



Custom API Tools

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Custom API Tools

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Custom API Tools

API - General



API is everywhere!

APIs (Application Programming Interfaces) enable different software components to communicate and interact. Below are examples of API usage:

- **Social Media Integration** - users authentication & interaction with user profiles.
- **Mapping and Location Services** - Google Maps & Weather APIs.
- **E-commerce and Payments** - Payment Gateway (PayPal and Stripe) & Shipping Carrier APIs (real-time shipping rates and track packages)
- **Data Retrieval and Automation** - Public Data (Star Wars and GeoNames) & Chatbot APIs (messaging platforms and automated responses).
- **Internal Systems and Enterprise Applications** - Internal APIs within organizations and Cloud Service APIs (AWS).

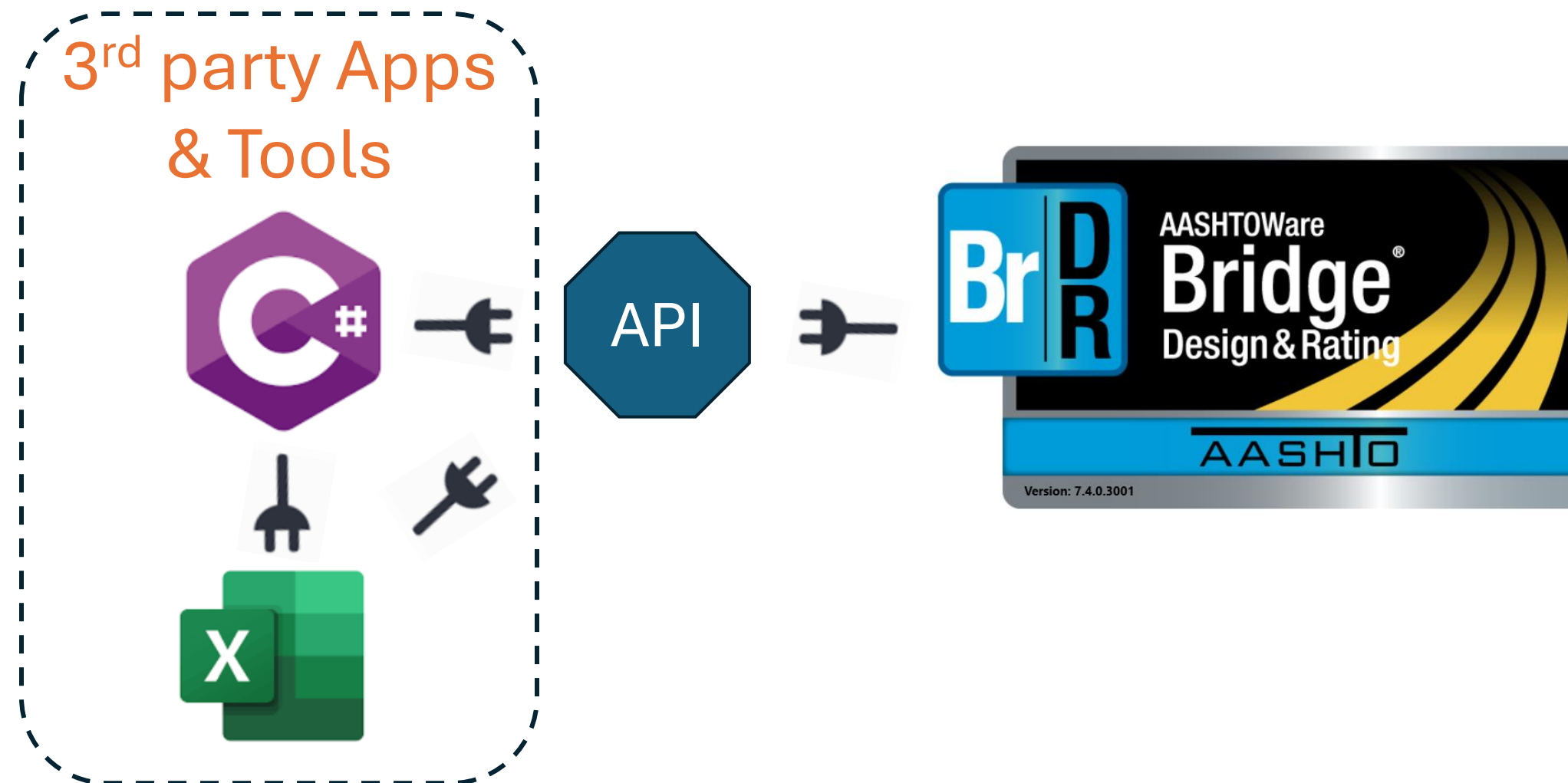


Custom API Tools

API - BrDR



- Included with BrDR.
- Allows different software to interact with BrDR.
- Contains defined commands to Connect, Get, Set, Create & Delete.
- Used to create custom tools and functionality outside of BrDR.





- **Limited Resources**
 - Time, Cost & Effort.
- **Excessive repetitive manual work**
 - Eliminate need for Copy & Paste into BrDR.
 - Excel bridge models that need to be converted into BrDR models.
 - Similar structures.
- **Efficiency**
 - High efficiency expectations.
 - New technology suggests moving away from repetitive manual tasks.
- **Effectiveness**
 - Automation helps to focus on other tasks.



Custom API Tools

Caltrans API Tools - Quick Model Creation – MCB & RC Slab

MCB Tool – creates a fully defined multi cell box BrDR model from Excel data.

RC Slab Tool – creates a fully defined reinforced concrete slab BrDR model from Excel data.

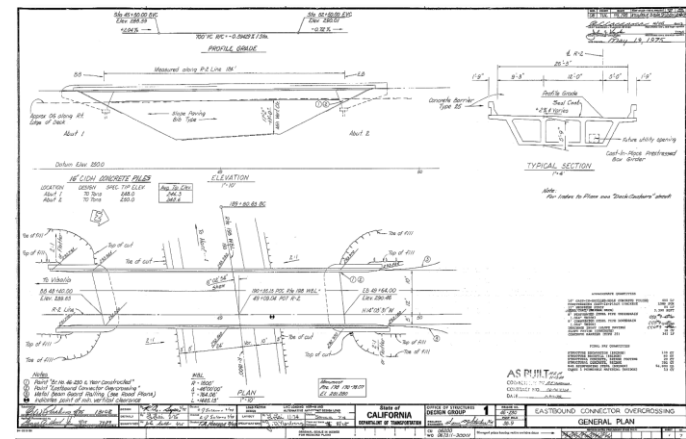
- Transfers bridge data from Excel to BrDR. For a 2-span MCB:
 - ~ 200 manual data entries in Excel
 - ~ 1000 data entries are transferred to BrDR
 - ~ 2 hours to create a model → **60%** time saving
- Calculates and populates LLDF tables.
- Provides consistent modeling, naming conventions and data checking.

As-builts

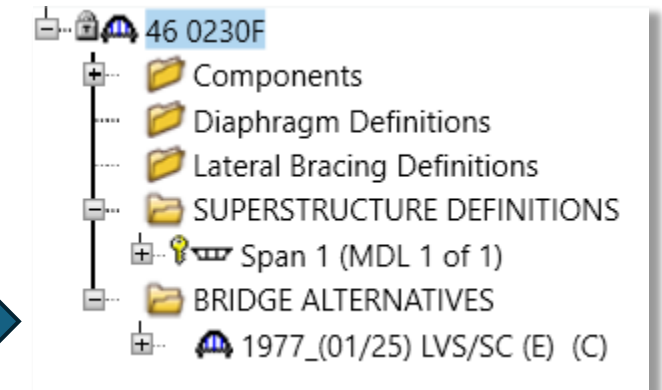
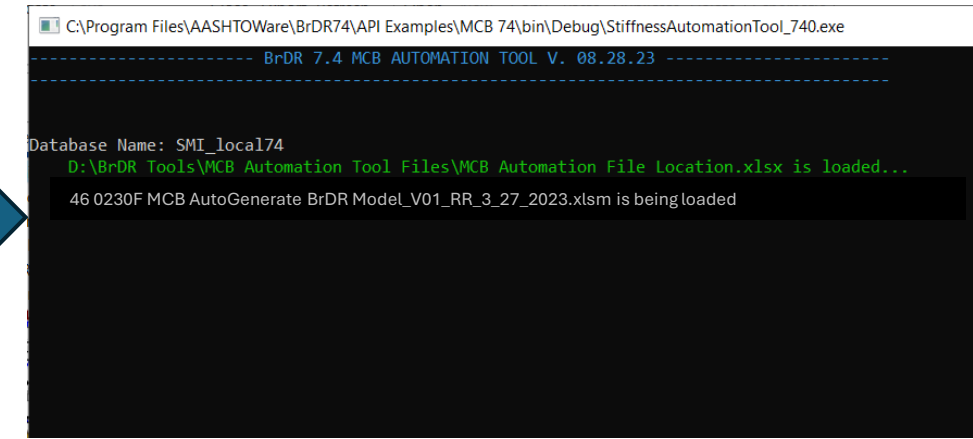
Data Input Spreadsheet

