



**QA/QC**

Robert Owens, P.E. – TxDOT Bridge Division

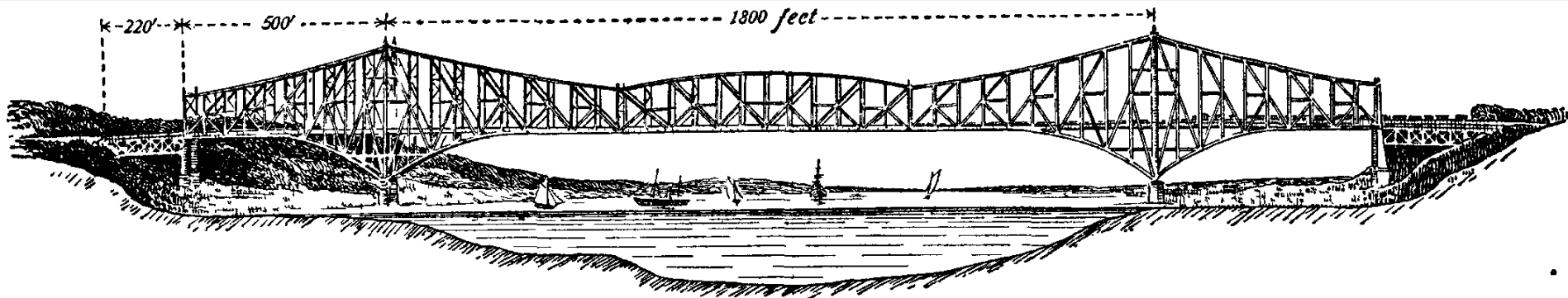


April 10, 2026



**Quebec Bridge**  
**Quebec City, Canada**

Credit Martin St-Amant - Wikipedia - CC-BY-SA-3.0

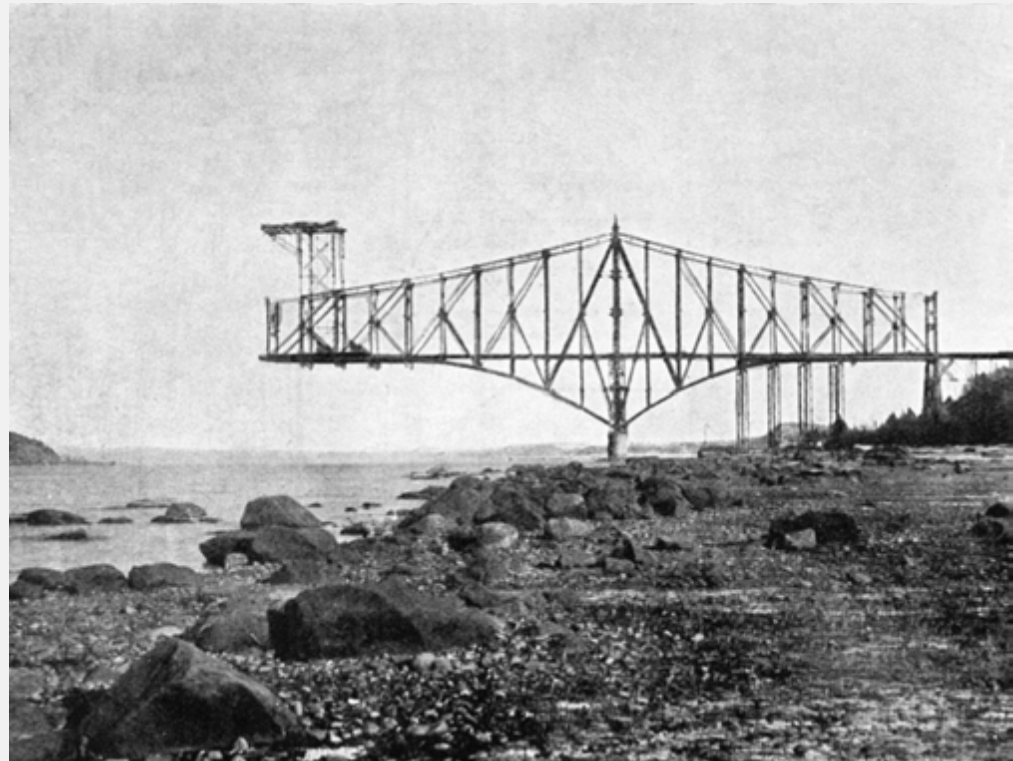


**Quebec Bridge Drawing of Original  
Design 1903**

**Quebec City, Canada**

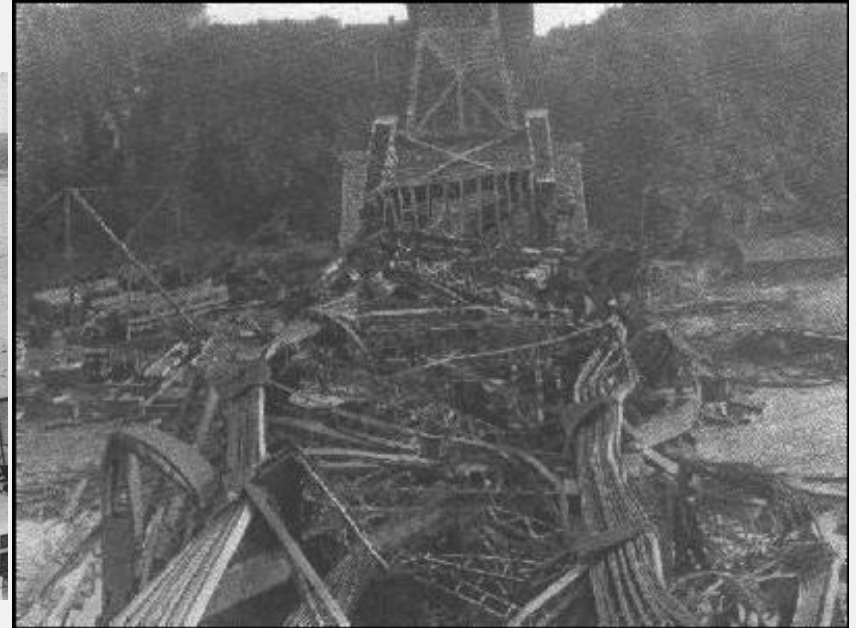
Credit: Wikipedia

- By 1904, the Southern half of the structure was taking shape.
- However, preliminary calculations during the design were never checked.
- The bridge's own deadload was more than the load carrying capacity.
- By the summer of 1907 large deformations were noticed when the bridge was near completion.
- Quebec Bridge and Rail Company consulting engineer Theodore Cooper, who at first replied that the problems were minor.
- Near quitting time on the afternoon of August 29, after four years of construction, the south arm and part of the central section of the bridge collapsed into the St. Lawrence River in 15 seconds.
- 75 workers were killed.



