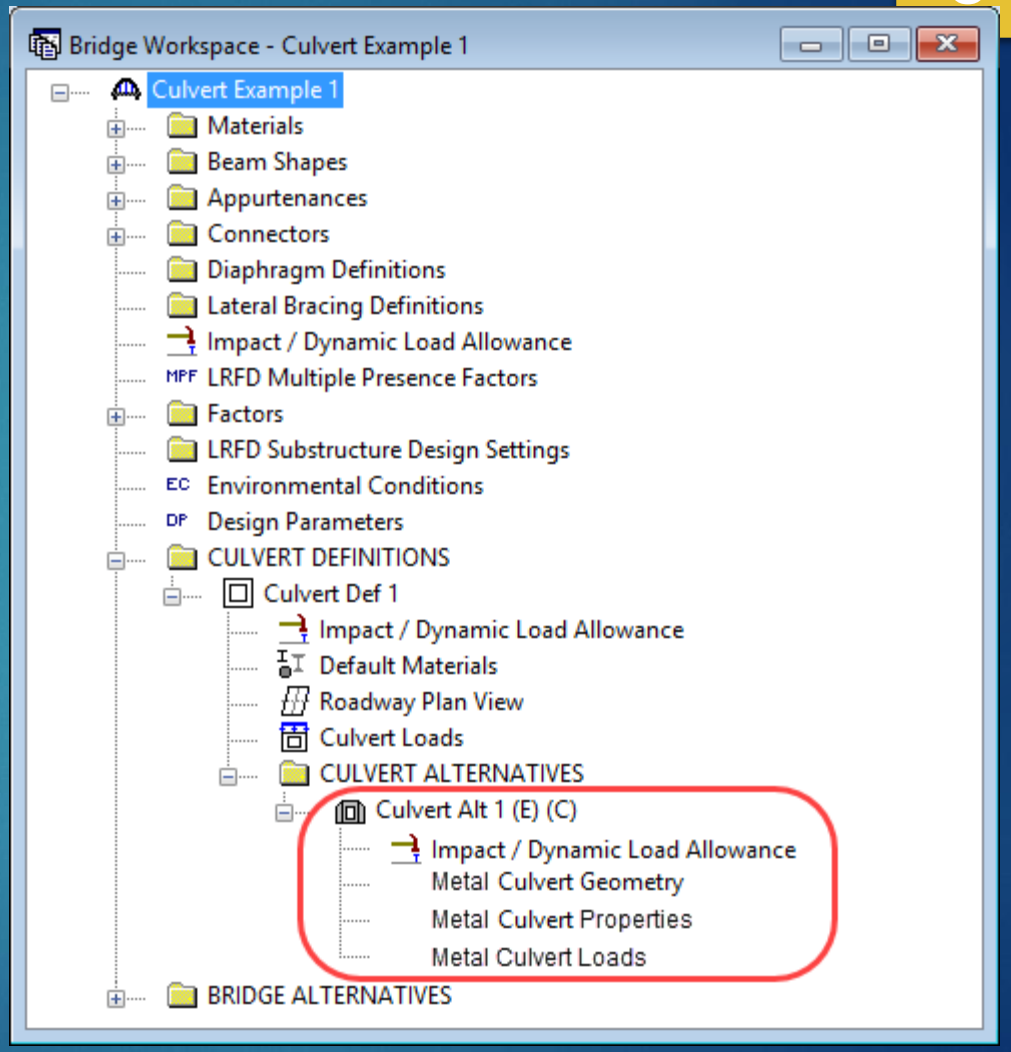


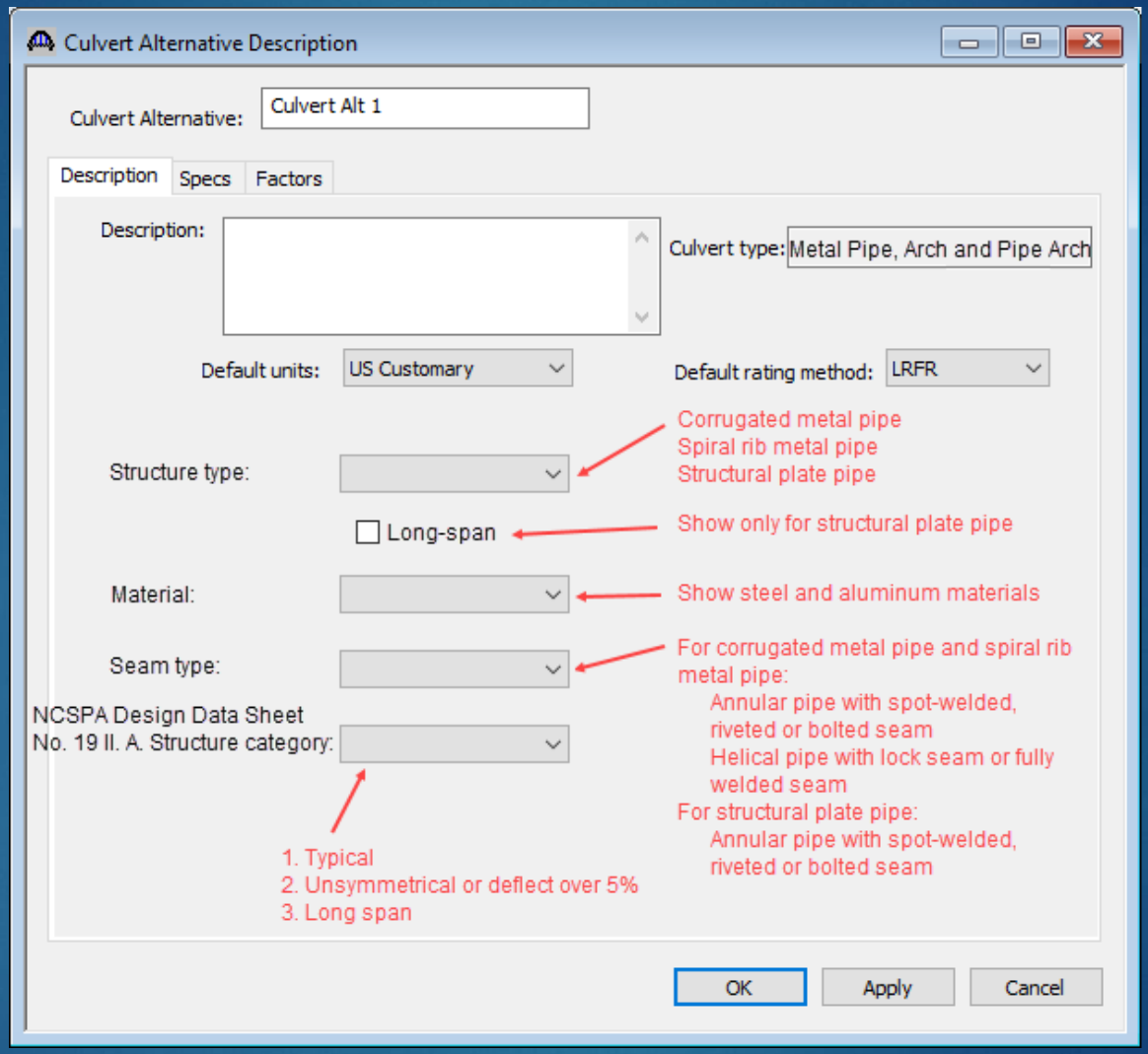


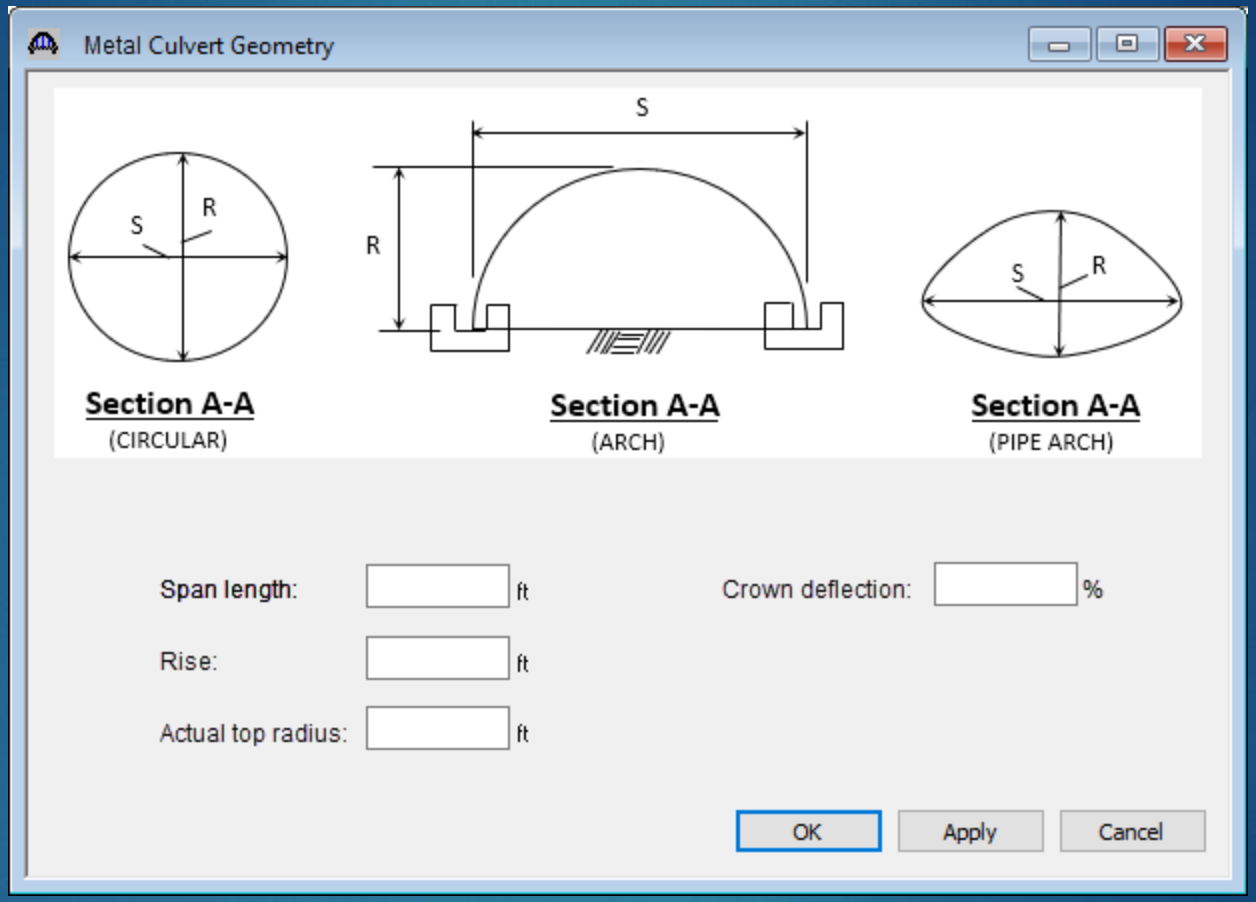

Culvert Roadway Plan View
Culvert Structure Definition Reference Line
Left Opening Rotation
Culvert
~~Box~~ Length
Sta Ahd
Roadway Reference Line
Skew Angle
Right Opening Rotation
~~Box~~ Length along Culvert Structure Definition Reference Line =
134.00
ft
Culvert
Skew Angle =
Degrees
Left Opening Rotation =
Degrees
Right Opening Rotation =
Degrees
OK
Apply
Cancel