API Tool

BrDR Model



	C	D	E	F	G	H	I	J	K	L
1		K:\Analysis\Permits\Transportation (Variance) Permits\BrDR Stiffness Models\Student Production\46 0230F_TT								
2		46 0230F MCB AutoGenerate BrDR Mc								
3		Bridge General Information								
4		Bridge Number	46 0230F			Year Built	1977			
5		Bridge Name	S99-E198 CONNECTOR OC			Year Specification	1973			
6		Rating Engineer	Tien Nguyen		TTN	Year Widened				
7		Checking Engineer	Checking Engineer		LRC	Yr Widened Spec.				
8										
9										
10		Bridge Type	PTBox			Design Loading	HS20+Alt+Permit+Futu			
11		Design Metho	LFD	(ASD, LFD, LRFD)						
12										
13										
14										
15										



Report

DESIGN LOADING		Critical Location			
Rating	Factor	Structure	Control Element	Load Action	Location
Inventory	1.01	Span 1	Box Girder	Service III	1/8th of span, FULL BOX
Operating	1.53	Span 1	Box Girder	Moment (Strength)	PK 0.5th of span, FULL BOX

~3000 Lines of code

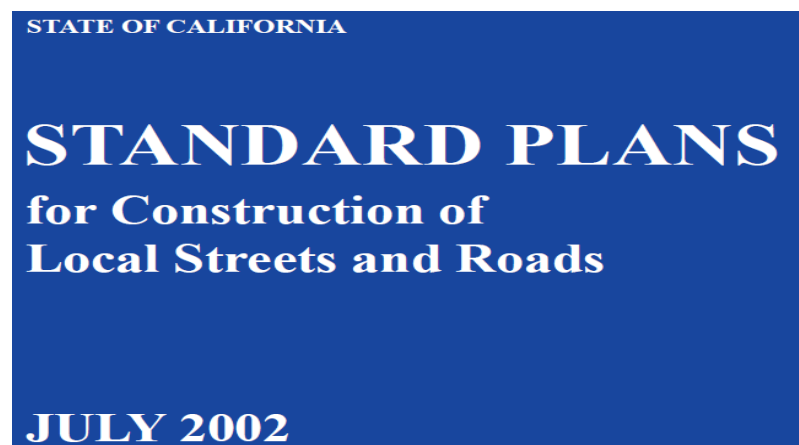
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Custom API Tools

Caltrans API Tools - Quick Model Creation – RC Culverts

- RC Culvert Tool** – creates a reinforced concrete culvert BrDR model from Excel data.
 - Transfers culvert data from Excel to BrDR. For a 2-cell culvert:
 - ~ 9 manual data entries in Excel
 - ~ 100 data entries are transferred to BrDR
 - ~ 20 min to create a model → **80%** time saving
 - Provides consistent modeling, naming conventions and data checking.

Standard Plans



SPAN		1220 mm (4')				
HEIGHT		610 mm (2')		915 mm (3')		
Maximum Earth Cover		3.0 m (10')	6.0 m (20')	3.0 m (10')	6.0 m (20')	
Conc	Roof	T ₁	180 mm (7")	180 mm (7")	180 mm (7")	180 mm (7")
	Walls	T ₂	150 mm (6")	150 mm (6")	150 mm (6")	150 mm (6")
	Invert	T ₃	180 mm (7")	180 mm (7")	180 mm (7")	180 mm (7")
Spacing		400	375 mm (16")	400 mm (16")	375 mm (15")	
	Ref		2M (#7)	3M (#4)	22M (#7)	16M (#5)
			16M (#5)	16M (#5)	16M (#5)	
			19M (#6)	13M (#4)	13M (#4)	
			13M (#4)	16M (#5)	16M (#5)	

~900 Lines of code

2014 User Group Meeting

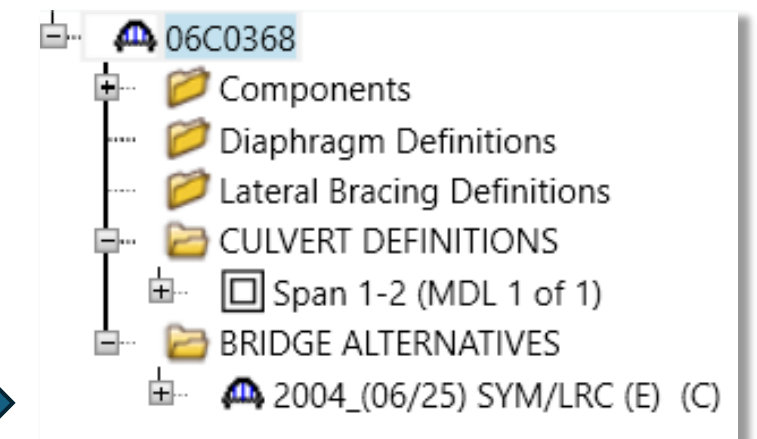
Data Input Spreadsheet (Appendix C – Culvert API code example)

Bridge Number	06C0368
Bridge Name	MARK CREEK
Rating Engineer	Sergey Markevich
Checking Engineer	Checking Engineer
Bridge Type	RC Culvert
Design Method	LFD (ASD, LFD,
Units	SI

API Tool

```
K:\Analysis\Bridge Ratings\Ra x +  
----- BrDR 7.6 CULVERT AUTOMATION TOOL V. 06.25.25 -----  
Database Name: SMI_local76  
06C0368 Culvert AutoGen BrDR 761 (062525).xslm is loaded...  
Session started!  
Template Name: 2-Cell Template  
Culvert Automation has started...  
Press any key to continue or close the window to cancel...
```

BrDR Model



Report

STRUCTURE RATING DATA SHEET - LRFR (FOR ARCHIVING IN BIRIS)
NOT SAVED TO K Drive File

BRIDGE NO: 06C0368
Facility Carried: FOSTER RD
Location: 2.7 MI SW GAS POINT RD
BRIDGE NAME: MARK CREEK

Structural Elements Rated:
RC Double Box Culvert

Rating	Structure	Control Element	Load Action	Location	Rating Method
HL-93 Inventory: 0.57	Culvert	Guard	Moment (Strength)	Opt of Int. Wall 2, 2004 RC Culvert	LRFR Rating Factor
HL-93 Operating: 0.73	Culvert	Guard	Moment (Strength)	Opt of Int. Wall 1, 2004 RC Culvert	LRFR Rating Factor

NOT SAVED TO K Drive File

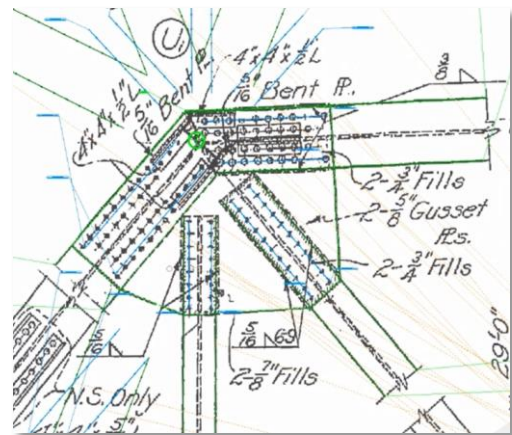
LEGAL RATING

Rating	Structure	Control Element	Load Action	Location	Rating Method
Type 3 (237): 1.85 Legal	Culvert	Guard	Moment (Strength)	0.98ft of Ext. Wall 2, 2004 RC Culvert	LRFR Rating Factor
Type 3S2 (947): 2.01 Legal	Culvert	Guard	Moment (Strength)	0.98ft of Ext. Wall 2, 2004 RC Culvert	LRFR Rating Factor
Type 3-3 (407): 1.59 Legal	Culvert	Guard	Moment (Strength)	Opt of Ext. Wall 1, 2004 RC Culvert	LRFR Rating Factor
NRL (407): 1.69 Legal	Culvert	Guard	Moment (Strength)	Opt of Ext. Wall 2, 2004 RC Culvert	LRFR Rating Factor
SHV - S14 (173): 1.69 Legal	Culvert	Guard	Moment (Strength)	Opt of Ext. Wall 1, 2004 RC Culvert	LRFR Rating Factor
SHV - S15 (117): 1.69 Legal	Culvert	Guard	Moment (Strength)	Opt of Ext. Wall 2, 2004 RC Culvert	LRFR Rating Factor
SHV - S16 (4 757): 1.69 Legal	Culvert	Guard	Moment (Strength)	Opt of Ext. Wall 2, 2004 RC Culvert	LRFR Rating Factor
SHV - S17 (8 757): 1.69 Legal	Culvert	Guard	Moment (Strength)	Opt of Ext. Wall 2, 2004 RC Culvert	LRFR Rating Factor
FAST - EV3 (28 757): 0.87	Culvert	Guard	Moment (Strength)	Opt of Int. Wall 1, 2004 RC Culvert	LRFR Rating Factor
FAST - EV3 (417): 0.87	Culvert	Guard	Moment (Strength)	Opt of Int. Wall 1, 2004 RC Culvert	LRFR Rating Factor

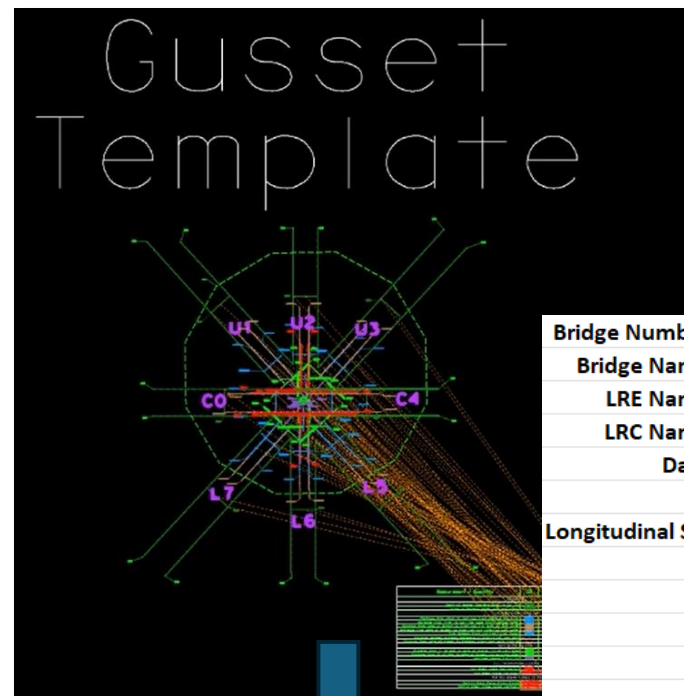
Gusset Plate Tool – adds gusset plate definitions to an existing truss BrDR model using Excel data.