**View of Cantilever Arm**

Credit: Wikipedia



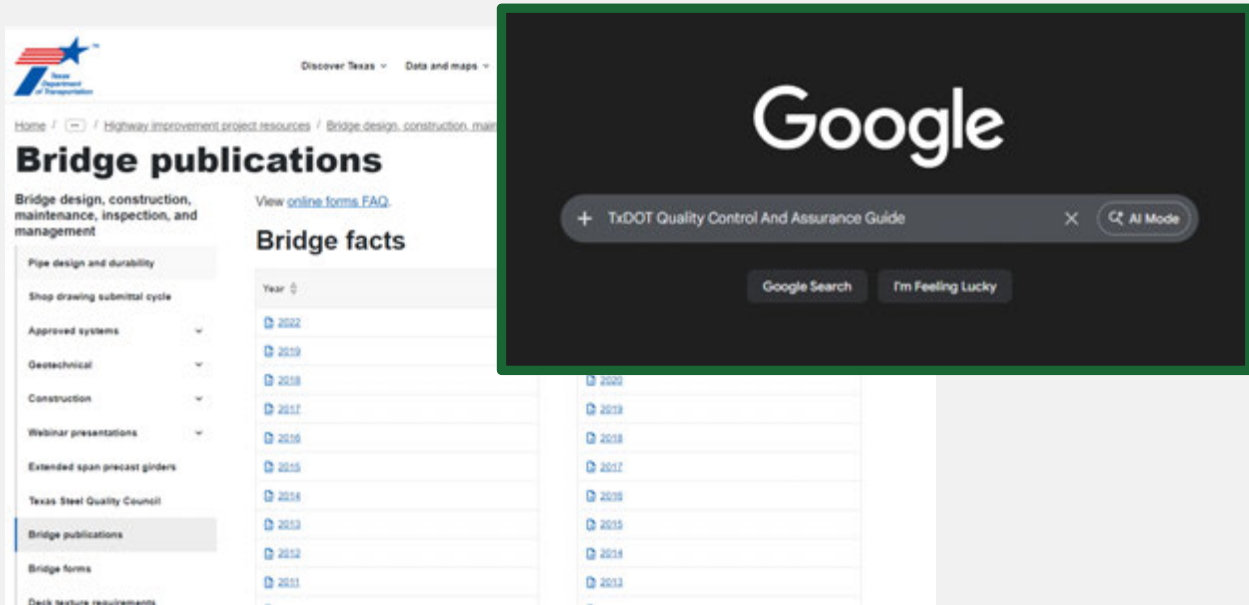
## 1907 Wreckage

Credit: Wikipedia

## TxDOT Quality Control and Quality Assurance Guide

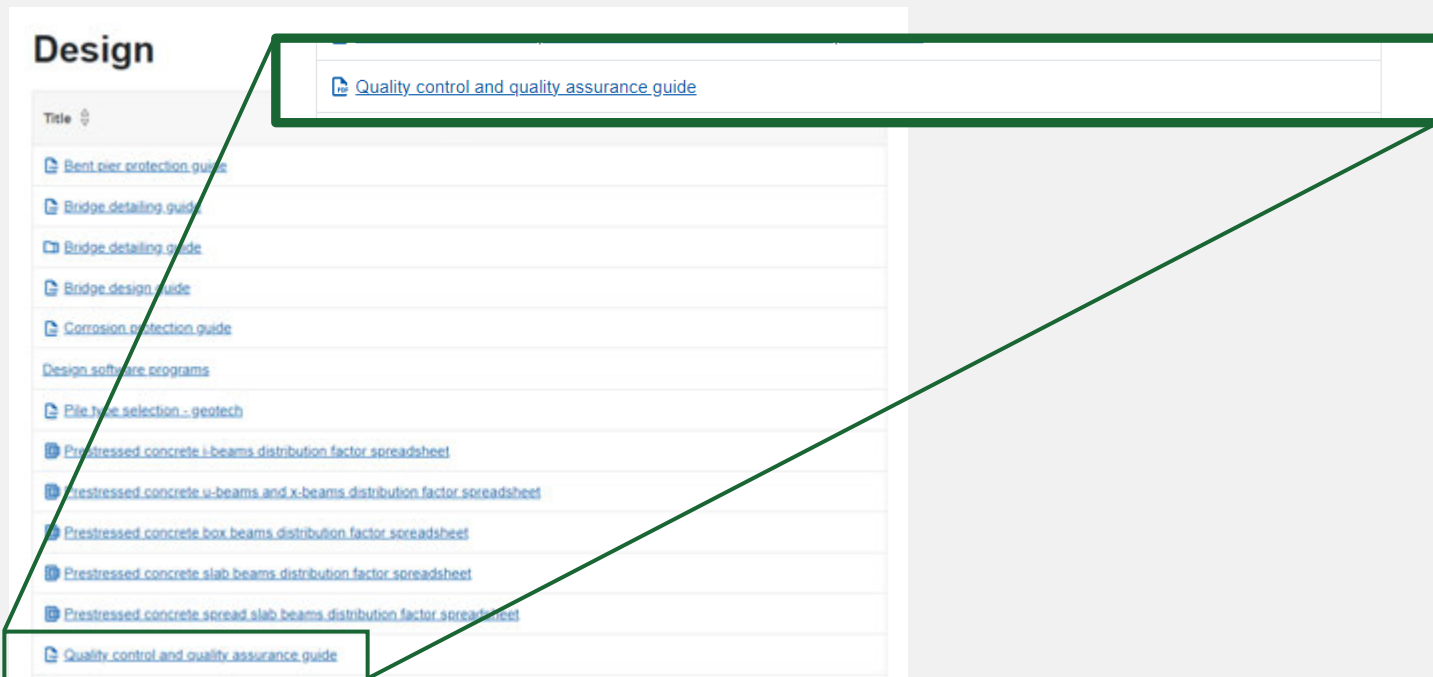
The Texas Department of Transportation (TxDOT) Bridge Division, Design Section has developed and implemented this **Quality Control** and **Quality Assurance** (QC/QA) guide to provide the highest **Quality Products** to TxDOT divisions and districts, other state agencies, federal agencies, consultants, and contractors.