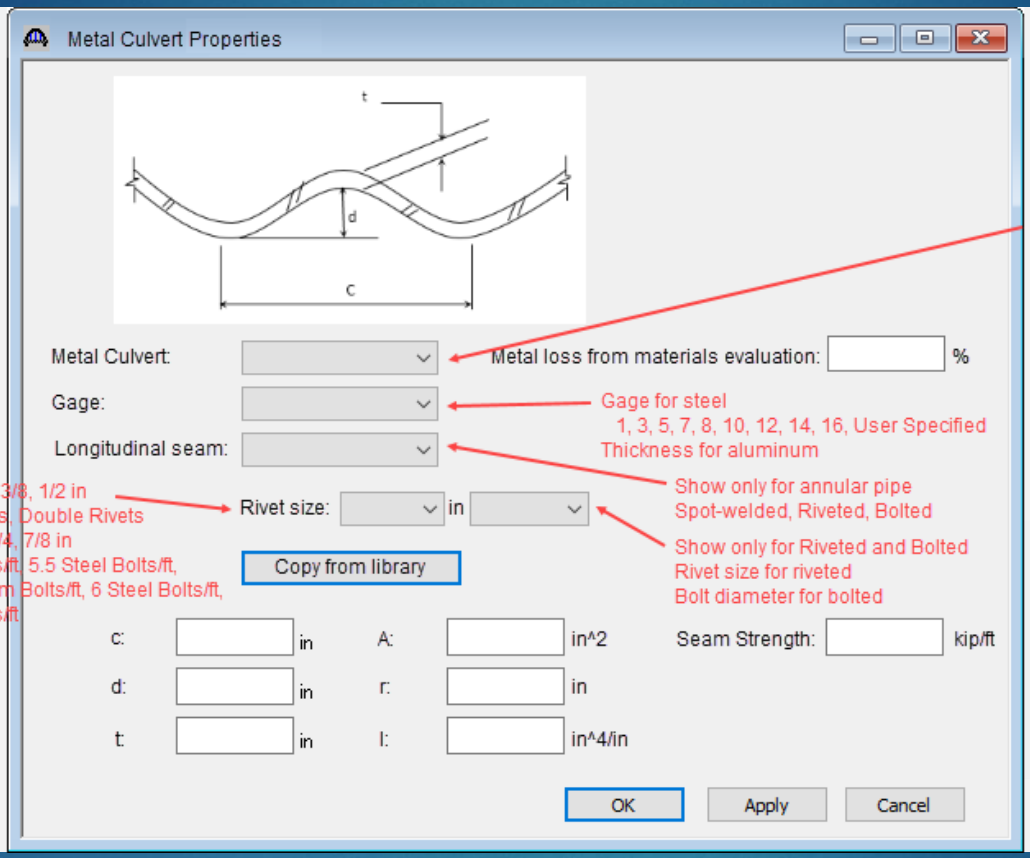

Culvert Loads
Soil material:
Standard Soil 1
Lateral Soil Pressure
Apply soil pressure to left side
Apply soil pressure to right side
Water unit load =
62.40
pcf
Move to RC Box Culvert Loads window
OK
Apply
Cancel


New Culvert Alternative
Culvert Type:
RC Box
Metal Pipe, Arch and Pipe Arch
OK
Cancel


Bridge Workspace - Culvert Example 1
Culvert Example 1
Materials
Beam Shapes
Appurtenances
Connectors
Diaphragm Definitions
Lateral Bracing Definitions
Impact / Dynamic Load Allowance
MPF LRFD Multiple Presence Factors
Factors
LRFD Substructure Design Settings
EC Environmental Conditions
DP Design Parameters
CULVERT DEFINITIONS
Culvert Def 1
Impact / Dynamic Load Allowance
Default Materials
Roadway Plan View
Culvert Loads
CULVERT ALTERNATIVES
Culvert Alt 1 (E) (C)
Impact / Dynamic Load Allowance
Metal Culvert Geometry
Metal Culvert Properties
Metal Culvert Loads
BRIDGE ALTERNATIVES


Culvert Alternative Description
Culvert Alternative: Culvert Alt 1
Description
Specs
Factors
Description:
Culvert type: Metal Pipe, Arch and Pipe Arch
Default units: US Customary
Default rating method: LRFR
Structure type:
Corrugated metal pipe
Spiral rib metal pipe
Structural plate pipe
Long-span
Show only for structural plate pipe
Material:
Show steel and aluminum materials
Seam type:
For corrugated metal pipe and spiral rib metal pipe:
Annular pipe with spot-welded, riveted or bolted seam
Helical pipe with lock seam or fully welded seam
For structural plate pipe:
Annular pipe with spot-welded, riveted or bolted seam
NCSPA Design Data Sheet No. 19 II. A. Structure category:
1. Typical
2. Unsymmetrical or deflect over 5%
3. Long span
OK
Apply
Cancel