Phase 1

As-builts



MicroStation



Drone Photos



Phase 2

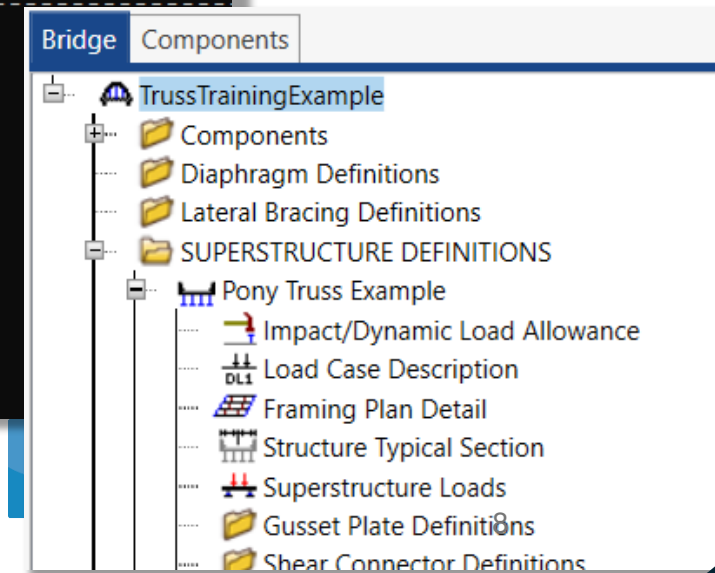
Data Input Spreadsheet

Bridge Number	xx xxxx	Number of Spans	1	Adj
Bridge Name	Bridge Name	Do we have corrosion?	NO	
LRE Name	OK	Truss Type	Pony Truss	
LRC Name	15Z	SuperStructure Name	Span Name	
Date	7/22/2025			
Longitudinal Section				

API Tool

```
C:\Program Files\AASHTOWare\BrDR74\API Examples\Gusset 74\bin\Debug\GussetPlateAutoTool.exe
----- BrDR 7.4 GUSSET PLATE AUTOMATION TOOL V. 04122023 -----
Database Name: SMI_local74
Enter Bridge Name: 12c0109
Session started!
Enter Bridge Number (ex.: 01 2345R):
```

BrDR Model



~3200
Lines of code

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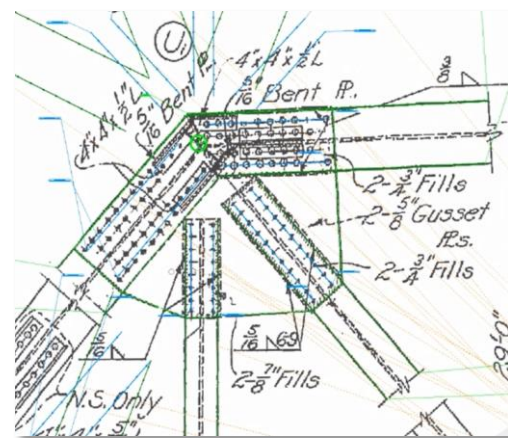




Phase 1: MicroStation Image Processing

- Dimensioning of a gusset plate image (as-built or drone picture). For a gusset plate:
 - ~ 20 elements that need to be manually adjusted in MicroStation
 - ~ 30 measurements required for the analysis are generated by VBA.
- The geometry data then is transferred to a gusset plate spreadsheet using VBA.

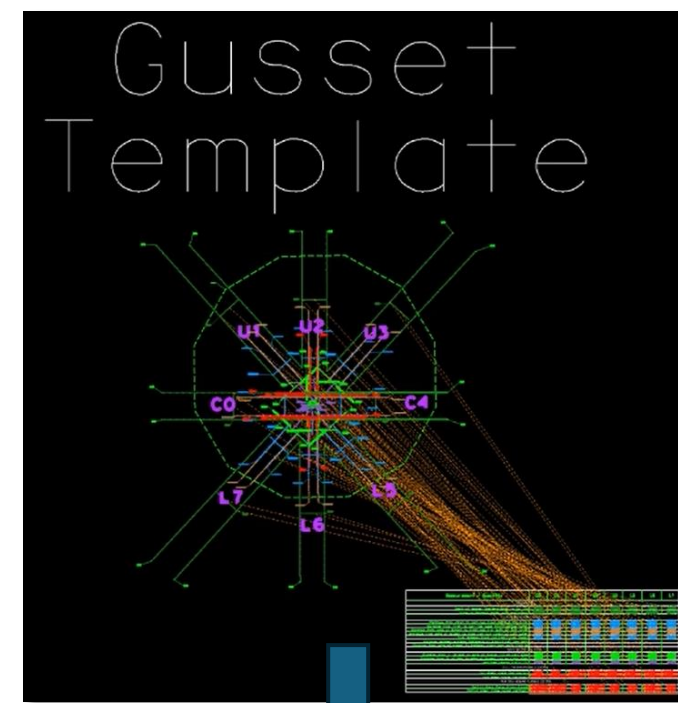
As-builts



Drone Photos



MicroStation



(see next slide)

~3200
Lines of code

2025 Rating and Design User Group Meeting

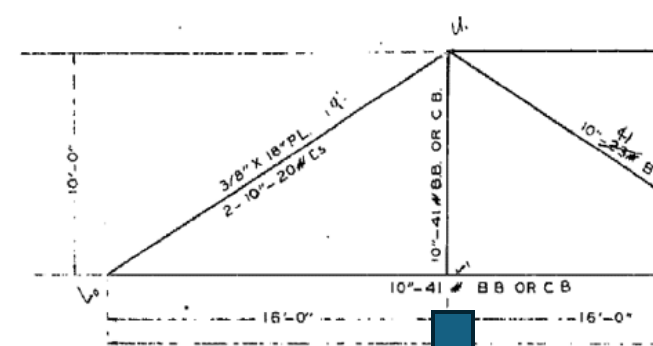
Phase 2: The Gusset Plate Spreadsheet and API

- More data is manually added to the spreadsheet.
- The gusset plate tool adds gusset plate definitions to an existing BrDR bridge model using the spreadsheet data.

Data Input Spreadsheet

Bridge Number	xx xxxx	Number of Spans	1	Adj
Bridge Name	Bridge Name			
LRE Name	OK	Do we have corrosion?	NO	
LRC Name	TGZ	Truss Type	Pony Truss	
Date	7/22/2025	SuperStructure Name	Span Name	

Longitudinal Section



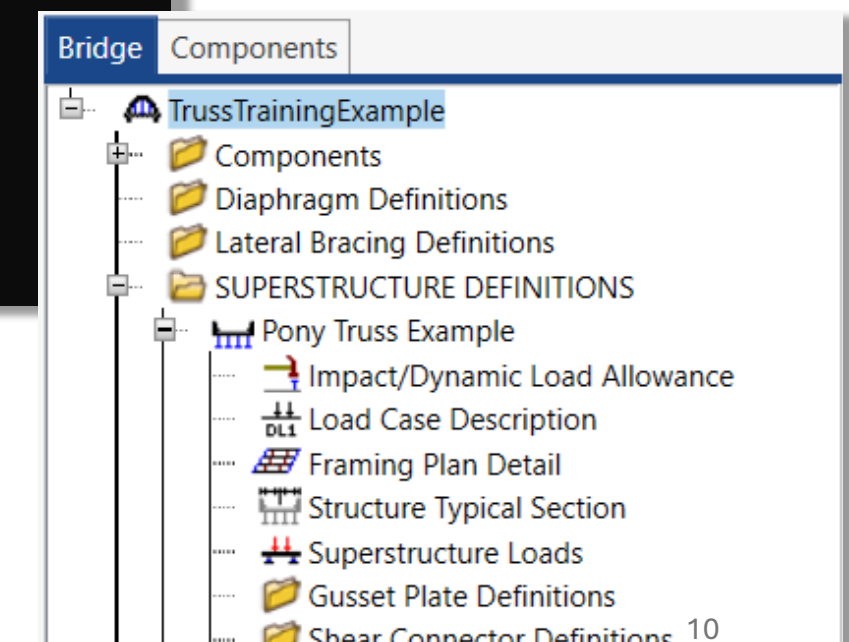
(see previous slide)



API Tool

```
C:\Program Files\AASHTOWare\BrDR74\API Examples\Gusset 74\bin\Debug\GussetPlateAutoTool.exe
----- BrDR 7.4 GUSSET PLATE AUTOMATION TOOL V. 04122023 -----
Database Name: SMI_local174
Enter Bridge Name: 12c0109
Session started!
Enter Bridge Number (ex.: 01 2345R):
```

BrDR Model



~3200
Lines of code

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Shear Iteration Tool - performs shear iteration and outputs new rating factors (RF) by doing the following actions for every truck:

1. Run analysis with scale factor = 1.0
2. Keep modifying scale factor and running analysis until RF=1.0
3. Final scale factor is the new iterated RF
4. Export scale factors into Excel file and use in generating final load rating report.

