

1701 S. PADRE ISLAND DRIVE, CORPUS CHRISTI, TEXAS 78416 | 361.808.2660 | WWW.TXDOT.GOV

July 21, 2022

Mr. Keith Armstrong Project Manager Flatiron/Dragados, LLC 1620 N Port Ave Corpus Christi, Texas 78401

RE: US 181 Harbor Bridge Replacement Project

CSJ# 0101-06-095

SEL: 000785 FDLLC Response to TxDOT Suspension of Work on New Harbor Bridge

Dear Mr. Armstrong:

This letter is in response to Flatiron Dragados, LLC's (FDLLC) correspondence regarding the above-referenced matter, dated July 18, 2022, and received several hours after close of business. All capitalized terms used and not defined herein have the meanings assigned them in the Comprehensive Development Agreement ("CDA") between FDLLC and the Texas Department of Transportation ("TxDOT"), dated September 28, 2015.

Although FDLLC has agreed in its July 18 letter to the suspension of work on the New Harbor Bridge, TxDOT feels it is necessary to correct the record regarding certain assertions in FDLLC's letter. While we will not attempt to address every inaccuracy and unsupported allegation in the letter, we offer the following.

For the reasons set forth in TxDOT's July 15, 2022 letter to FDLLC, TxDOT's suspension of the Work on the New Harbor Bridge was properly made in accordance with Section 16.2.3 of the CDA ("Developer Defaults Related to Safety") and is not a suspension for convenience. TxDOT's Notice of Nonconforming Work relates in detail the significant and unremedied safety issues presented by the design, including the potential for collapse. FDLLC's continued erection of the superstructure of the New Harbor Bridge despite the Notice of Nonconforming Work, TxDOT's numerous comments and concerns, as well as the findings of the IBT report, present an emergency or danger to persons and property.

While your letter states that FDLLC has consistently maintained that the design of the New Harbor Bridge is in all aspects contractually compliant, TxDOT has been equally consistent through design review comments, correspondence, meetings, and other communications in expressing its concerns with the design and FDLLC's failure to comply with the contract. FDLLC's assertion that "TxDOT issued a Certificate of Compliance noting it took no exceptions taken with the design which allowed FDLLC to proceed with construction" is false. First, TxDOT does not issue Certificates of Compliance. Pursuant to Section 2.2.7.7 of the Technical Provisions ("TP"), the Professional Services Quality Acceptance Manager issues the Certificates of Compliance of Design Documents. FDLLC is then required to obtain TxDOT concurrence prior to commencement of construction. TP Section 2.2.7.7

Mr. Keith Armstrong 2 July 21, 2022

expressly provides that TxDOT's concurrence does not constitute "Approval" of the design or construction, nor does it relieve FDLLC of its responsibility for meeting the requirements of the Contract Documents. Indeed, FDLLC is solely responsible for the compliance of its Work with the CDA. TxDOT's signature on the Certificate of Compliance referenced in your letter expressly states it is an acknowledgement of receipt of the deliverable released by FDLLC in accordance with TP 2.2.7.7.

Second, TxDOT certainly took exception to elements of FDLLC's design and clearly stated its concerns to FDLLC, through design review comments, meetings, correspondence, and the Certificate of Compliance. The Certificate of Compliance refers FDLLC to TxDOT's letter of June 28, 2021, which provides the following regarding FDLLC's Released for Construction (RFC) plans for the main span tower foundations:

TxDOT continues to have concerns related to certain assumptions, and code interpretations contained in the RFC Submittal. These questions and concerns are documented in the attached comment review form, also transmitted via SharePoint. For additional emphasis, TxDOT has expressed concerns related to FDLLC's assumptions that the footing cap behaves as a rigid element and that the foundation loading can be modeled as a singular concentrated load in the center of the footing.

Similarly, a separate Certificate of Compliance refers FDLLC to TxDOT's letter of June 10, 2021, which provides the following comments regarding the superstructure segments, delta frames and median slab:

TxDOT continues to have concerns related to the design methodology, assumptions, design criteria, and code interpretations contained in the RFC Submittal. In addition, TxDOT is unable to evaluate the expected performance and behavior of the New Harbor Bridge during and after construction based on the information provided by FDLLC in the RFC Submittal. These questions and concerns are documented in the attached comment review form, also transmitted via SharePoint.

Both the June 10, 2021 and June 28, 2021 letters include the following:

Please be advised that pursuant to Section 2.2.7.7 of the Technical Provisions, TxDOT's concurrence does not constitute approval of the design or subsequent construction, nor does this letter relieve FDLLC of its responsibility to meet the requirements of the Contract Documents.

Attached for your reference are the TxDOT letters dated June 10, 2021 and June 28, 2021 and related Certificates of Compliance.

Well aware of TxDOT's concerns, comments, and reservations, FDLLC nevertheless proceeded with construction at its own risk. It is disingenuous for FDLLC to now claim that TxDOT is introducing a new position, as asserted in your letter.

FDLLC's letter claims that FDLLC has worked with TxDOT in good faith and fully responded to all questions and comments from TxDOT, HNTB and IBT. The facts are that FDLLC's response to TxDOT's significant comments and concerns has been to refuse to modify its design to conform to the CDA and to present various claims against TxDOT related to TxDOT's identification of FDLLC's

Mr. Keith Armstrong 3 July 21, 2022

defective work. TxDOT has repeatedly requested FDLLC to either provide additional information or confirm that there is no additional information pertinent to FDLLC's design that has not been considered by IBT. FDLLC has not responded to TxDOT's request. In good faith, TxDOT has engaged in numerous meetings with FDLLC, including project-level and executive meetings and, more recently, meetings with IBT and Arup-CFC to reach a resolution. Rather than engage in constructive discussions with TxDOT and IBT, FDLLC and its designer have used these meetings to deny that there are any issues with its design, to refute TxDOT's right to conduct an independent design review, and to refute the validity of IBT's report without addressing its substantive content. FDLLC's summary assertion that the IBT report does not meet industry standards is entirely without basis and is provided without explanation.

FDLLC claims it "has been more than reasonable and diligent in responding to TxDOT's purported concerns," however as set forth above, this has not been the case. In several instances, FDLLC merely forwarded its designer's letters denying any nonconformance despite TxDOT's comments, the Notice of Nonconforming Work, and the independent design review. FDLLC's statement that it offered a plan purporting to address TxDOT's concerns that was "rejected out of hand" is equally false. TxDOT refers FDLLC to TxDOT's letter dated June 21, 2022 in that regard.

Your July 18, 2022 letter lists certain materials, claiming "[u]nless this information is made available, FDLLC and its designers cannot more fully respond to IBT's purported concerns." Please note the information listed under (i) and (ii) in your letter was provided to FDLLC on July 19, 2022. TxDOT has no record of the request made under (iii) on page 2 of your letter. The load information requested was provided in the June 10 meeting and is included in Attachment A to FDLLC's own letter SEL: 000772. Furthermore, IBT's concerns are not "purported" as they are the carefully analyzed findings resulting from an independent design review by a world-renowned firm.

We remind FDLLC that TxDOT has had several meetings with FDLLC during which the problems with the delta frames were a subject of discussion. TxDOT continues to be willing to discuss the issues with FDLLC's design, including the delta frames, although the fact that FDLLC was planning to install the delta frames as designed, despite TxDOT's comments and the findings of the IBT report, is troubling and indicative of FDLLC's unwillingness to address the concerns identified by TxDOT. TxDOT confirms its request in its July 19, 2022 letter to advise TxDOT of when FDLLC is available to meet after reviewing the information forwarded with the letter.