# TxDOT Quality Control and Quality Assurance Guide – Pt 1



<https://www.txdot.gov/business/resources/highway/bridge/bridge-publications.html>

# TxDOT Quality Control and Quality Assurance Guide – Pt 2



[https://ftp.txdot.gov/pub/txdot-info/library/pubs/bus/bridge/qa\\_qc\\_guide.pdf](https://ftp.txdot.gov/pub/txdot-info/library/pubs/bus/bridge/qa_qc_guide.pdf)

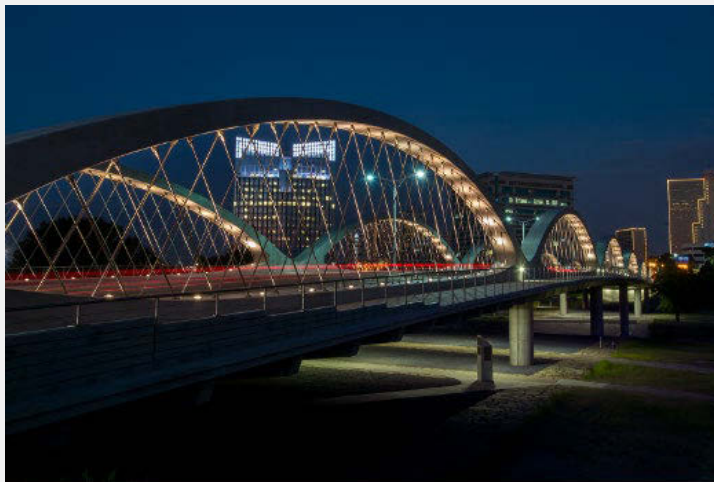
# TxDOT Quality Control and Quality Assurance Guide – Pt 3



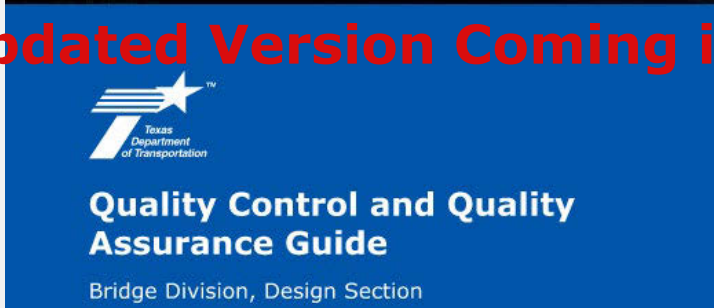
## Quality Control and Quality Assurance Guide