Since shear capacity is load dependent, capacity calculation needs to be iterated based on demand correlated with the RF being used.

Note: this tool was used before shear iteration was introduced into BrDR and is no longer needed.

API Tool

```
C:\Program Files\AASHTOWare\BrDR74\API Examples\Iteration Tool 74\bin\Debug\ShearIterationTool.exe
----- BrDR 7.4 SHEAR ITERATION TOOL V. 08.16.2023 -----
Data Exchange File Location: D:/BrDR Tools/Shear Iteration Tool Files/SampleExcelOutput.csv
Database Name: SMI_local74
Bridge Number: "28 0038R OKR/EAE"
Session started!

Bridge Description: 28 0038R RODEO CREEK
Oleg Kreydich (LRE) / Erin Elder (LRC)
Model Created 09/23
LastChangeTimestamp: 10/9/2023 10:55:53 PM

Shear Iteration will be performed on the following superstructure(s):
Superstructure: Span 1-3 (MDL 1 of 3) / Slab Superstructure
    Lt(1969), 9'-2" and Varies RC Slab (Slab Member / RC Member)
Superstructure: Span 1-3 (MDL 2 of 3) / Girder Superstructure
    G1, Exterior Girder (Girder Member / RC Member)
    G2, Interior Girder (Girder Member / RC Member)
    G4, Exterior Girder (Girder Member / RC Member)
Superstructure: Span 1-3 (MDL 3 of 3) / Girder Line Superstructure
    Rt(1969), 8'-11" and Varies PS/CIP Slab (Girder Line Member / Post Tensioned Member)

Shear Iteration is requested for the following truck(s):
Type 3
Type 3S2
Type 3-3
NRL
SU4
SU5
SU6
SU7
EV2
EV3
P5 Annual
P5 Split
```



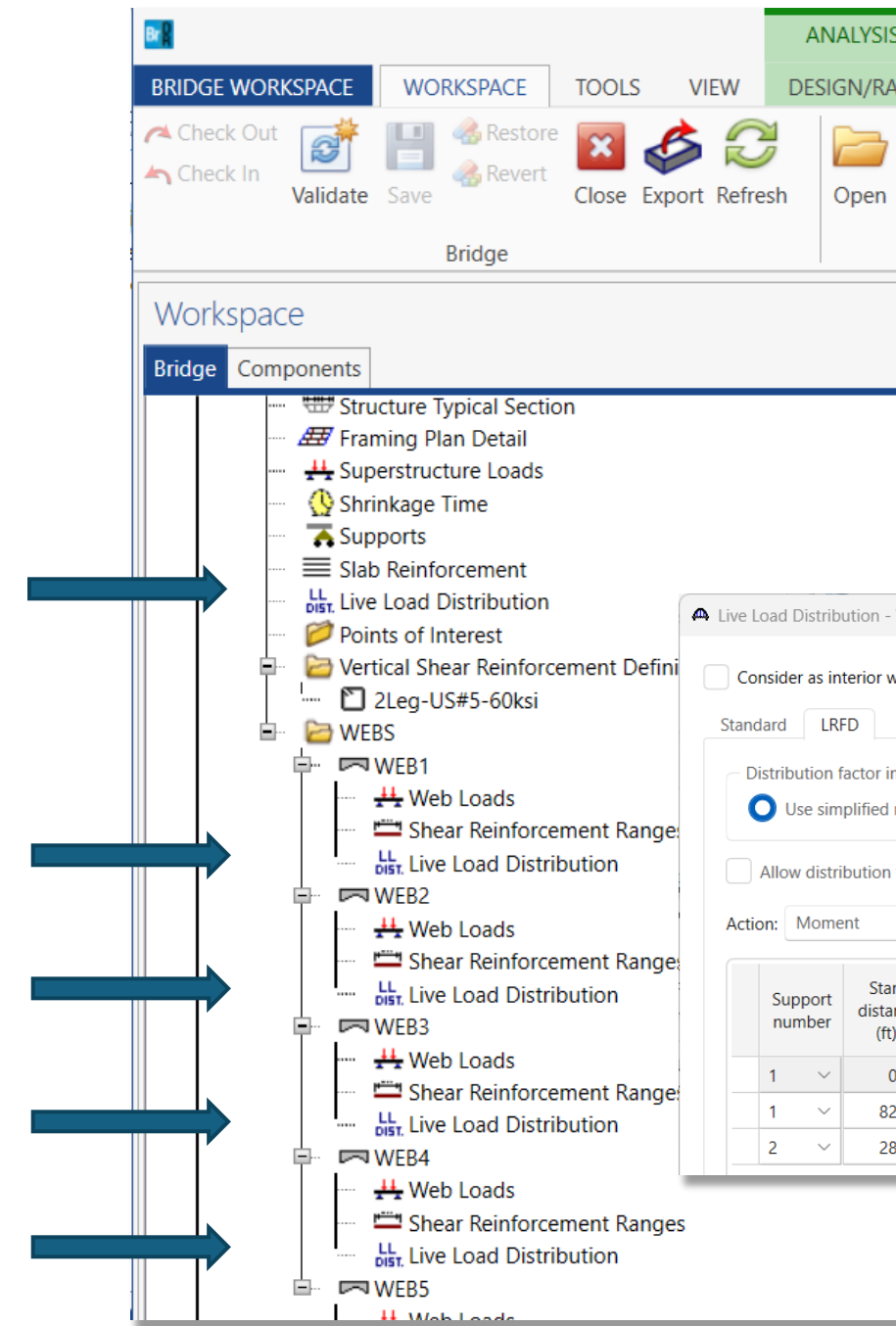


LLDF Calculator - calculates and populates live load distribution factor tables for all members.

API Tool

```
C:\Program Files\AASHTOWare\BrDR74\API Examples\LLDF Calc recal\bin\Debug\LLDFTool_740.exe  
----- BrDR 7.4 LLDF CALCULATION TOOL V. 07.20.23 -----  
Database Name: SMI_local174  
Enter BrDR Model Name / BID (ex.: 01 2345 / 123):  
392  
Session started!  
Bridge 392 workspace window is not found open  
  
Bridge Name: 54 0570  
Bridge Name: WEST REDLANDS OH  
Template Last Change Timestamp: 9/27/2023 11:35:01 PM  
Press any key to continue or close the window to cancel...
```

BrDR



LLDF GUI

Live Load Distribution - WEB1

Consider as interior web

Standard LRFD

Distribution factor input method
 Use simplified method Use advanced method Computed date: 07/23/2025 11:14:24

Allow distribution factors to be used to compute effects of permit loads with routine traffic

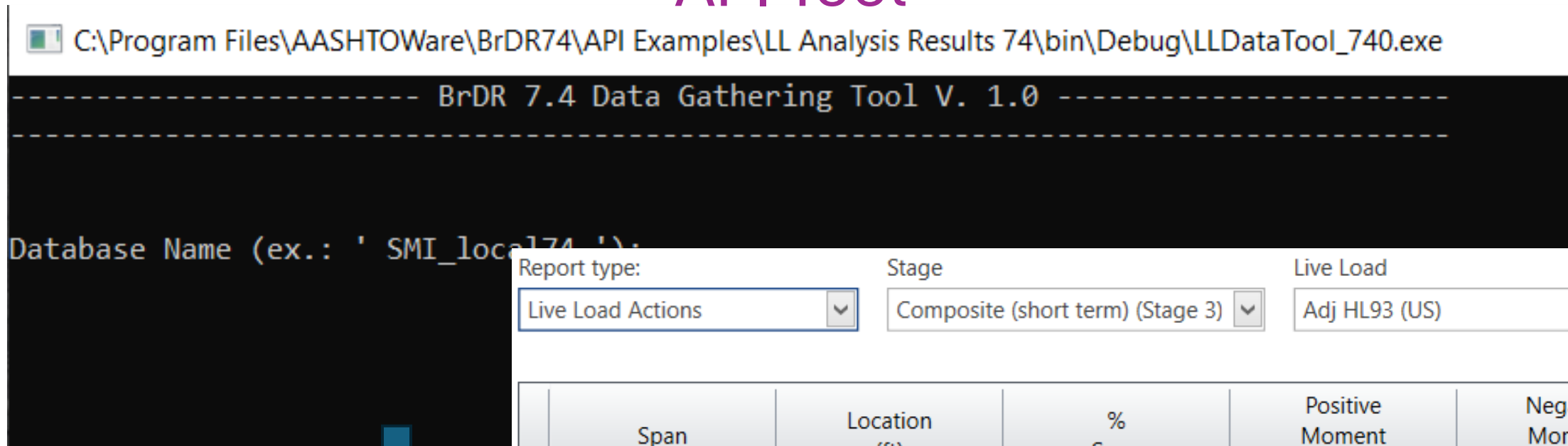
Action: Moment

Support number	Start distance (ft)	Length (ft)	End distance (ft)	Distribution factor (lanes)	
				1 lane	Multi-lane
1	0.00	82.907	82.91	0.493	0.788
1	82.91	57.185	140.09	0.493	0.788
2	28.59	82.907	111.50	0.493	0.788

~850
Lines of code

Analysis Data Export Tool - analyzes a bridge and exports all stage / live load / live load type analysis data for all trucks into an Excel file.