TxDOT reserves all rights and remedies under the CDA and applicable law.

Sincerely,

—DocuSigned by: Joseph Briones

-2956969BAA3C4CE...

Joseph Briones, P.E. Corpus Christi District Project Manager Texas Department of Transportation

Attachment: TxDOT's Letter Dated June 10, 2021

TxDOT's Letter Dated June 28, 2021

Certificate of Compliance – New Harbor Bridge Foundations Certificate of Compliance – New Harbor Bridge Delta Frames

OUR VALUES: People • Accountability • Trust • Honesty
OUR MISSION: Connecting You With Texas

Mr. Keith Armstrong 4 July 21, 2022

cc: Kurt Knebel, Flatiron Constructors, Inc. Justo Molina, Flatiron/Dragados, LLC Valente Olivarez, Jr., P.E.

OUR VALUES: People • Accountability • Trust • Honesty
OUR MISSION: Connecting You With Texas



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June 10, 2021

Mr. Keith Armstrong Project Manager Flatiron/Dragados, LLC 1620 N Port Ave Corpus Christi, Texas 78401

RE: US 181 Harbor Bridge Replacement Project

CSJ# 0101-06-095

Released for Construction (RFC) MSUPER-A Superstructure Typical Segments, Delta Frames

and Median Slab

Dear Mr. Armstrong:

The Texas Department of Transportation ("TxDOT") is in receipt of Flatiron/Dragados, LLC's ("FDLLC") Design Submittal titled *Released for Construction (RFC) MSUPER-A Superstructure Typical Segments, Delta Frames and Median Slab* and the related Certification of Compliance (together the "RFC Submittal") pursuant to Section 2.2.7 of the Technical Provisions for the Comprehensive Development Agreement ("CDA").

TxDOT continues to have concerns related to the design methodology, assumptions, design criteria, and code interpretations contained in the RFC Submittal. In addition, TxDOT is unable to evaluate the expected performance and behavior of the New Harbor Bridge during and after construction based on the information provided by FDLLC in the RFC Submittal. These questions and concerns are documented in the attached comment review form, also transmitted via SharePoint.

Notwithstanding the preceding concerns and in an effort to move construction of the Project forward, TxDOT provides its concurrence with the Professional Services Quality Acceptance Manager's Certification of Compliance for this RFC Submittal, which permits FDLLC to proceed with construction. Please be advised that pursuant to Section 2.2.7.7 of the Technical Provisions, TxDOT's concurrence does not constitute approval of the design or subsequent construction, nor does this letter relieve FDLLC of its responsibility to meet the requirements of the Contract Documents. Submittal reviews by TxDOT are not intended to serve as a full, independent design assessment. That responsibility rests with FDLLC as the Developer for the Project.

TxDOT reserves all rights under the CDA and at law in connection with the design and construction of the Project and any future Submittals. TxDOT specifically refers FDLLC to Sections 4.1.8, 6.7, 6.8, 10 and 18 of the CDA and does not intend to waive its rights thereunder pursuant to this letter for the work contained in the RFC Submittal.

Mr. Keith Armstrong 2 June 10, 2021

If you have any further questions, please do not hesitate to contact me at (361) 808-2327.

Sincerely,



Joseph Briones, P.E. Corpus Christi District Project Manager Texas Department of Transportation

Attachment: MASTER_SUB-4591CRF(2021-05-25)Rev01.xlsx

cc: Nick Polce, Flatiron Constructors, Inc. Hugo Fontirroig, Flatiron/Dragados, LLC Valente Olivarez, Jr., P.E., TxDOT John Becker, P.E., HNTB





US181 Harbor Bridge Project | NHB Professional Services Quality Management Plan **Project**

Design Submittal Certificate of Compliance-RFC Doc. Name

Documents

Doc. No. NHB-PSQP118FA

Date	October 13, 2020			Job No. 277609						
	NHB-PSQP118FA	A Design Submittal Ce	ertifi	cate of Compliance						
		RFC DOCUMENTS								
Package Description										
The New Harb	The New Harbor Bridge Independent Technical Reviewer (ITR) Task Manager certifies that (check one of the below options):									
conclusions are ☐ In accordar	e ready to be incorporated into released	I for construction documents. able does not require an Independent Techn	ical Rev							
SIGNED:	R TASK MANAGER	PRINT: Manuel Contreras Pietri	DATE	5/25/2021						
	v									
review process Task Manager	The New Harbor Bridge (NHB) Design Task Manager and NHB Design Manager certify that quality control activities have been conducted throughout the review process in compliance with the NHB Professional Services Quality Management Plan (NHB-PSQMP) and contractual requirements. The NHB Design Task Manager and NHB Design Manager certify that the deliverable is complete to the appropriate stage of design, is checked, and the conclusions are ready to be incorporated into released for construction documents.									
COMMENTS: SIGNED:	Mit by	PRINT: Matthew Carter	DATE	5/25/2021						
NH	B DESIGN TASK MANAGER (LEA	D								
SIGNED:	P.G. Tille	PRINT: Peter Tillson	DATE	5/25/2021						
NH	B DESIGN MANAGER or approved	Alternate Signatory								
The NHB Professional Services Quality Assurance Manager (NHB-PSQAM) certifies that the following reviews have been completed and that all comments have been resolved: Design Coordination Reviews, Independent Technical Review, Constructability Review, TxDOT comments addressed If one of these boxes is unchecked, the reason must be adequately explained in the COMMENTS section. The NHB-PSQAM certifies that the work shown conforms to the Contract requirements, that design quality control procedures have followed the NHB-PSQAM, that the Personnel in Responsible Charge have signed all deliverables prepared under their direction, and by signing this release, the NHB-PSQAM approves the audit process and procedures conducted in support of this release. (For those drawings and documents included in the submittal that are prepared by a manufacturer or supplier or other persons not under their direct supervision, the Personnel in Responsible Charge shall affix a stamp that indicates the design shown on the sheet or document conforms to the overall design and contract										
requirements.)	1 &			5						
COMMENTS	:									
SIGNED:	O Mosavi IB PSOAM	PRINT: Ardalan Mosavi	DATE	5/25/2021						
NI	D 1 3 (1.11)									

Page 1 of 2 Arup CFC Design Joint Venture





Project US181 Harbor Bridge Project | NHB Professional Services Quality Management Plan

Doc. Name Design Submittal Certificate of Compliance-RFC

Documents

Doc. No. NHB-PSQP118FA

Date October 13, 2020 **Job No.** 277609

The Developer Project Manager has verified that:							
Design has undergone constructability review and is constructible as represented.							
☐ The deliverable is complete and approved.							
COMMENTS:							
SIGNED: Beith amstrong Keith Armstrong	D. FFE 05 05 05 0001						
SIGNED: Keith Armstrong	DATE: 05-25-2021						
PROJECT/MANAGER – Constructor or Approved Alternate Signatory							
The TxDOT Project Manager has received this deliverable, released by the Developer in accordance	200 with TD 2 2 7 0 TD 2 2 7 7						
The TXDOT Project ividinger has received this deriverable, released by the Developer in accordan	ice with 11 2.2././						
COMMENTS: Refer to TxDOT's letter dated 6/10/2021							
— DocuSigned by:							
Booksights by:	C /10 /2021						
Joseph Brigner	6/10/2021						
SIGNED: Joseph Briones	DATE:						
TADOT BERGIEGE MANAGER or DESIGNEE							
2930909BAA3C4CE							

. 2.2.7.7

Written by: PGT	Revised by:	Approved by: AAM
Date: October 13, 2020	Date:	Date: October 13, 2020

Arup CFC Design Joint Venture Page 2 of 2



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June 28, 2021

Mr. Keith Armstrong Project Manager Flatiron/Dragados, LLC 1620 N Port Ave Corpus Christi, Texas 78401

RE: US 181 Harbor Bridge Replacement Project

CSJ# 0101-06-095

SEL: 000627 Response to TxDOT's letter dated June 3, 2021, Supplement to PCO-041 and RCO-037 and PCO-042 and RCO-038, and SUB-4403 Released for Construction (RFC) M02 $\,$

Main Span Tower Foundations

Dear Mr. Armstrong:

The Texas Department of Transportation ("TxDOT") is in receipt of Flatiron/Dragados, LLC ("FDLLC") letter dated June 8, 2021 and Design Submittal titled Released for Construction (RFC) M02 Main Span Tower Foundations and the related Certification of Compliance (together the "RFC Submittal") submitted pursuant to Section 2.2.7 of the Technical Provision for the Comprehensive Development Agreement ("CDA").