Bridge Division, Design Section  
January 2021

# TxDOT Quality Control and Quality Assurance Guide – Pt 4



**New Updated Version Coming in 2026**



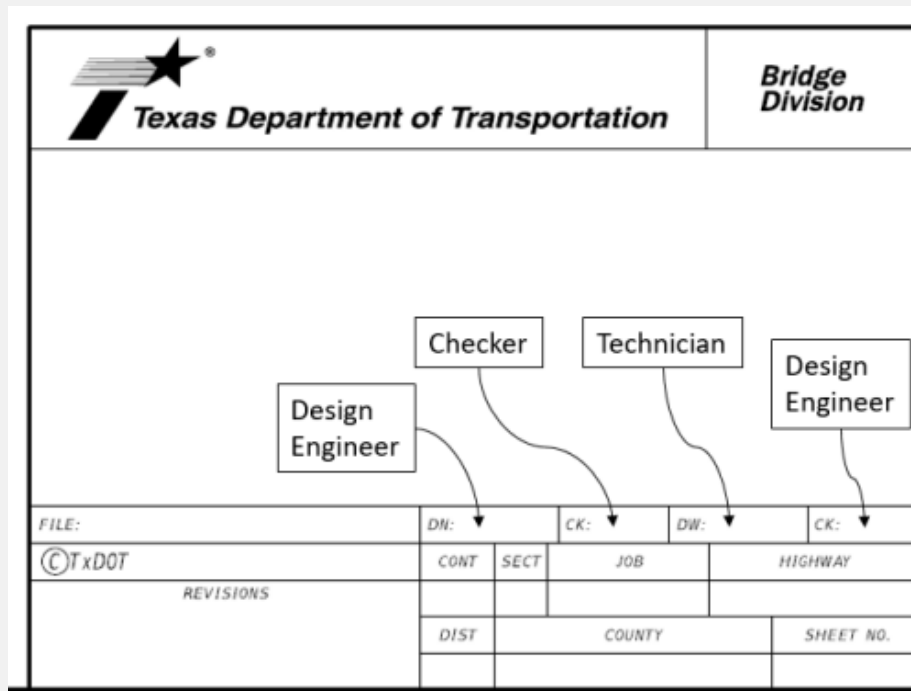





# TxDOT Quality Control and Quality Assurance Guide – Pt 6

The Quality Control/Quality Assurance (QC/QA) program establishes the following goals:

- Designs are free of errors and omissions.
- Contain designs for all elements and are thorough.
- Are appropriately designed.
- Conform to TxDOT policies, and procedures defined in the relevant TxDOT manuals and guides.
- Clearly define the sources of information for the calculations.
- Result in constructible plans.



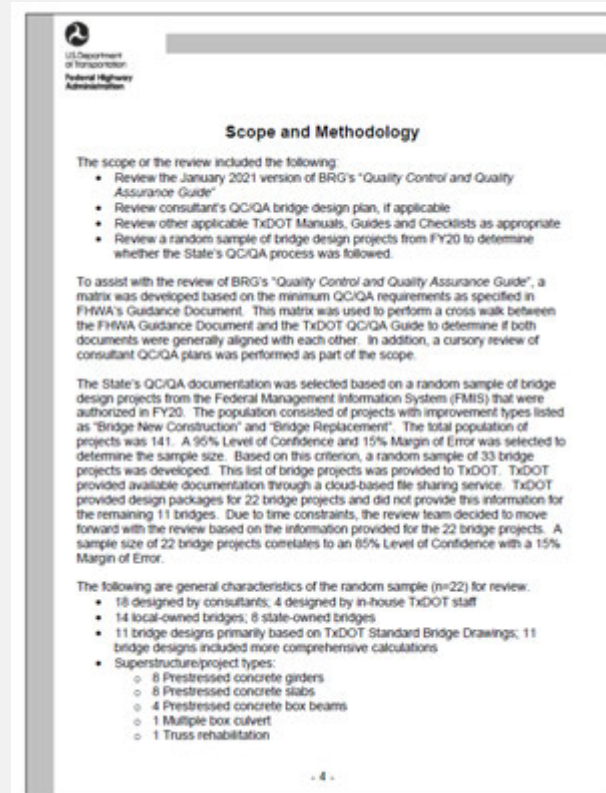
 Texas Department of Transportation		<b>Bridge Division</b>			
<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; padding: 5px; margin: 5px;">Design Engineer</div> <div style="border: 1px solid black; padding: 5px; margin: 5px;">Checker</div> <div style="border: 1px solid black; padding: 5px; margin: 5px;">Technician</div> <div style="border: 1px solid black; padding: 5px; margin: 5px;">Design Engineer</div> </div>					
FILE:	DN:	CK:	DW:	CK:	
©TxDOT	CONT	SECT	JOB	HIGHWAY	
REVISIONS					
	DIST	COUNTY		SHEET NO.	