API Tool



BrDR Results

Report type: Live Load Actions Stage: Composite (short term) (Stage 3) Live Load: Adj HL93 (US) Live Load Type: Lane

Span	Location (ft)	% Span	Positive Moment (kip-ft)	Negative Moment (kip-ft)	Positive Shear (kip)	Negative Shear (kip)
1	0.00	0.0	0.00	0.00	36.26	
1	1.25	1.2	48.32	0.00	35.42	
1	10.73	10.0	377.53	0.00	29.37	

Excel Table

Span	Location (ft)	% Span	Positive Moment (kip-ft)	Negative Moment (kip-ft)	Positive Shear (kip)	Negative Shear (kip)	A	B	C	D	E	F	G	H	I	J	K	L	M
1	32.1	1	Live Load	Live Load	SuperStruc	Member	Span #	Location, f	% span	(+) Momer	(-) Momen	(+) Shear	(-) Shear	(+) Axial	(-) Axia				
1	42.9	2	EV2	Axle Load	Span 1 (MI	Span 1 (MI	1	0	0	0	0	503.512	0	0	0				
1	53.6	3	EV2	Truck + La	Span 1 (MI	Span 1 (MI	1	0	0	0	0	563.638	0	0	0				
1	64.3	4	EV2	Equivalent	Span 1 (MI	Span 1 (MI	1	0	0	0	0	60.127	0	0	0				
1	75.0	5	EV3	Axle Load	Span 1 (MI	Span 1 (MI	1	0	0	0	0	749.725	0	0	0				
1	85.7	6	EV3	Truck + La	Span 1 (MI	Span 1 (MI	1	0	0	0	0	805.106	0	0	0				
1	96.4	7	EV3	Equivalent	Span 1 (MI	Span 1 (MI	1	0	0	0	0	55.38	0	0	0				
1	107.1	8	HL-93 (US)	Axle Load	Span 1 (MI	Span 1 (MI	1	0	0	0	0	612.639	0	0	0				
1	117.8	9	HL-93 (US)	Truck + La	Span 1 (MI	Span 1 (MI	1	0	0	0	0	867.533	0	0	0				
1	128.5	10	HL-93 (US)	Tandem Lc	Span 1 (MI	Span 1 (MI	1	0	0	0	0	455.015	0	0	0				
1	139.2	11	HL-93 (US)	Tandem +	Span 1 (MI	Span 1 (MI	1	0	0	0	0	709.909	0	0	0			13	0
1	149.9	12	HL-93 (US)	Equivalent	Span 1 (MI	Span 1 (MI	1	0	0	0	0	254.893	0	0	0				

~650 Lines of code

Custom API Tools

Other Possibilities



1. **Bridge response studies** - looping through model modifications and analysis provides a way to study and research.
2. **Database maintenance** - looping through all models in a database provides a way to modify models based on specified criteria.
3. **Other...**



1. Install Microsoft Visual Studio ([Appendix A – Microsoft Visual Studio installation settings](#)) or similar software.
2. Get developer package
 - A. API examples (written in C#) ([Appendix B – API examples](#))
 - B. BrDR API reference and BrDR API Guide.
3. Run the provided example codes to see what they do.
4. Try to understand the code. It is in English!
5. Modify the code to build your own custom tools.
6. Get more code “building blocks” ([Appendix C – Culvert API code example](#)).
 - A. Materials, rebar definitions, superstructure alternatives, etc.
 - B. Calculate LLDF
 - C. Analysis results
 - D. Etc...



Custom API Tools

Challenges



1. Learning C# language & BrDR API.
2. C# software needs to be installed (Microsoft Visual Studio or similar).
3. Navigating through the BrDR documentation and finding what you need.
4. Lack of documentation (6.8.4 has more information than 7.6.1).
5. Lack of code examples (e.g.: navigating through different parts of a model).
6. No API examples in VBA or Python.
7. ProMiles help is required for more complicated tasks.
8. External API tools require update with every new BrDR version
 - A. References update
 - B. Major API changes without announcement breaks the tools.

How to get here using API???

Column	Longitudinal		Transverse	
	Support type	Spring constant (kN-m/rad)	Support type	Spring constant (kN-m/rad)
> Column1	Sp...	0.001	Fix...	
Column2	Sp...	0.001	Fix...	
Column3	Sp...	0.001	Fix...	

Custom API Tools

Summary



BrDR API provides endless possibilities to efficiently model, maintain and study bridges. From a simple task automation to a complex database manipulation, custom API tools make it doable. However, the challenges associated with BrDR API make it unnecessarily difficult to start coding. The following improvements are recommended to encourage custom API tool development:

Help Documentation:

- API Guide needs to be improved at least to the level of 6.8.4 BrDR API Guide including type codes, explained sample codes, hierarchy diagrams, etc. Missing key portions of C# API coding like cast operation need to be included as well.
- API help files need to be enhanced to improve search experience.

API Examples:

- More Examples!!!
 - All BrDR model components (beam shapes, materials, rebar definitions, etc.)
 - Basic tasks (calculating LLDF, analyzing a model, getting to the analysis results, etc.)
 - fully defined bridge (MCB, truss , etc.)
- Examples of BrDR API in VBA and Python languages.





Workloads Individual components Language packs Installation locations

Web & Cloud (4)

- ASP.NET and web development Build web applications using ASP.NET Core, ASP.NET, HTML/JavaScript, and Containers including Docker supp...
- Azure development** Azure SDKs, tools, and projects for developing cloud apps and creating resources using .NET and .NET Framework....
- Python development Editing, debugging, interactive development and source control for Python.
- Node.js development Build scalable network applications using Node.js, an asynchronous event-driven JavaScript runtime.

Desktop & Mobile (5)

- Mobile development with .NET Build cross-platform applications for iOS, Android or Windows using Xamarin. This includes a preview of the
- .NET desktop development Build WPF, Windows Forms, and console applications using C#, Visual Basic, and F# with .NET and .NET Frame...
- Desktop development with C++ Build modern C++ apps for Windows using tools of your choice, including MSVC, Clang, CMake, or MSBuild.
- Universal Windows Platform development** Create applications for the Universal Windows Platform with C#, VB, or optionally C++.

Location

Installation details

- ▶ Visual Studio core editor
- ▼ Universal Windows Platform develop...
 - ▼ Included
 - ✓ Blend for Visual Studio
 - ✓ .NET Native and .NET Standard
 - ✓ NuGet package manager
 - ✓ Universal Windows Platform tools
 - ✓ Windows 10 SDK (10.0.19041.0)
 - ▼ Optional
 - IntelliCode
 - USB Device Connectivity
 - C++ (v143) Universal Windows Platform to...
 - C++ (v142) Universal Windows Platform to...
 - C++ (v141) Universal Windows Platform to...
 - Graphics debugger and GPU profiler for Di...
 - Windows 11 SDK (10.0.22000.0)
 - Windows 10 SDK (10.0.18362.0)

Download web page: <https://visualstudio.microsoft.com/downloads/>

Custom API Tools

Appendix B – API Examples



- Example1-1
- Example1-2
- Example1-3
- Example1-4
- Example1-5
- Example1-6
- Example1-6-CPP
- Example1-7
- Example1-8
- Example1-9
- Example1-10
- Example1-11
- Example1-12
- Example2-1
- Example2-2
- Example2-3
- Example2-4
- Example2-5
- Example3-1
- Example3-2
- Example3-3
- AASHTOWare BrDR Analysis and Engine API Reference.chm
- AASHTOWare BrDR API Reference.chm
- AASHTOWare BrDR Specification Checker API Reference.chm
- ApiExamples.sln
- BrDR API Guide.pdf
- ReadMe.txt
- UpgradeLog.htm