It is TxDOT's understanding from FDLLC's letter and the RFC Submittal that FDLLC has determined it will utilize the LRFD design methodology for the New Harbor Bridge instead of the previously selected methodology that is not permitted by the CDA.

As it has been noted before, the determination on which methodology to utilize resides entirely on FDLLC, provided such methodology complies with the CDA. FDLLC's decision to utilize the LRFD design methodology is at FDLLC's sole election, and we confirm that TxDOT has provided no such direction to FDLLC in that regard. TxDOT's directive does not require FDLLC to implement an LRFD design methodology. It simply requires FDLLC to comply with the Contract Documents, utilizing either ASD or LRFD designs as detailed in Directive Letter No. 12.

TxDOT continues to have concerns related to certain assumptions, and code interpretations contained in the RFC Submittal. These questions and concerns are documented in the attached comment review form, also transmitted via SharePoint. For additional emphasis, TxDOT has expressed concerns related to FDLLC's assumptions that the footing cap behaves as a rigid element and that the foundation loading can be modeled as a singular concentrated load in the center of the footing.

Notwithstanding the preceding concerns and in an effort to move construction of the Project forward, TxDOT provides its concurrence with the Professional Services Quality Acceptance Manager's Certification of Compliance for this RFC Submittal, which permits FDLLC to proceed with construction. Please be advised that pursuant to Section 2.2.7.7 of the Technical Provisions,

Mr. Keith Armstrong 2 June 28, 2021

TxDOT's concurrence does not constitute approval of the design or subsequent construction, nor does this letter relieve FDLLC of its responsibility to meet the requirements of the Contract Documents.

TxDOT reserves all rights under the CDA and at law in connection with the design and construction of the Project and any future Submittals. TxDOT specifically refers FDLLC to Sections 4.1.8, 6.7, 6.8, 10 and 18 of the CDA and does not intend to waive its rights thereunder pursuant to this letter for the work contained in the RFC Submittal.

If you have any further questions, please do not hesitate to contact me at (361) 808-2327.

Sincerely,



Joseph Briones, P.E. Corpus Christi District Project Manager Texas Department of Transportation

Attachment: HB_SUB-4403CRF(2021-06-09)Rev05.pdf

cc: Nick Polce, Flatiron Constructors, Inc. Hugo Fontirroig, Flatiron/Dragados, LLC Valente Olivarez, Jr., P.E., TxDOT John Becker, P.E., HNTB

Review Comments

Project Name	US 181 Harbor Bridge Replacement Project					
CSJ	0101-06-095					
Submittal Name	Released for Construction (RFC) M02 Main Span Tower Foundations					
Engineer	Flatiron-Dragados, LLC					
Organization	Flatiron-Dragados, LLC					
Reviewer	HNTB GEC					
Organization	HNTB GEC					
Description of Comment Category	1 = Non-Compliant with Contractual Requirements 2 = Incomplete/Missing Information 3 = Observation					

	Date	Initial
Submitted for Review	12/14/20	
Review Complete		
Responses Provided		
Responses Resolved		
Changes Made		
Changes Verified		