## TxDOT Quality Control and Quality Assurance Guide – Pt 7

### Consultant Prepared Plans

For consultant-prepared plans, the consultants are required to submit their **Quality Control Plan** in writing prior to starting work or as otherwise directed in the contract. TxDOT reserves the right to review the consultants' quality control process.

# Federal Highway Administration (FHWA) Review

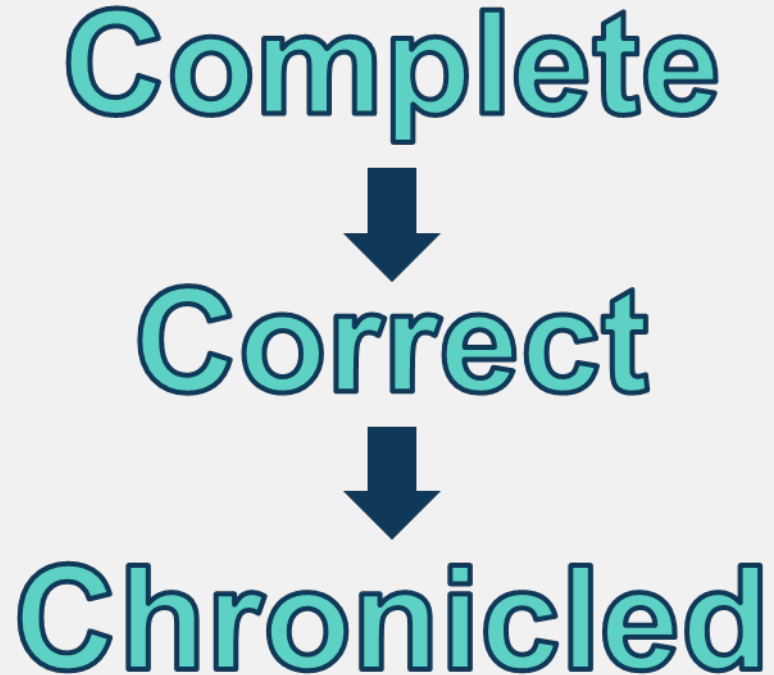


## Federal Highway Administration (FHWA) Review Cont

### Purpose and Objective of the Review

Evaluate the TxDOT Bridge Division's (BRG) "Quality Control and Quality Assurance Guide" and to review the current practice used by bridge designers to carry out the State's QC/QA process. The objectives of the review are:

- Determine if BRG's "Quality Control and Quality Assurance Guide" is in alignment with FHWA's "Guidance on QC/QA in Bridge Design in Response to NTSB Recommendation (H-08-17)" <https://www.fhwa.dot.gov/bridge/h0817.pdf>
- Determine if bridge designers for TxDOT projects are adhering to BRG's "Quality Control and Quality Assurance Guide"
- Determine areas for improvement in the bridge design QC/QA process.



## Six General Outcomes/Recommendations

- 1: Independent Design Checks (IDC) for complex structures
- 2: **Consultant QC Processes on File**
- 3: Some Projects **Lacking QC Coversheets or Not Filled Out Properly**
  - QA Verifications
  - Includes “standard” bridges
- 4: **QC Coversheet Consistency**
  - Varied among consultants
  - Address design calcs and detail checks
- 5: **Titleblocks filled out on detail sheets including bridge and bridge class culvert layouts**
- 6: **Designer and checker initials** on all design calc packages

# 1: Independent Design Check (IDC) Requirements

- Complex Structure Definition
  - Bridges having a difficult or unique foundation problem
  - New or complex designs with unique operational or design features such as:
    - Cable-stayed
    - Suspension
    - Arch
    - Post-tension box girder
    - Segmental concrete
    - Moveable bridges
    - Truss bridges