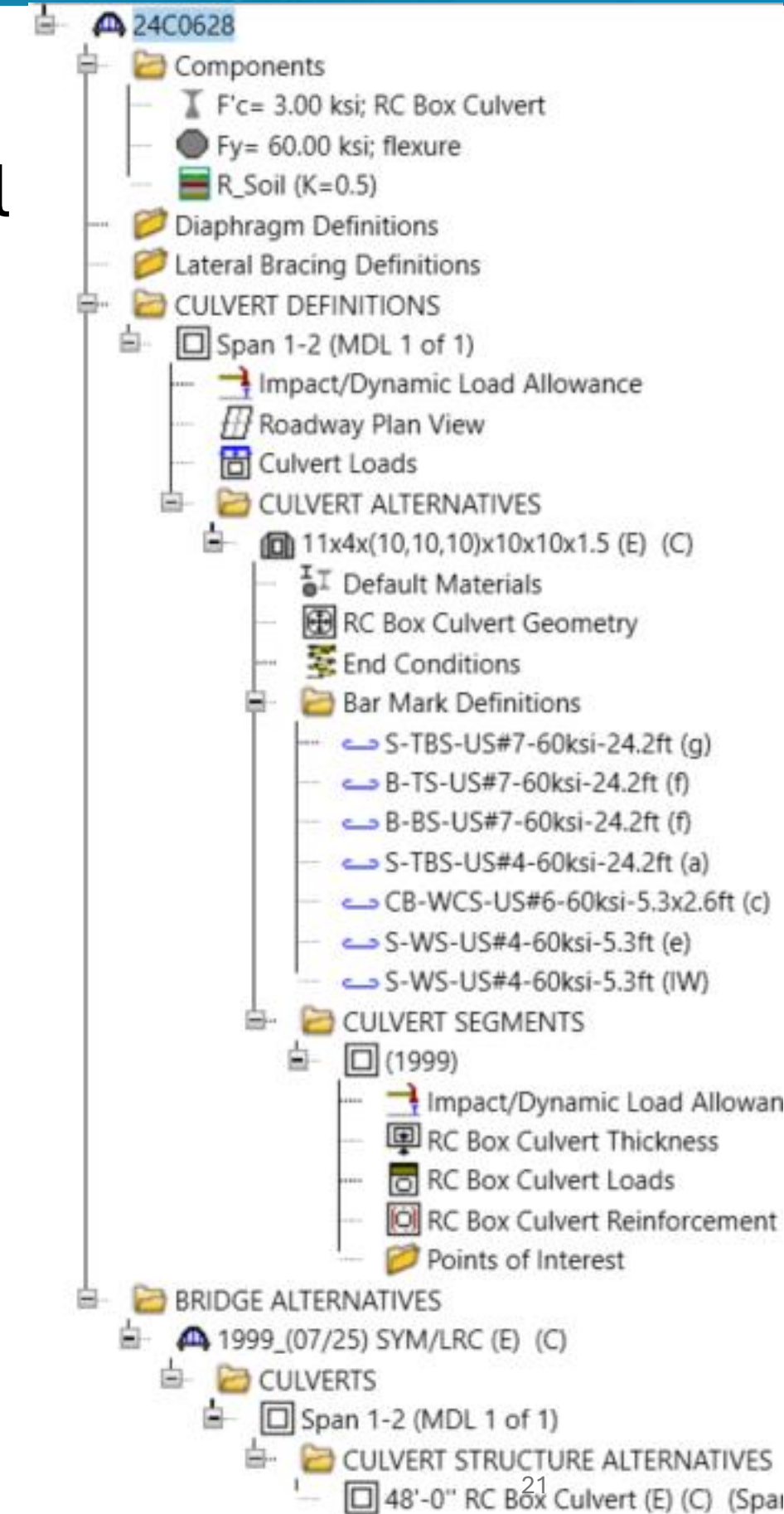
- 1 Basic API Operations
 - 1.1 Object retrieve examples
 - 1.2 Object CRUD examples
 - 1.3 Summary object examples
 - 1.4 Retrieving reinforced concrete cross sections
 - 1.5 Retrieving prestressed beam spans
 - 1.6 C++ Object retrieve example (a subset of Example 1.1) [Not in solution]
 - 1.7 Calculating Steel Cross-Sectional Area
 - 1.8 Create and save bridge example
 - 1.9 Import Utility example
 - 1.10 Licensing example
 - 1.11 IFC bridge import/export example

- 2 Analysis Examples
 - 2.1 Analysis API
 - 2.2 Simplified Analysis API (LFD)
 - 2.3 XML-based Analysis API
 - 2.4 Rating Tool API
 - 2.5 Simplified Analysis API (LRFR)

- 3 Engine
 - 3.1 Creating a 3rd-party engine
 - 3.2 Creating a 3rd-party engine properties UI window
 - 3.3 Retrieve Engine Properties from Bridge Object



The API code connects to an Excel Culvert Spreadsheet, imports appropriate BrDR template culvert model and modifies the model based on the culvert design and configuration



Custom API Tools

Appendix C – Culvert API Code Example



Sign in credentials

Connect to Excel

Get data from Excel

Sign in to BrDR

The screenshot shows the AASHTO Bridge Design & Rating software interface. A 'Connect' dialog box is open, displaying the software logo and version information: 'AASHTO Ware™ BRIDGE DESIGN AND RATING, Bridge Design & Rating, Version 7.6.1.3001, Build date Apr 07 2025'. The dialog has three input fields: 'Username' with the value 'brr', 'Password' with masked characters, and 'Connect to' with a dropdown menu showing 'SMI_local176'. Below the inputs are 'OK', 'Cancel', 'Help', and 'License' buttons. In the background, a project tree is visible with folders like 'Components', 'CULVERT SEGMENTS', and 'BRIDGE ALTERNATIVES'. A specific culvert structure is selected, showing details like 'F'c= 3.00 ksi; RC Box Culvert' and 'Ry= 60.00 ksi; flexure'.

Custom API Tools

Appendix C – Culvert API Code Example



```
DøBsidgêNãñãgês døBsidgêNãñãgês BRIDGÊWãse BsidgêNãñãgês  
døBsidgê døBsidgêNãñãgês RêtsiêwêBýBsidgêId BÍD  
  çsidgê ñøtj gòuñd êssòs  
ig døBsidgê ñu'll
```

```
Còñsòlê WsítjêLínê BÍD Bsidgê ID ís ñøtj uñíruê  
BÍD BÍD døBsidgêNãñãgês GêtjCòuñtj  
Còñsòlê WsítjêLínê BÍD Bsidgê ID xí'll çê çsêáttêd
```

```
ínřòstj á tñêrlãttê  
çtjsínô TêñrlãttêGílêçtjsínô çtjsínô Éyçêl Rãñgê BsDRDãttã Cêlls ' _ Lá'luê,  
ig Gílê Éyíçttj TêñrlãttêGílêçtjsínô
```

```
døBsidgê døBsidgêNãñãgês ÍnřòstjBsidgê TêñrlãttêGílêçtjsínô
```

```
ig døBsidgê ñu'll
```

```
Còñsòlê WsítjêLínê Bsidgê ñødêl tñêrlãttê çãññøtj çê gòuñd  
Còñsòlê WsítjêLínê Rsêçç áñy lèy tjo éyítj  
Còñsòlê RêáđKêy  
  éyítj  
ínřj çòdê  
Éñwísòññêttj Éyítj çòdê
```

```
xsítjê çsidgê gêñêsál ñgò  
Còñsòlê WsítjêLínê  
Còñsòlê WsítjêLínê Têñrlãttê Nãñê døBsidgê Nãñê  
Còñsòlê WsítjêLínê  
Còñsòlê GòsêgòsòuñdCòlòs CòñsòlêCòlòs Dáslyêllòx  
Còñsòlê WsítjêLínê CùlWêstj Aútjòñãttjòñ hãç çtjãttêd  
Còñsòlê WsítjêLínê Rsêçç áñy lèy tjo çòñtjòuê òs çlòçç tñê xíñdòx tjo çãñçêl  
çtjçtjêççòuñdç Hãñđ Rlãý  
Còñsòlê RêáđKêy  
Còñsòlê RêçêttjCòlòs
```

```
Náñ çsidgê GÓÍ  
Còñsòlê WsítjêLínê  
Còñsòlê WsítjêLínê xòslíñô òñ Bsidgê Al'tjêsáñíwêç  
døBsidgê çtjsuçttjNun çêttjLã'luê BÍD  
døBsidgê AğêñçýCòdê çêttjLã'luê BÍD  
døBsidgê Nãñê çêttjLã'luê çtjsínô Éyçêl Rãñgê BsDRDãttã Cêlls ' _ Lá'luê,  
çtjsínô TêñrDêççs çtjsínô Éyçêl Rãñgê Tsãñçgêsçhêêttj Cêlls ' _ Lá'luê, çtjçtjêñ Éñwísòññêttj NêxLínê çtjsínô Éyçêl Rãñgê Tsãñçgêsçhêêttj Cêlls ' _ Lá'luê,  
døBsidgê Dêççsírçtjòñ çêttjLã'luê TêñrDêççs  
døBsidgê Yêásçùíltj çêttjLã'luê ínřj Éyçêl Rãñgê BsDRDãttã Cêlls ' _ Lá'luê,
```

```
uñítjç  
ig çtjsínô Éyçêl Rãñgê BsDRDãttã Cêlls ' _ Lá'luê, çí
```