ID	Sheet #	Section	Comment Type	Comment Category	Reviewer	Comment (Limit to One Item Per Row)	Rev#	Agree Response	Resolved	Fixed	Verified
1	5 of 30310	277609-NHB-CAL- M02-00 Drilled Shafts Calculation Report	Design	1	TxDOT/HNTB	The report states, "ASD Service Load combinations in accordance with the AASHTO Standard Specifications for Highway Bridges 17th Edition - 2002 are considered". AASHTO Standard Specifications for Highway Bridges 17th Edition - 2002 is not a contract document. TP 13.1 states, "The structural Elements of the Project, including bridgesshall be designed and constructed in conformance with the requirements of the Contract Documents, the current AASHTO LRFD Bridge Design Specifications except where directed otherwise by the TxDOT Bridge Design Manual – LRFD and the TxDOT Geotechnical Manual". Section 1 – Limit States of the TxDOT Bridge Design Manual states, "Foundation loads for single column bents and other non-typical substructures should be determined by Service I Limit State and Service IV Limit State". The load factors for Service I are all 1.0 except for wind on structure which is 0.3. The same is true for Service IV except for wind on structure which is 0.7. Per Section 2 – Foundations of the TxDOT Bridge Design Manual, Engater 5 of the Geotechnical manual dictates a minimum factor of safety to be used to determine drilled shaft capacity of 2.0. Nowhere in these contract documents is a 33% overstress allowed therefore its use is not compliant with the contract. As previously clarified by TxDOT, AASHTO Standard Specifications for Highway Bridges is not a contract compliant design document; it is not referenced in the Contract. Rev01: Refer to TxDOT's response letter to PCO-041/RCO-37 dated Jan. 29, 2021. Rev02: Please refer to TxDOT's letter dated February 26, 2021 responding to FDLLC's correspondence SEL: 000564 and SEL: 000573. Rev03: Refer to TxDOT's Directive Letter No. 12 - New Harbor Bridge Foundation Design dated March 26, 2021 Rev04: This comment remains unresolved and has been escalated outside of this submittal review process. Rev 05: As noted in the response, calculations based on AASHTO 17th Ed. have been removed. However, there are still open comments concerning the LRFD analysis (see C		Disagree with categorization that this comment has identified a non-compliance with the contractual requirements. Refer to Potential Change Order Notice No. 41. Rev02: Refer to minutes of meeting held on 11th March 2021 and other correspondence related to PCO 41/RCO 37 Rev 03: TxDOT's Directive Letter No. 12 is incomplete and cannot be implemented. Please refer to Arup-CFC's letters dated March 31, 2021 and April 22, 2021. Rev 04: M02 was submitted with ASD calculations and AASHTO LRFD calculations (as design check). In this reviewed design package M02, ASD calculations have been removed, and only the AASHTO LRFD calculations remain. Therefore, ASD calculations have been withdrawn and geotechnical design is now based upon AASHTO LRFD procedures only. Refer to Arup-CFC letter 277609-LET-FDLLC-034 Directive Letter 12 dated June 4, 2021. 277609-NHB-CAL-M02-Drilled Shafts Calculation Report has been updated, see pp4.8,24922,24923.	Refer to TXDOT's letter dated 6/28/21		
2	5 of 30310	277609-NHB-CAL- M02-00 Drilled Shafts Calculation Report	Design	1	TxDOT/HNTB	concerning the LRFD analysis (see Comment No. 15 below). The report states, "The capacity of the drilled shafts is described in the Geotechnical Engineering Report". The method used to determine the drilled shaft capacity listed in the Geotechnical Engineering Report is not compliant with the contract. See TxDOT/HNTB comments regarding this report as well as comment 1. Rev 01: Refer to TxDOT's response letter to PCO-041/RCO-37 dated Jan. 29, 2021. Rev02: Please refer to TxDOT's letter dated February 26, 2021 responding to FDLLC's correspondence SEL: 000564 and SEL: 000573. Rev03: Refer to TxDOT's Directive Letter No. 12 - New Harbor Bridge Foundation Design dated March 26, 2021 Rev04: This comment remains unresolved and has been escalated outside of this submittal review process. Rev 05: As noted in the response, calculations based on AASHTO 17th Ed. have been removed. However, there are still open comments concerning the LRFD analysis (see Comment No. 15 below)		Disagree with categorization that this comment has identified a non-compliance with the contractual requirements. Refer to Potential Change Order Notice No. 41. Rev02: Refer to minutes of meeting held on 11th March 2021 and other correspondence related to PCO 41/RCO 37 Rev 03: TxDOT's Directive Letter No. 12 is incomplete and cannot be implemented. Please refer to Arup-CFC's letters dated March 31, 2021 and April 22, 2021. Rev 04: The ASD calculation has been withdrawn and geotechnical design is based upon AASHTO LRFD procedures. Refer to Arup-CFC letter 277609-LET-FDLLC-034 Directive Letter 12 dated June 4, 2021. 277609-NHB-CAL-M02-Drilled Shafts Calculation Report has been updated, see pp4,8,24922,24923.	Refer to TXDOT's letter dated 6/28/21		
3	29,201-29203 of 30310	277609-NHB-CAL- M02-00 Drilled Shafts Calculation Report	Design	1	TxDOT/HNTB	The casing was used to satisfy minimum shear reinforcement requirements. Calculations are provided that show that the shafts with #6's at 24" spaces have sufficient shear capacity. However, #6's @ 24" does not provide the minimum shear area required. So the casings are included to provide the minimum shear requirement.		Note will be amended as follows. "The steel casing is not accounted for in the capacity verification of the drilled shafts. Only the length below the top of shaft will remain in place permanently."	V	V	V
4	6 of 30310	277609-NHB-CAL- M02-00 Drilled Shafts Calculation Report	Design	1	TxDOT/HNTB	Confirm that the global analysis (and the resulting shaft forces) includes the effects of large deflection, as required by AASHTO LRFD Section 4.5.3.2.		The deformation of the structure does not result in a significant change in foundation reactions (only 3% increase in longitudinal moment or 4% increase in transverse moment at the more critical North Tower). Therefore in accordance with LRFD 4.5.3.2.1 the effects of deformation do not need to be considered in the equations of equilibrium.	1		V
5	26-122 of 190	277609-NHB-CAL- M02-00 ITR Calculation Report	Design	3	TxDOT/HNTB	The independent review is not consistent with the design. The two reports present very different results.		The purpose of the ITR is to independently verify that the plans, specifications and associated reports are compliant with the CDA. The ITR has maintained an independent approach to analysis and verification of the structure. Provided that both sets of calculations conclude that the structure as represented on the plans is adequate it is not necessary for the calculation results to match.	√		√
6	12 thru 28 and 5346 thru 5362 of 30,310	277609-NHB-CAL- M02-00 Drilled Shafts Calculation Report 277609-NHB-CAL-	Design	1		Material Definitions - Modulus of Elasticity for concrete is 20 to 50% higher than defined in AASHTO 5.4.2.4.		As per note 5 on NHB0A, concrete material properties are per CEB-FIP 1990. The aggregate factor αe was taken as 1.2 to account for the aggregate used being dense limestone (dolomite). The use of a stiffer modulus is generally more conservative since some loads are stiffness driven.	√		V
7	6939 thru 11187 of 30,310	M02-00 Drilled Shafts Calculation Report 277609-NHB-CAL-	Design	1	TxDOT/HNTB	Software printout in metric units. Per TP 2.2.7.1, "Developer shall prepare and provide all Project-related Submittals and documents using English units of measure."		√ We will remove this part of the printout. Pages 6938-11220 of Revision 0 removed.	√	V	√
8	11813 of 30,310	M02-00 Drilled Shafts Calculation Report 277609-NHB-CAL-	Design	1	TxDOT/HNTB	Indicates 1st order analysis is performed. Given bridge geometry, tower does not meet slenderness requirements of AASHTO 5.7.4.3 and a second order analysis is necessary.		Upper tower design considers tower slenderness effects. Refer to comment 4 for foundation design and M04 comments for lower tower design.	√		√
9	Global Analysis	M02-00 Drilled Shafts Calculation Report 277609-NHB-CAL-	Design	2	TxDOT/HNTB	It is unclear how 6x6 stiffness matrix used for tower foundation based on soil-structure interaction is determined. If it comes from geotechnical analysis, please submit it for review.		Unit loads were applied to the foundation with explicit p-y, t-z, q-z springs to derive the 6 x 6 equivalent stiffness matrix. Springs were linearized to the design loads.	√		√
10	28497 of 30310	M02-00 Drilled Shafts Calculation Report 277609-NHB-CAL-	Design	2	TxDOT/HNTB	It is unclear if weight of footing is included as a portion of drilled shaft reactions. Please clarify.		Weight of footing is included. E.g. p. 28498 indicates that load case L1 is Gravity applied to footing and shafts.	√		√
11	30060 of 30310	M02-00 Drilled Shafts Calculation Report	Design	2	TxDOT/HNTB	Please clarify which AASHTO Specification was used to determine the LRFD strength limit state foundation loading		As per calculation report Section 2 the Basis of Design is documented in the General Notes sheets. Per General Notes I New Harbor Bridge, LRFD design is based on AASHTO LRFD Bridge Design Specifications 7th Edition with 2015 Interim Revisions.	√		√
12	5.0 Materials, Section D Note 4	General Notes II	Plan	3	TxDOT/HNTB	Consider specifying hot-dip galvanized reinforcing or allow continuously galvanized reinforcement as an alternate to epoxy coated reinforcement.		Noted. Drawing will remain unchanged and may be amended through a Notice of Design Change process if design-builder elects in the future to use galvanized reinforcement.	√		√
13	5.0 Materials, Section D Note 7	General Notes II	Plan	3	TxDOT/HNTB	Where is guidance for lap splice lengths, did not find this reference in AASHTO LRFD		This is industry standard practice because the tensile force required to be transferred across the lap is governed by the smaller bar.	√		√
14	Table 1	General Notes IV	Plan	3	TxDOT/HNTB	Consider using epoxy waterproofing instead of opaque sealer. This is now allowed in TxDOT thru a SP to that item		Noted. Drawing will remain unchanged and may be amended through a Notice of Design Change process if design-builder elects in the future to use epoxy waterproofing in lieu of opaque sealer.	√		√