# 1: Independent Design Check (IDC) Requirements Cont.

- **Requirements can be found in the QA/QC Guide Chapter 6, Section 2**
- In addition to meeting the QC/QA process when designing ordinary bridges:
  - IDC to validate complex or exotic structures or structural elements
  - Completed by a license professional engineer in the State of Texas
  - Be conducted without the aid of the original design calculations
  - Independent verification of the design using different analysis and design software packages than what was used during initial design
  - Generate a separate set of design calculations that are documented in a report. The report shall document any changes or recommendations regarding the original plans.
- IDC shall be
  - Performed by an engineering firm independent from the engineer responsible for the initial design
  - Performed by an engineering firm having no other project involvement
  - Performed by an engineer pre-certified in work category 5.2.1 Bridge Design
  - Designated by TxDOT for both Design-Build and Design-Bid-Build



## 2: Consultant QA/QC Processes on File


- Required to have the firm's general current documented QC/QA process on file stored in a central location
- Information would be treated as confidential
- Needs to be in consultant contracts

### **Consultant Prepared**

For consultant-prepared plans, the consultants are required to submit their Quality Control Plan in writing prior to starting work or as otherwise directed in the contract. TxDOT reserves the right to review the consultants' quality control process.

## 3 & 4: QA/QC Coversheets

- Need to **consistently** have on design notes packages
- Need to have **completely filled out**
- Potential need for a **consistent** form (range of consultants, TxDOT, etc)
- Checking of **calculations and details**
- **Include for standards bridges**
  - Geometry
  - Foundation design notes
- **Store with calcs in central location**

PROJECT BRIDGE DIVISION	County C. S. J. Highway SH 100 Project SH 100 at FM 20	Number 9902-1-000 SH 100 SH 100 at FM 20	Group Leader (Approval for Release) 		Date
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Structure	Component	Design Engineer Assigned	Software Used	Software Version	Checker Assigned	Design Engineer Prepared		Checker Checked		Design Engineer Corrected		Checker Verified	
						Initial	Date	Initial	Date	Initial	Date	Initial	Date
SH 100 at FM 20	General/Working Plan	Charlie Brown	ACI		Elizabeth Taylor	CCB	12/01/19	EIT	01/09/20	CCB	01/08/20	EIT	01/16/20
SH 100 at FM 20	Superstructure	Charlie Brown	BridgeLINE	3.0.2	Elizabeth Taylor	CCB	12/01/19	EIT	01/09/20	CCB	01/08/20	EIT	01/16/20
SH 100 at FM 20	Steel and Abutments	Charlie Brown	Cap 16		Joseph Stearns	CCB	12/01/19	SES	01/17/20	CCB	01/16/20	SES	01/16/20
SH 100 at FM 20	Clearance	Charlie Brown	MSA 3.0	11.0	Joseph Stearns	CCB	12/01/19	SES	01/17/20	CCB	01/16/20	SES	01/16/20