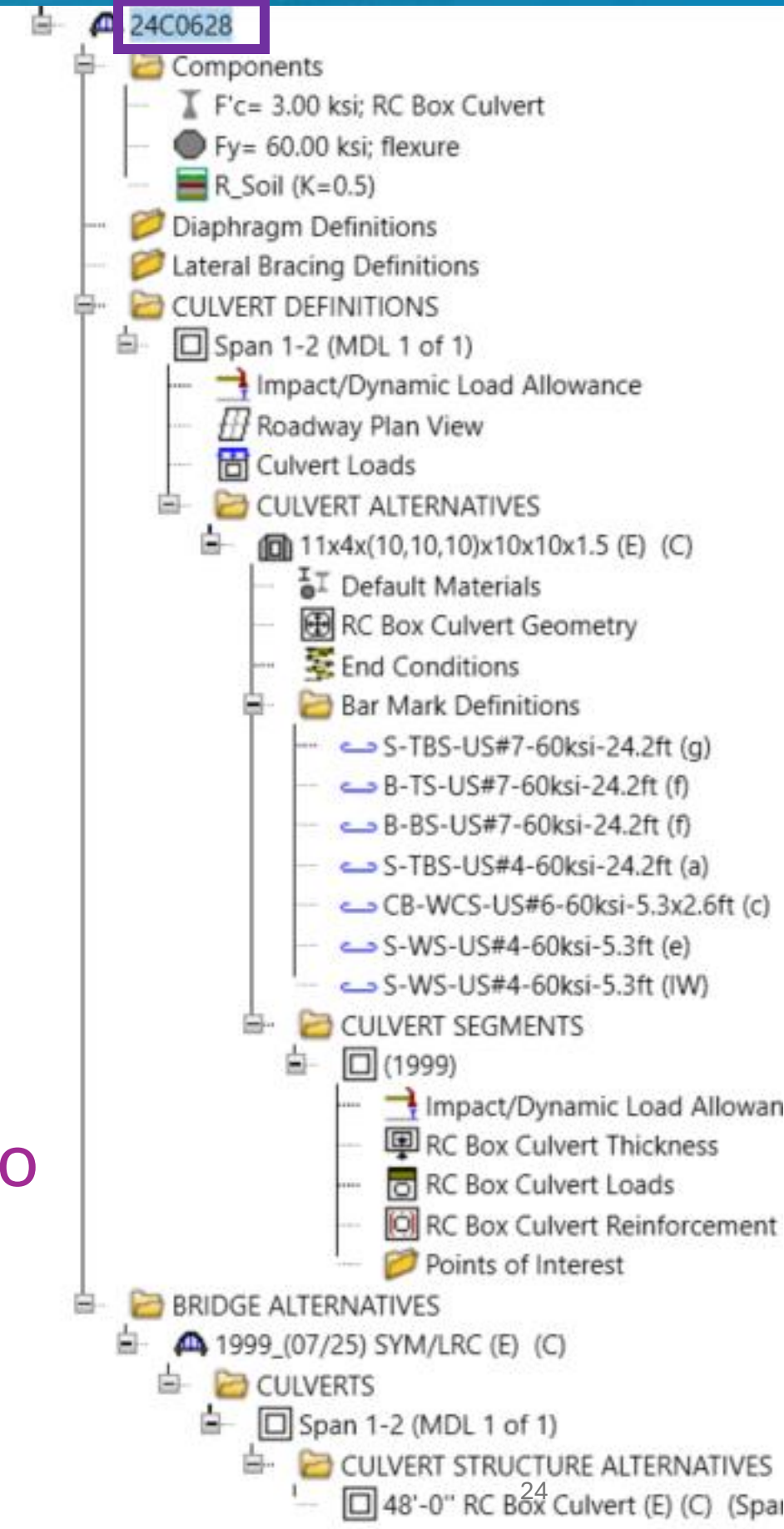
```
døBsidgê BsidgêUñítjçTjçrê çêttjLã'luê .....
```

```
êlçê  
døBsidgê BsidgêUñítjçTjçrê çêttjLã'luê .....
```

Check if a bridge number exists

Import a template

Write to the bridge general info



Custom API Tools

Appendix C – Culvert API Code Example



Agēncý çòdēs

```
RòxÒgğsētj
dòBsídğē CusťfōnAgēncýGíēldŌnē šēťlǎlúē  şťsínğ  Éyçēl Rǎñğē TsǎñşğēsŞhēēť Cēllş RòxŌgğsētj  ..  Lǎlúē,  ğíťđēs týřē
dòBsídğē CusťfōnAgēncýGíēldŤxò šēťlǎlúē  şťsínğ  Éyçēl Rǎñğē TsǎñşğēsŞhēēť Cēllş RòxŌgğsētj  ..  Lǎlúē,  nòđēl çsēáťđēd
dòBsídğē CusťfōnAgēncýGíēldŤhsēē šēťlǎlúē  şťsínğ  Éyçēl Rǎñğē TsǎñşğēsŞhēēť Cēllş RòxŌgğsētj  ..  Lǎlúē,  nǎy şlêx
dòBsídğē CusťfōnAgēncýGíēldGòus šēťlǎlúē  şťsínğ  Éyçēl Rǎñğē TsǎñşğēsŞhēēť Cēllş RòxŌgğsētj  ..  Lǎlúē,  şřǎñ lēñğťh
dòBsídğē CusťfōnAgēncýGíēldGíwē šēťlǎlúē  şťsínğ  Éyçēl Rǎñğē TsǎñşğēsŞhēēť Cēllş RòxŌgğsētj  ..  Lǎlúē,  ğísdēs şřǎçínğ
dòBsídğē CusťfōnAgēncýGíēldŞiy šēťlǎlúē  şťsínğ  Éyçēl Rǎñğē TsǎñşğēsŞhēēť Cēllş RòxŌgğsētj  ..  Lǎlúē,  çòñđítđiŋ ğáčťđōs
dòBsídğē CusťfōnAgēncýGíēldŞēwēñ šēťlǎlúē  şťsínğ  Éyçēl Rǎñğē TsǎñşğēsŞhēēť Cēllş RòxŌgğsētj  ..  Lǎlúē,  lldğ
dòBsídğē CusťfōnAgēncýGíēldÉiğhť šēťlǎlúē  şťsínğ  Éyçēl Rǎñğē TsǎñşğēsŞhēēť Cēllş RòxŌgğsētj  ..  Lǎlúē,  wēssđiŋ
dòBsídğē CusťfōnAgēncýGíēldNínē šēťlǎlúē  şťsínğ  Éyçēl Rǎñğē TsǎñşğēsŞhēēť Cēllş RòxŌgğsētj  ..  Lǎlúē,  wòsl ǎsòuñđ
dòBsídğē CusťfōnAgēncýGíēldŤēñ šēťlǎlúē  şťsínğ  Éyçēl Rǎñğē TsǎñşğēsŞhēēť Cēllş RòxŌgğsētj  ..  Lǎlúē,  wòsl ǎsòuñđ
```

Bridge General Info

```
Bsídğē ǎłťēsñǎťwē
ǎşşunřťđiŋ òñlý òñē çsídğē ǎłťēsñǎťwē
DòBsídğēǎłť  dòBsídğēǎłť  dòBsídğē BsídğēǎłťLíşť .
```

Bridge Alternative

```
dòBsídğēǎłť Nǎñē šēťlǎlúē  şťsínğ  Éyçēl Rǎñğē BsDRĐǎťǎ Cēllş  _ _  Lǎlúē,
dòBsídğēǎłť RēğēsēñçēLínēLēñğťh šēťlǎlúē  dòuçlē  Éyçēl Rǎñğē BsDRĐǎťǎ Cēllş  _ _  Lǎlúē,  şēťşşōsşđiŋđıťş LēñğťhŌñđıťş ĞŤ
ıñť Çhēçl  şǎwēÇhēçl
```

Culvert Alternative

```
ǎşşunřťđiŋ òñlý òñē çsídğē ǎłťēsñǎťwē şurēsşťşucťşusē
DòCulwēşť  dòCulwēşť  dòBsídğēǎłť CulwēşťLíşť
dòCulwēşť Nǎñē šēťlǎlúē  şťsínğ  Éyçēl Rǎñğē BsDRĐǎťǎ Cēllş  _ _  Lǎlúē,
```

Culvert Alternative

```
ǎşşunřťđiŋ òñlý òñē çsídğē şurēsşťşucťşusē ǎłťēsñǎťwē
DòCulwēşťşťşucťşALť  dòCulwēşťşťşucťşALť  dòCulwēşť CulwēşťşťşucťşALťLíşť
dòCulwēşťşťşucťşALť Nǎñē šēťlǎlúē  şťsínğ  Éyçēl Rǎñğē BsDRĐǎťǎ Cēllş  _ _  Lǎlúē,
```

Culvert Definition

```
dòCulwēşťşťşucťşDēğ  dòCulwēşťşťşucťşALť ĞēťşťşucťşDēğ
```