ID Shee	t# \$	Section	Comment Type	Comment	Reviewer	Comment (Limit to One Item Per Row)	Rev #	Agree	e Response	Resolved	Fixed	Verified
15 30062 of	30310 M02 Shafts	09-NHB-CAL- 12-00 Drilled ts Calculation Report	Design	2	TxDOT/HNTE	Page 30062 contains a note that reads, "pile cap dimensions are not considered for the pile group analysis". It appears as though this analysis assumes an infinitely rigid footing. This assumption along with the application of loading to the center of the pile cap as opposed to directly under each pylon leg are two noticeable differences between this current analysis and the previous EOR analysis. The previous analysis showed overstress of 5 shafts. The assumptions made in the current analysis appear unconservative. Rev01: The approach described in the response is not conservative or compliant with the contract documents. AASHTO LRFD Bridge Design Specifications Article 4.4 states, "Any method of analysis that satisfies the requirements of equilibrium and compatibility and utilizes stress-strain relationships for the proposed materials may be used." Modeling the footing as rigid does not utilize appropriate stress strain relationships. Article 4.5.1 states, "Mathematical models shall include loads, geometry, and material behavior of the structure, and, where appropriate, response characteristics of the foundation." Modelling the footing as rigid does not include material behavior. Article 5.4.2.4 provides a compliant modulus of elasticity that could be used in the analysis of the footing. The footing is not infinitely rigid. Article 5.13.2 states, "Meros footing supports more than one column, pier or wall, the footing shall be designed for the actual conditions of continuity and restraint". Modeling the footing as rigid is not designing for the actual conditions. Article 10.5.3.1 states, "Design of foundations at strength limit states shall not consider the deformations required to mobilize the nominal resistances of the 3 foundation elements. Design at strength limit states shall not consider the deformations required to mobilize the nominal resistances of the 3 foundation elements. Design at strength limit states shall not consider the deformations required to mobilize the nominal resistances of the 3 founda			Geotechnical capacity of the shafts is verified based on a conventional rigid cap assumption which is a safe plastic analysis method employing conventional redistribution of loads between shafts to verify that the overall capacity of the group is sufficient to satisfy equilibrium without exceedance of the drilled shaft capacity. Structural capacity is verified by enveloping both rigid cap and flexible cap analyses to ensure that structural capacity is not exceeded in the event that drilled shafts mobilize higher than the design geotechnical capacity. For the flexible cap analysis (described in Section 4 of the calculations), loads are applied at each tower leg concurrently. Rev 01 - Disagree with comment. The comment represents design interference by seeking to impose preferential design methodologies supported by erroneous inferences drawn from AASHTO LRFD. The design method which is described above was presented at an Over The Shoulder meeting on 12th January 2021. The design method is conventional and is compliant with the contract documents. Rev 02 - Refer to Arup-CFC letter dated 12th March 2021 which provides further explanation regarding distribution of forces to individual shafts within a pile group. Rev 03 - None of the content of TxDOT's Directive Letter No. 12 is relevant to the subject of this comment which is whether the use of a rigid pile cap assumption for the tower footings represents Good Industry Practice. TxDOT has not responded to Arup-CFC letter dated 12th March 2021 - please respond. We are not clear whether TxDOT still support the Rev 01 comment which states that a rigid pile cap approach is not compliant with AASHTO LRFD because on 18th March 2021 we received an email from John Becker representing TxDOT which included an attachment which stated amongst other things "The modeling as a rigid footing is a simplification, and not appropriate for this application." Please clarify TxDOT position - is it that the use of a rigid footing is non compliant with AASHTO LRFD or is it that the use	Refer to TXDOT's letter dated 6/28/21		
16 Append		12-00 Drilled its Calculation	Design	2	TxDOT/HNTE	3 Please provide more of an explanation as to how this analysis was conducted.			A presentation was given at an Over The Shoulder meeting on 12th January 2021 which gave more of an explanation as to how the analysis was conducted.	V		V
17 NHB-32B 1 32E		d Shaft Details	Design	2	TxDOT/HNTE	Compression Load Capacity indicated in Drilled Shaft Schedule for north tower drilled shafts does not match the Geotechnical Report. The Allowable Capacity indicated in the Geotechnical Report is 4,751 tons, but plans indicate 6,317.5 tons. Regardless of any allowable increase in basic unit stress for specific load cases/groups, the Allowable Capacity remains unchanged and should be consistent with the Geotechnical Report as shown for the south tower drilled shafts.			New comment on old information. Comment was received on 02/03/2021 which is 61 days after the submittal was provided to TxDOT on 12/04/2020 and outside of the 14 day review period. However, as a courtesy the following response is provided. Allowable capacity shown on drawings is consistent with the demand. Allowable capacity has not been changed compared to the previously accepted version of the drawing. The New Lead Engineering Firm has reviewed and sign/sealed the drawing.	V		
18 24923 of	26022 M02 Shafts	09-NHB-CAL- 12-00 Drilled its Calculation Report	Design	2	TxDOT/HNTE	ASD analysis of geotechnical capacity is limited to 3x load cases for south tower, 4x load cases for north tower. Previous designs accounted for dozens of 3 load cases, with loading in opposing directions to address foundation asymmetry. It is unclear how these load cases were developed or selected, and how they adequately represent the full performance and controlling load cases for all shafts.			New comment on old information. Comment was received on 02/03/2021 which is 61 days after the submittal was provided to TxDOT on 12/04/2020. Comment is outside of the 14 day review period and does not require a response. However, as a courtesy the following response is provided. The Engineer of Record selected critical load cases based on review of demands on the foundation.	V		
19 25772 of	26022 M02 Shafts	09-NHB-CAL- 12-00 Drilled its Calculation Report	Design	2	TxDOT/HNTE	LRFD analysis of geotechnical capacity is limited to 1x STR-III load case for each tower. It is unclear how these single load cases were developed or selected, how the represent all required LRFD load cases, how they account for pier asymmetry at north tower, and how they adequately represent the full performance and controlling load cases for all shafts.			New comment on old information. Comment was received on 02/03/2021 which is 61 days after the submittal was provided to TxDOT on 12/04/2020. Comment is outside of the 14 day review period and does not require a response. However, as a courtesy the following response is provided. The Engineer of Record selected critical load cases based on review of demands on the foundation. STRENGTH III is governing - wind buffeting was orientated to create maximum demands on the drilled shafts taking consideration of the 8ft corner shaft on the North Tower.	V		
20 25772 of	26022 M02 Shafts	09-NHB-CAL- 12-00 Drilled its Calculation Report	Design	1	TxDOT/HNTE	LRFD geotechnical analysis results indicate a maximum factored shaft demand/load of 13,552 kips for south tower, 13,198 kips for north tower, both under STR-III load case. LRFD-based Oasys foundation models in Appendix B indicate maximum factored axial demands of 16,380 kips on South Tower, 16,850 at North Tower (at 8' OD corner shaft with tested Ultimate Capacity/Nominal Resistance of only 14,559 kips!). These analyses appear contradictory, and North Tower Oasys model appears to indicate that the 8' corner shaft will be loaded beyond both the factored and nominal geotechnical resistance of the shaft.			New comment on old information. Comment was received on 02/03/2021 which is 61 days after the submittal was provided to TxDOT on 12/04/2020. Comment is outside of the 14 day review period and does not require a response. However, as a courtesy the following response is provided. At the Over The Shoulder meeting on 12th January 2021 the Engineer of Record presented the design approach to footing flexibility which envelopes rigid and flexible assumptions for structural demands whilst utilizing a rigid assumption for geotechnical demands.	V		
21 25772 of	26022 M02 Shafts	09-NHB-CAL- 12-00 Drilled its Calculation Report	Design	1	TxDOT/HNTE	LRFD geotechnical analysis does not differentiate the capacity vs demand for the 8' OD corner shaft at the North Tower, which per structural LRFD analysis is shown to be significantly overloaded (see comment above).			New comment on old information. Comment was received on 02/03/2021 which is 61 days after the submittal was provided to TxDOT on 12/04/2020. Comment is outside of the 14 day review period and does not require a response. However, as a courtesy the following response is provided. Pile 7 was analyzed as an 8ft shaft (refer p. 25775 for Pile Property designation and pp. 25777 to 25781 for Pile Property description). The factored geotechnical demand on pile 7 is 9,402 kips compared to a factored geotechnical capacity of 10,192 kips.	V		