Metal Culvert Geometry
S
R
S
R
S
R
Section A-A
(CIRCULAR)
Section A-A
(ARCH)
Section A-A
(PIPE ARCH)
Span length:
ft
Rise:
ft
Actual top radius:
ft
Crown deflection:
%
OK
Apply
Cancel



Show metal culverts and User Specified

For corrugated steel pipe:
- 1 1/2 x 1/4 in
- 2 2/3 x 1/2 in
- 3 x 1 in
- 5 x 1 in

For corrugated aluminum pipe:
- 1 1/2 x 1/4 in
- 2 2/3 x 1/2 in
- 3 x 1 in
- 6 x 1 in

For spiral rib steel pipe:
- 3/4 x 3/4 x 7 1/2 in
- 3/4 x 1 x 11 1/2 in

For spiral rib aluminum pipe:
- 3/4 x 3/4 x 7 1/2 in
- 3/4 x 1 x 11 1/2 in

For structural plate steel pipe:
- 6 x 2 in

For structural plate aluminum pipe:
- 9 x 2 1/2 in

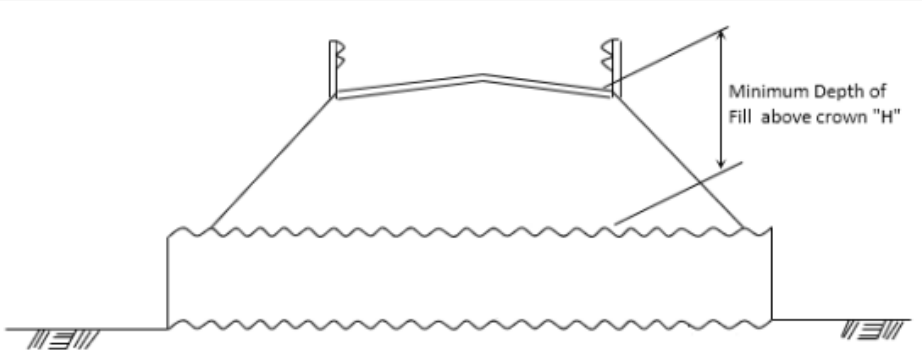
Gage for steel
1, 3, 5, 7, 8, 10, 12, 14, 16, User Specified
Thickness for aluminum

Show only for annular pipe
Spot-welded, Riveted, Bolted

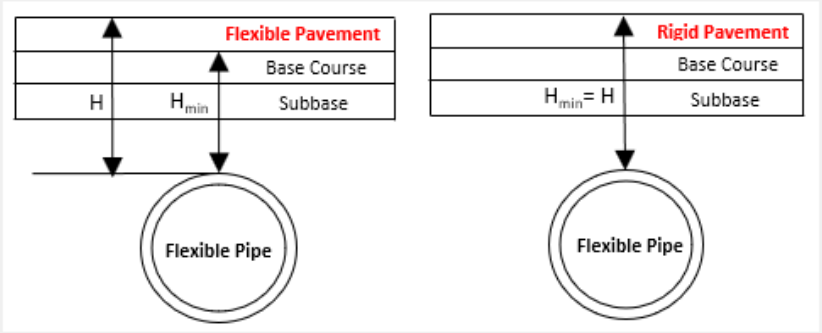
Show only for Riveted and Bolted
Rivet size for riveted
Bolt diameter for bolted

Rivet size 5/16, 3/8, 1/2 in
Single Rivets, Double Rivets
Bolt diameter 3/4, 7/8 in
4 Steel Bolts/ft, 5.5 Steel Bolts/ft,
5.5 Aluminum Bolts/ft, 6 Steel Bolts/ft,
8 Steel Bolts/ft

Metal Culvert Loads



ELEVATION



Depth of fill: ft

Minimum cover depth: ft

OK Apply Cancel

AASHTOWare Bridge Design & Rating AASHTO

Next Steps

- Incorporate other agency customizations of Ohio DOT spreadsheet
- Review culvert specification updates proposed by NCHRP 15-54
- Estimate level of effort for implementation
- BrDR Task Force and TAG review and comments
- Respond to comments and update requirements, mockups and estimate

Questions?