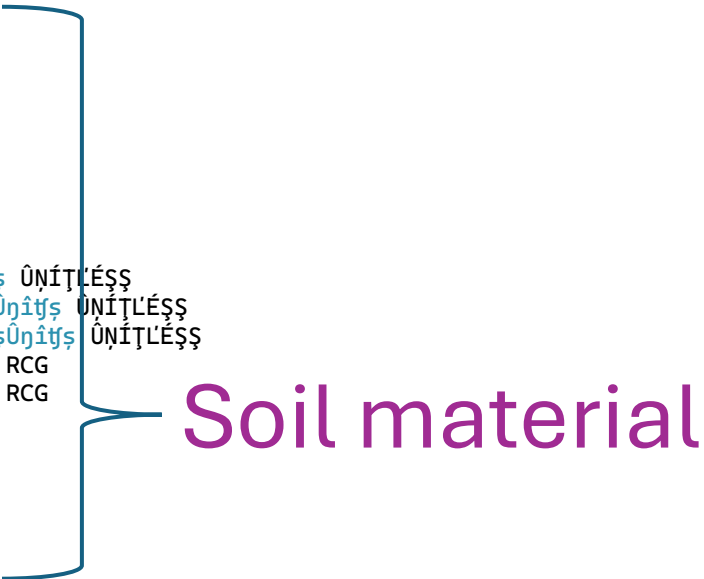

Custom API Tools

Appendix C – Culvert API Code Example



şöil

```
Cöñşöle WsıtıñêLıñê xöslıñğ öñ şöil Năıfésıáıl  
ıñıf şöilCöuntıf  
ğöseäch DöşöilNăıfésıáıl döşöilNăıfésıáıl ıñ döBsıđğê şöilNăıfésıáılLışıf  
  
şıfşıñğ TêñşşöilNăñê şıfşıñğ Éyçêl Răñğê BsDRDăıfă Cêllş _ ' _ şöilCöuntıf Lăılüê,  
döşöilNăıfésıáıl Năñê ŞeyLăılüê TêñşşöilNăñê  
döşöilNăıfésıáıl Dêşşıñıfıñ ŞeyLăılüê şıfşıñğ Éyçêl Răñğê BsDRDăıfă Cêllş _ ' şöilCöuntıf Lăılüê,  
döşöilNăıfésıáıl şöilÜñıfıLöăđ ŞeyLăılüê döuçlê Éyçêl Răñğê BsDRDăıfă Cêllş _ ' şöilCöuntıf Lăılüê,  
döşöilNăıfésıáıl ŞăıfşıñğşöilÜñıfıLöăđ ŞeyLăılüê döuçlê Éyçêl Răñğê BsDRDăıfă Cêllş _ ' şöilCöuntıf Lăılüê,  
döşöilNăıfésıáıl LşğđAıfRêşıfLăıfésıáılÉăşıfRşesşCöêğğ ŞeyLăılüê döuçlê Éyçêl Răñğê BsDRDăıfă Cêllş _ ' şöilCöuntıf Lăılüê,  
döşöilNăıfésıáıl LşğđLşğsAçıfıñêLăıfésıáılÉăşıfRşesşCöêğğ ŞeyLăılüê döuçlê Éyçêl Răñğê BsDRDăıfă Cêllş _ ' şöilCöuntıf Lăılüê,  
döşöilNăıfésıáıl LşğđLşğsRăşşıwêLăıfésıáılÉăşıfRşesşCöêğğ ŞeyLăılüê döuçlê Éyçêl Răñğê BsDRDăıfă Cêllş _ ' şöilCöuntıf Lăılüê,  
döşöilNăıfésıáıl LşğNăıfLăıfésıáılşöilRşesşşusê ŞeyLăılüê döuçlê Éyçêl Răñğê BsDRDăıfă Cêllş _ ' şöilCöuntıf Lăılüê,  
döşöilNăıfésıáıl LşğNıñLăıfésıáılşöilRşesşşusê ŞeyLăılüê döuçlê Éyçêl Răñğê BsDRDăıfă Cêllş _ ' şöilCöuntıf Lăılüê,  
  
şöilCöuntıf  
Chêçl ŞăwêChêçl
```



- 24C0628
 - Components
 - F'c= 3.00 ksi; RC Box Culvert
 - Fv= 60.00 ksi; flexure
 - R_Soil (K=0.5)
 - Diaphragm Definitions
 - Lateral Bracing Definitions
 - CULVERT DEFINITIONS
 - Span 1-2 (MDL 1 of 1)
 - Impact/Dynamic Load Allowance
 - Roadway Plan View
 - Culvert Loads
 - CULVERT ALTERNATIVES
 - 11x4x(10,10,10)x10x10x1.5 (E) (C)
 - Default Materials
 - RC Box Culvert Geometry
 - End Conditions
 - Bar Mark Definitions
 - S-TBS-US#7-60ksi-24.2ft (g)
 - B-TS-US#7-60ksi-24.2ft (f)
 - B-BS-US#7-60ksi-24.2ft (f)
 - S-TBS-US#4-60ksi-24.2ft (a)
 - CB-WCS-US#6-60ksi-5.3x2.6ft (c)
 - S-WS-US#4-60ksi-5.3ft (e)
 - S-WS-US#4-60ksi-5.3ft (IW)
 - CULVERT SEGMENTS
 - (1999)
 - Impact/Dynamic Load Allowan
 - RC Box Culvert Thickness
 - RC Box Culvert Loads
 - RC Box Culvert Reinforcement
 - Points of Interest
 - BRIDGE ALTERNATIVES
 - 1999_(07/25) SYM/LRC (E) (C)
 - CULVERTS
 - Span 1-2 (MDL 1 of 1)
 - CULVERT STRUCTURE ALTERNATIVES
 - 48'-0" RC Box Culvert (E) (C) (Span

Custom API Tools

Appendix C – Culvert API Code Example



սրբեմնաբանական արժեքներ
Հոսքի արագությունը և լիակազմի մակարդակը
Հողի ընթացակարգի մոդելավորումը

Վերականգնելու համար
Ստանդարտացված մոդելավորումը
Ստանդարտացված մոդելավորումը

Culvert Definition

Ստանդարտացված մոդելավորումը
Ստանդարտացված մոդելավորումը
Ստանդարտացված մոդելավորումը

Roadway

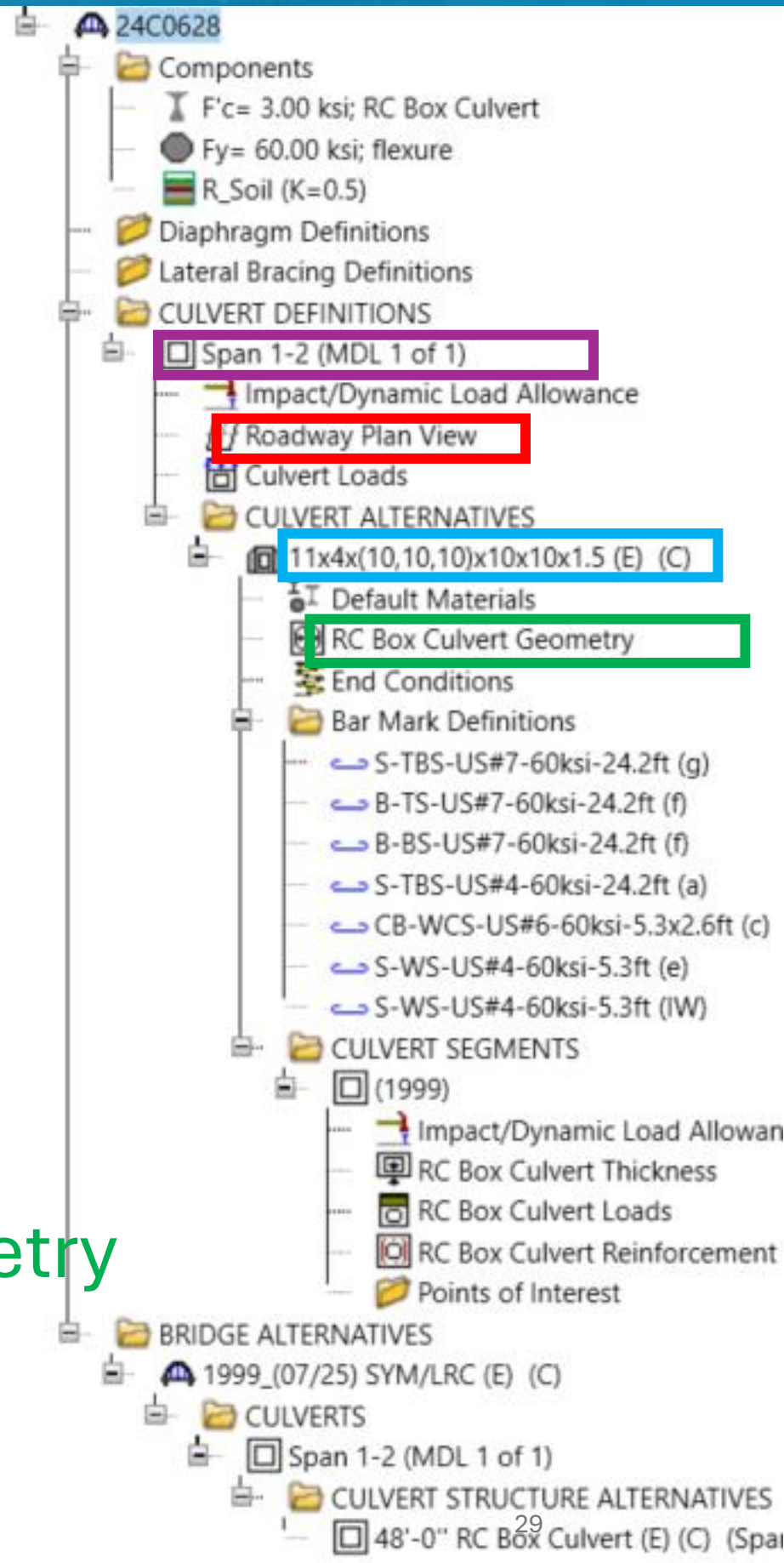
Ստանդարտացված մոդելավորումը
Ստանդարտացված մոդելավորումը
Ստանդարտացված մոդելավորումը

Culvert Alternative

Ստանդարտացված մոդելավորումը
Ստանդարտացված մոդելավորումը
Ստանդարտացված մոդելավորումը

Geometry

Ստանդարտացված մոդելավորումը
Ստանդարտացված մոդելավորումը
Ստանդարտացված մոդելավորումը





```
C:\Program Files\AASHTOWare\API\BrDR76\Tools\Culvert 76 - Copy\bin\Debug\net8.0-windows\Example2-1.exe
----- BrDR 7.6 CULVERT AUTOMATION TOOL V. 06.25.25 -----
-----
24C0607 Culvert AutoGen BrDR 761 (071425).xlsm is loaded...
Session started!

Template Name: 2-Cell Template

Culvert Automation has started...
Press any key to continue or close the window to cancel...

    working on Bridge Alternatives...
        Success!

    working on Concrete Material...
        Success!

    working on Steel Reinforcement Material...
        Success!

    working on Soil Material...
        Success!

    working on superstructure definitions...
        Success!

Model Saved!

Session ended!

Press any key to exit...
```