US181 Harbor Bridge Project | NHB Professional Services Quality Management Plan **Project**

Design Submittal Certificate of Compliance-RFC Doc. Name

Documents

Doc. No. NHB-PSQP118FA

Date

October 13, 2020 Job No. 277609 NHB-PSQP118FA Design Submittal Certificate of Compliance RFC DOCUMENTS New Harbor Bridge M02 Main Span - Tower Foundation, R5 Date 6/8/2021 Package Description The New Harbor Bridge Independent Technical Reviewer (ITR) Task Manager certifies that: ☑ The deliverable has been independently checked by the ITR in accordance with the NHB Professional Services Quality Management Plan (NHB-PSQMP) and is complete to the appropriate stage of design including independent calculations signed/sealed by the ITR Task Manager and is ready to be released for construction. PRINT: Manuel Contreras Pietri DATE: 6/8/2021 SIGNED: ITR TASK MANAGER The New Harbor Bridge (NHB) Design Task Manager and NHB Design Manager certify that quality control activities have been conducted throughout the review process in compliance with the NHB Professional Services Quality Management Plan (NHB-PSQMP) and contractual requirements. The NHB Design Task Manager and NHB Design Manager certify that the deliverable is complete to the appropriate stage of design, is checked, and the conclusions are ready to be incorporated into released for construction documents. COMMENTS: SIGNED: PRINT: Matthew Carter DATE: 6/8/2021 NHB DESIGN TASK MANAGER (LEAD) PRINT: Peter Tillson DATE: 6/8/2021 NHB DESIGN MANAGER or approved Alternate Signatory The NHB Professional Services Quality Assurance Manager (NHB-PSQAM) certifies that the following reviews have been completed and that all comments have been resolved: ☑ Design Coordination Reviews, ☑ Independent Technical Review, ☑ Constructability Review, ☑ TxDOT comments addressed If one of these boxes is unchecked, the reason must be adequately explained in the COMMENTS section. The NHB-PSQAM certifies that the work shown conforms to the Contract requirements, that design quality control procedures have followed the NHB-PSQMP, that the Personnel in Responsible Charge have signed all deliverables prepared under their direction, and by signing this release, the NHB-PSQAM approves the audit process and procedures conducted in support of this release. (For those drawings and documents included in the submittal that are prepared by a manufacturer or supplier or other persons not under their direct supervision, the Personnel in Responsible Charge shall affix a stamp that indicates the design shown on the sheet or document conforms to the overall design and contract requirements.) COMMENTS: SIGNED: A Mosavi PRINT: Ardalan Mosavi DATE: 6/8/2021 NHB-PSQAM

Page 1 of 2 Arup CFC Design Joint Venture





Project US181 Harbor Bridge Project | NHB Professional Services Quality Management Plan

Doc. Name Design Submittal Certificate of Compliance-RFC

Documents

Doc. No. NHB-PSQP118FA

Date October 13, 2020 **Job No.** 277609

The Developer Project Manager has verified that:						
Design has undergone constructability review and is constructible as represented. The Released for Construction Package and working drawings for the portion of the Project to be constructed are complete and approved						
COMMENTS:						
SIGNED:: PROJECT MANAGER - Constructor or Approved Alternate Signatory COMMENTS: PRINT: Keith Armstrong DATE: 6/9/2021						
The TxDOT Project Manager has received this deliverable, released by the Developer in accordance with TP 2.2.7.9 TP 2.2.7.7.						
COMMENTS: Refer to TxDOT's Letter Dated 06/28/2021						
SIGNED:: Joseph Briones Joseph Briones DATE:						
TXDOT PROJECT MANAGER or DESIGNEE						

Written by: PGT	Revised by:	Approved by: AAM
Date: October 13, 2020	Date:	Date: October 13, 2020

Arup CFC Design Joint Venture Page 2 of 2





Project US181 Harbor Bridge Project | NHB Professional Services Quality Management Plan

Doc. Name Release for Construction Certification of Compliance

Checklist

Doc. No. NHB-PSQP119FA

Date October 13, 2020 **Job No.** 277609

NHB-PSQP119FA Release for Construction Certification of Compliance Checklist

Date: June 08, 2021						
DA CIVA CE	·					
	New Harbor Bridge M02 Main Span – Tower Foundation, R5	I				
Item	Status	Checked				
	TP Section 2.2.7.5.1 – Released for Construction Submittal					
PSQAM	Complete with a signed certification from the PSQA Manager	AAM				
•	TP Section 2.2.7.7 – Released for Construction Package "Certification of Compliance	"				
a)	Design Drawings - Complete	МС				
b)	Design Calculations - Complete	MC				
c)	Design Reports – Not applicable	МС				
d)	Specifications - – No new specifications required. Project Technical Provisions and standard TxDOT specifications apply.	МС				
e)	Electronic Files - Provided	MC				
f)	Project ROW Documentation -	MF				
g)	Government Approvals -	MF				
h)	Utility Owner Approvals -	MF				

Written by: PGT	Revised by:	Approved by: AAM
Date: October 13, 2020	Date:	Date: October 13, 2020

Arup CFC Design Joint Venture Page 1 of 1





Project US181 Harbor Bridge Project | NHB Professional Services Quality Management Plan

Doc. Name Design Quality Review Certification Doc. No. NHB-PSQP116FA

Date October 13, 2020 Job No. 277609

NHB-PSQP116FA DESIGN QUALITY REVIEW CERTIFICATION

Work Package New Harbor Bridge M02 Main Span – Tower Foundation, R5

Quality Control Review Certification

As part of the Design Quality Review, I Matthew Carter, the Engineer of Record or Person in Responsible Charge for this Work Package, certify that the design team has completed a Quality Control Review of the plans, specifications and/or construction quality documents for the above referenced Work Package. Any review comments that I provided to the design team were addressed to my satisfaction, and review comments and responses are available to TxDOT upon request.

Name: Matthew Carter

Signature: p.p

Date: June 8, 2021

Title: NHB Lead Design Engineer

Quality Assurance Review Certification

As part of the Design Quality Review, I <u>Ardalan Mosavi</u>, an independent reviewer not associated with any design production work for this project, certify that I have completed a Quality Assurance Review of the plans, specifications, construction quality documents and/or quality control review for the above referenced Work Package. Any review comments I provided to the design team were addressed to my satisfaction, and review comments and responses are available to TxDOT upon request.

Name: Ardalan Mosavi

Signature: A Mosaci

Date: June 8, 2021

Title: NHB-PSQAM

Written by: PGT Revised by: Approved by: AAM
Date: October 13, 2020 Date: Date: October 13, 2020

Arup CFC Design Joint Venture Page 1 of 1



Work Package	M02 Main Span – Tower Foundation
Revision	02
Submittal Stage	Released For Construction
Date	02/08/21
Note	M02 contains the tower foundations drawings from the previous M02 submittal. These sheets are unchanged from the previous M02 submittal. The other M02 drawings relating to the general notes and layout will be transmitted separately as M02A.