Checker's Comments

No Changes  
 Revise Design as shown  
 Other Comments/Conclusions

Minor corrections; original design satisfactory

Missing Missing Part Calculations

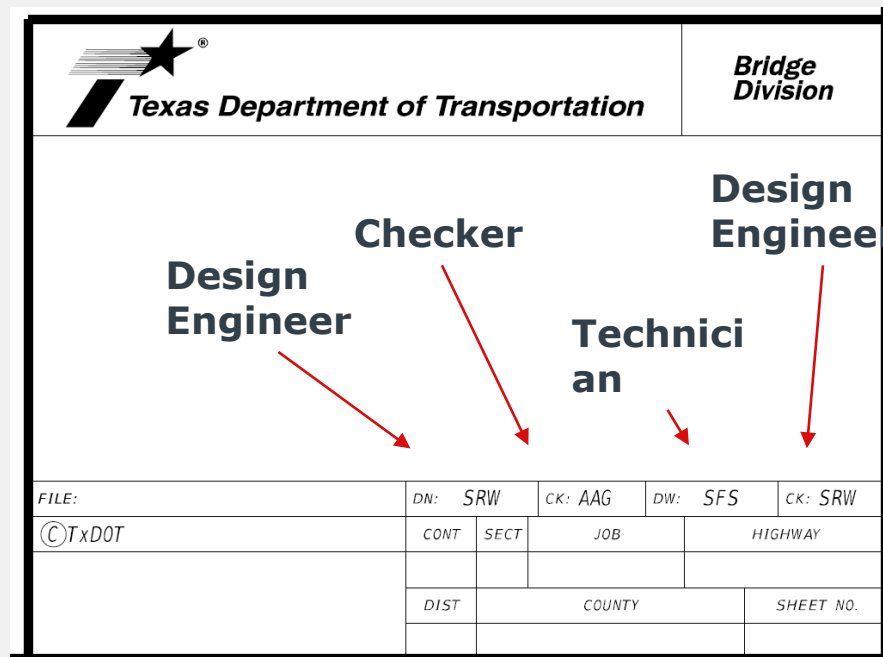
  

Structure	Component	Bridge ID#	Technician Assigned	Technician Prepared		Design Engineer Checked		Technician Corrected		Design Engineer Verified	
				Initial	Date	Initial	Date	Initial	Date	Initial	Date
SH 100 at FM 20	Steel	7984	Sean Rowland	CR	12/11/19	CCB	12/22/19	ESN	12/22/19	CCB	12/28/19
SH 100 at FM 20	Substructure	7984	Sean Rowland	CR	12/01/19	CCB	12/02/19	ESN	12/25/19	CCB	12/02/20
SH 100 at FM 20	Clearance	7984	Taylor Smith	ES	12/01/19	CCB	12/02/19	ESN	12/25/19	CCB	12/02/20

The calculations specifically identified above have been completed by me or under my responsible supervision.

## 5: Titleblocks

- Need designer/technician/checker/detail check boxes on **bridge layouts and bridge details**
- Multi-disciplinary review essential
  - Roadway design...e.g. does the layout match the P&P
  - Bridge design...consistency with structural details, etc.
  - Hydraulics...e.g. does the bridge info match the Hydraulic Data Sheet, frequency & freeboard?, etc.



The diagram shows a titleblock form with the following layout:

- Top left: Texas Department of Transportation logo.
- Top right: Bridge Division.
- Center: Design Engineer, Checker, Technician, Design Engineer.
- Bottom: A table with fields for FILE:, DN: SRW, CK: AAG, DW: SFS, CK: SRW, CONT, SECT, JOB, HIGHWAY, DIST, COUNTY, SHEET NO.

Red arrows indicate the following assignments:

- Design Engineer (left) points to the FILE: field.
- Checker points to the DN: SRW field.
- Technician points to the DIST field.
- Design Engineer (right) points to the CK: SRW field.

FILE:		DN: SRW	CK: AAG	DW: SFS	CK: SRW
©TxDOT	CONT	SECT	JOB	HIGHWAY	
	DIST	COUNTY		SHEET NO.	

## 6: Designer and Checker Initials on All Calculations

- Checker initials and checks clearly identified in calculations.
- Must be clearly shown on all calculation packages to demonstrate accountability and thorough review.

### Launch Calculations

	Design:	HIJ	Date:	2/6/2015
	Ck Dsn:	<b>ABC</b>	Date:	<b>2/14/15</b>
	Version:	1.08	ID #:	9999
and Bridge			Sheet:	of
			Units:	E

### Input

1-4	5	5	9-10	9-10	
142	142	142	150	150	
2-5	1 & 6	2-5	1 & 7	2-6	
4	2	4	2	5	
8	8	8	8	8	
Tx62	Tx62	Tx62	Tx62	Tx62	
62	62	62	62	62	
42	42	42	42	42	
2.75	2.75	2.75	2.75	2.75	
0.356	0.356	0.356	0.334	0.334	
0.249	0.218	0.249	0.246	0.259	
0.02	0.02	0.02	0.02	0.02	
0	-0.04	-0.04	0	0	

HIJ ✓ 0.26

## Conclusion

- New guidance will be out in 2026.
- TxDOT needs Consultant partners to help with this effort.

■ Questions?

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