Package	Sheet Number	Sheet Title	Revision	Redline Markup NDCs (for Record Drawings)				
M02	NHB6	MAIN SPAN FOUNDATION LAYOUT I - TOWERS 1NT & 1ST	6	Not Applicable				
M02	NHB8B	MAIN SPAN BORING LOGS TERMS AND SYMBOLS	0	Not Applicable				
M02	NHB9	MAIN SPAN BORING LOGS I (NP-1)	0	Not Applicable				
M02	NHB10	MAIN SPAN BORING LOGS I (NP-1)	0	Not Applicable				
M02	NHB11	MAIN SPAN BORING LOGS I (NP-1)	0	Not Applicable				
M02	NHB12	MAIN SPAN BORING LOGS I (NP-1)	0	Not Applicable				
M02	NHB13	MAIN SPAN BORING LOGS II (NP-2)	0	Not Applicable				
M02	NHB14	MAIN SPAN BORING LOGS II (NP-2)	0	Not Applicable				
M02	NHB15	MAIN SPAN BORING LOGS II (NP-2)	0	Not Applicable				
M02	NHB16	MAIN SPAN BORING LOGS II (NP-2)		Not Applicable				
M02	NHB17	MAIN SPAN BORING LOGS III (SP-1)	0	Not Applicable				
M02	NHB18	MAIN SPAN BORING LOGS III (SP-1)	0	Not Applicable				
M02	NHB19	MAIN SPAN BORING LOGS III (SP-1)		Not Applicable				
M02	NHB20	MAIN SPAN BORING LOGS III (SP-1)	0	Not Applicable				
M02	NHB21	MAIN SPAN BORING LOGS IV (SP-2)	0	Not Applicable				
M02	NHB22	MAIN SPAN BORING LOGS IV (SP-2)	0	Not Applicable				
M02	NHB23	MAIN SPAN BORING LOGS IV (SP-2)		Not Applicable				
M02	NHB24	MAIN SPAN BORING LOGS IV (SP-2)	0	Not Applicable				
M02	NHB29C	MAIN SPAN ADDITIONAL PILES DATA TABLE - TOWER 1NT	2	Not Applicable				
M02	NHB29D	MAIN SPAN ADDITIONAL PILES DETAILS - TOWER 1NT	2	Not Applicable				
M02	NHB30A	MAIN SPAN DRILLED SHAFT LAYOUT - TOWER 1NT	3	Not Applicable				
M02	NHB30B	MAIN SPAN DRILLED SHAFT LAYOUT - TOWER 1ST	3	Not Applicable				
M02	NHB30C	MAIN SPAN PRECAST PILE LAYOUT - TOWER 1NT	2	Not Applicable				
M02	NHB31	MAIN SPAN DRILLED SHAFT DETAILS TYPE A	3	Not Applicable				
M02	NHB32	MAIN SPAN DRILLED SHAFT DETAILS TYPE B	3	Not Applicable				
M02	NHB32A	MAIN SPAN DRILLED SHAFT DETAILS TYPE C		Not Applicable				
M02	NHB32B	MAIN SPAN DRILLED SHAFT DETAILS TYPE D		Not Applicable				
M02	NHB32C	MAIN SPAN DRILLED SHAFT DETAILS TYPE E		Not Applicable				
M02	NHB32D	MAIN SPAN DRILLED SHAFT DETAILS TYPE F	3	Not Applicable				

Review Comments

Project Name	US 181 Harbor Bridge Replacement Project
CSJ	0101-06-095
Submittal Name	Released for Construction (RFC) M02 Main Span Tower Foundations
Engineer	Flatiron-Dragados, LLC
Organization	Flatiron-Dragados, LLC
Reviewer	HNTB GEC
Organization	HNTB GEC
Description of Comment Category	1 = Non-Compliant with Contractual Requirements 2 = Incomplete/Missing Information 3 = Observation

	Date	Initial
Submitted for Review	12/14/20	
Review Complete		
Responses Provided		
Responses Resolved		
Changes Made		
Changes Verified		

ID	Sheet #	Section	Comment Type	Comment Category	Reviewer	Comment (Limit to One Item Per Row)	Rev#	Agree Response	Resolved	Fixed	Verified
1	5 of 30310	277609-NHB-CAL- M02-00 Drilled Shafts Calculation Report	Design	1	TxDOT/HNTE	The report states, "ASD Service Load combinations in accordance with the AASHTO Standard Specifications for Highway Bridges 17th Edition - 2002 are considered". AASHTO Standard Specifications for Highway Bridges 17th Edition - 2002 is not a contract document. TP 13.1 states, "The structural Elements of the Project, including bridgesshall be designed and constructed in conformance with the requirements of the Contract Documents, the current AASHTO LRFD Bridge Design Specifications except where directed otherwise by the TxDOT Bridge Design Manual – LRFD and the TxDOT Geotechnical Manual". Section 1 – Limit States of the TxDOT Bridge Design Manual states, "Foundation loads for single column bents and other non-typical substructures should be determined by Service I Limit State and Service IV Limit State". The load factors for Service I are all 1.0 except for wind on structure which is 0.3. The same is true for Service IV except for wind on structure which is 0.7. Per Section 2 – Foundations of the TxDOT Bridge Design Manual, Engater 5 of the Geotechnical manual dictates a minimum factor of safety to be used to determine drilled shaft capacity of 2.0. Nowhere in these contract documents is a 33% overstress allowed therefore its use is not compliant with the contract. As previously clarified by TxDOT, AASHTO Standard Specifications for Highway Bridges is not a contract compliant design document; it is not referenced in the Contract. Rev01: Refer to TxDOT's response letter to PCO-041/RCO-37 dated Jan. 29, 2021. Rev02: Please refer to TxDOT's letter dated February 26, 2021 responding to FDLLC's correspondence SEL: 000564 and SEL: 000573. Rev03: Refer to TxDOT's Directive Letter No. 12 - New Harbor Bridge Foundation Design dated March 26, 2021 Rev04: This comment remains unresolved and has been escalated outside of this submittal review process. Rev 05: As noted in the response, calculations based on AASHTO 17th Ed. have been removed. However, there are still open comments concerning the LRFD analysis (see C		Disagree with categorization that this comment has identified a non-compliance with the contractual requirements. Refer to Potential Change Order Notice No. 41. Rev02: Refer to minutes of meeting held on 11th March 2021 and other correspondence related to PCO 41/RCO 37 Rev 03: TxDOT's Directive Letter No. 12 is incomplete and cannot be implemented. Please refer to Arup-CFC's letters dated March 31, 2021 and April 22, 2021. Rev 04: M02 was submitted with ASD calculations and AASHTO LRFD calculations (as design check). In this reviewed design package M02, ASD calculations have been removed, and only the AASHTO LRFD calculations remain. Therefore, ASD calculations have been withdrawn and geotechnical design is now based upon AASHTO LRFD procedures only. Refer to Arup-CFC letter 277609-LET-FDLLC-034 Directive Letter 12 dated June 4, 2021. 277609-NHB-CAL-M02-Drilled Shafts Calculation Report has been updated, see pp4.8,24922,24923.	Refer to TXDOT's letter dated 6/28/21		
2	5 of 30310	277609-NHB-CAL- M02-00 Drilled Shafts Calculation Report	Design	1	TxDOT/HNTE	concerning the LRFD analysis (see Comment No. 15 below). The report states, "The capacity of the drilled shafts is described in the Geotechnical Engineering Report". The method used to determine the drilled shaft capacity listed in the Geotechnical Engineering Report is not compliant with the contract. See TxDOT/HNTB comments regarding this report as well as comment 1. Rev 01: Refer to TxDOT's response letter to PCO-041/RCO-37 dated Jan. 29, 2021. Rev02: Please refer to TxDOT's letter dated February 26, 2021 responding to FDLLC's correspondence SEL: 000564 and SEL: 000573. Rev03: Refer to TxDOT's Directive Letter No. 12 - New Harbor Bridge Foundation Design dated March 26, 2021 Rev04: This comment remains unresolved and has been escalated outside of this submittal review process. Rev 05: As noted in the response, calculations based on AASHTO 17th Ed. have been removed. However, there are still open comments concerning the LRFD analysis (see Comment No. 15 below)		Disagree with categorization that this comment has identified a non-compliance with the contractual requirements. Refer to Potential Change Order Notice No. 41. Rev02: Refer to minutes of meeting held on 11th March 2021 and other correspondence related to PCO 41/RCO 37 Rev 03: TxDOT's Directive Letter No. 12 is incomplete and cannot be implemented. Please refer to Arup-CFC's letters dated March 31, 2021 and April 22, 2021. Rev 04: The ASD calculation has been withdrawn and geotechnical design is based upon AASHTO LRFD procedures. Refer to Arup-CFC letter 277609-LET-FDLLC-034 Directive Letter 12 dated June 4, 2021. 277609-NHB-CAL-M02-Drilled Shaft's Calculation Report has been updated, see pp4,8,24922,24923.	Refer to TXDOT's letter dated 6/28/21		
3	29,201-29203 of 30310	277609-NHB-CAL- M02-00 Drilled Shafts Calculation Report	Design	1	TxDOT/HNTE	The casing was used to satisfy minimum shear reinforcement requirements. Calculations are provided that show that the shafts with #6's at 24" spaces have sufficient shear capacity. However, #6's @ 24" does not provide the minimum shear area required. So the casings are included to provide the minimum shear requirement.		Note will be amended as follows. "The steel casing is not accounted for in the capacity verification of the drilled shafts. Only the length below the top of shaft will remain in place permanently."	V	√	٧
4	6 of 30310	277609-NHB-CAL- M02-00 Drilled Shafts Calculation Report	Design	1	TxDOT/HNTE	Confirm that the global analysis (and the resulting shaft forces) includes the effects of large deflection, as required by AASHTO LRFD Section 4.5.3.2.		The deformation of the structure does not result in a significant change in foundation reactions (only 3% increase in longitudinal moment or 4% increase in transverse moment at the more critical North Tower). Therefore in accordance with LRFD 4.5.3.2.1 the effects of deformation do not need to be considered in the equations of equilibrium.	1		V
5	26-122 of 190	277609-NHB-CAL- M02-00 ITR Calculation Report	Design	3	TxDOT/HNTE	The independent review is not consistent with the design. The two reports present very different results.		The purpose of the ITR is to independently verify that the plans, specifications and associated reports are compliant with the CDA. The ITR has maintained an independent approach to analysis and verification of the structure. Provided that both sets of calculations conclude that the structure as represented on the plans is adequate it is not necessary for the calculation results to match.	√		√
6	12 thru 28 and 5346 thru 5362 of 30,310	277609-NHB-CAL- M02-00 Drilled Shafts Calculation Report 277609-NHB-CAL-	Design	1		Material Definitions - Modulus of Elasticity for concrete is 20 to 50% higher than defined in AASHTO 5.4.2.4.		As per note 5 on NHB0A, concrete material properties are per CEB-FIP 1990. The aggregate factor αe was taken as 1.2 to account for the aggregate used being dense limestone (dolomite). The use of a stiffer modulus is generally more conservative since some loads are stiffness driven.	√		V
7	6939 thru 11187 of 30,310	M02-00 Drilled Shafts Calculation Report 277609-NHB-CAL-	Design	1	TxDOT/HNTE	Software printout in metric units. Per TP 2.2.7.1, "Developer shall prepare and provide all Project-related Submittals and documents using English units of measure."		√ We will remove this part of the printout. Pages 6938-11220 of Revision 0 removed.	√	V	√
8	11813 of 30,310	M02-00 Drilled Shafts Calculation Report 277609-NHB-CAL-	Design	1	TxDOT/HNTE	Indicates 1st order analysis is performed. Given bridge geometry, tower does not meet slenderness requirements of AASHTO 5.7.4.3 and a second order analysis is necessary.		Upper tower design considers tower slenderness effects. Refer to comment 4 for foundation design and M04 comments for lower tower design.	√		√
9	Global Analysis	M02-00 Drilled Shafts Calculation Report 277609-NHB-CAL-	Design	2	TxDOT/HNTE	It is unclear how 6x6 stiffness matrix used for tower foundation based on soil-structure interaction is determined. If it comes from geotechnical analysis, please submit it for review.		Unit loads were applied to the foundation with explicit p-y, t-z, q-z springs to derive the 6 x 6 equivalent stiffness matrix. Springs were linearized to the design loads.	√		√
10	28497 of 30310	M02-00 Drilled Shafts Calculation Report 277609-NHB-CAL-	Design	2	TxDOT/HNTE	It is unclear if weight of footing is included as a portion of drilled shaft reactions. Please clarify.		Weight of footing is included. E.g. p. 28498 indicates that load case L1 is Gravity applied to footing and shafts.	√		√
11	30060 of 30310	M02-00 Drilled Shafts Calculation Report	Design	2	TxDOT/HNTE	Please clarify which AASHTO Specification was used to determine the LRFD strength limit state foundation loading		As per calculation report Section 2 the Basis of Design is documented in the General Notes sheets. Per General Notes I New Harbor Bridge, LRFD design is based on AASHTO LRFD Bridge Design Specifications 7th Edition with 2015 Interim Revisions.	√		√
12	5.0 Materials, Section D Note 4	General Notes II	Plan	3	TxDOT/HNTE	Consider specifying hot-dip galvanized reinforcing or allow continuously galvanized reinforcement as an alternate to epoxy coated reinforcement.		Noted. Drawing will remain unchanged and may be amended through a Notice of Design Change process if design-builder elects in the future to use galvanized reinforcement.	√		√
13	5.0 Materials, Section D Note 7	General Notes II	Plan	3	TxDOT/HNTE	Where is guidance for lap splice lengths, did not find this reference in AASHTO LRFD		This is industry standard practice because the tensile force required to be transferred across the lap is governed by the smaller bar.	√		√
14	Table 1	General Notes IV	Plan	3	TxDOT/HNTE	Consider using epoxy waterproofing instead of opaque sealer. This is now allowed in TxDOT thru a SP to that item		Noted. Drawing will remain unchanged and may be amended through a Notice of Design Change process if design-builder elects in the future to use epoxy waterproofing in lieu of opaque sealer.	√		√

ID Sheet:	#	Section	Comment Type	Commen Category		Comment (Limit to One Item Per Row)	Rev #	Agree	e Response	Resolved	Fixed	Verified
15 30062 of 3	0310 N	77609-NHB-CAL- M02-00 Drilled hafts Calculation Report	Design	2	TxDOT/HNTE	Page 30062 contains a note that reads, "pile cap dimensions are not considered for the pile group analysis". It appears as though this analysis assumes an infinitely rigid footing. This assumption along with the application of loading to the center of the pile cap as opposed to directly under each pyton leg are two noticeable differences between this current analysis and the previous EOR analysis. The previous analysis showed overstress of 5 shafts. The assumptions made in the current analysis appear unconservative. Rev01: The approach described in the response is not conservative or compliant with the contract documents. AASHTO LRFD Bridge Design Specifications Article 4.4 states, "Any method of analysis that satisfies the requirements of equilibrium and compatibility and utilizes stress-strain relationships for the proposed materials may be used." Modeling the footing as rigid does not utilize appropriate stress strain relationships. Article 4.5.1 states, "Mathematical models shall include loads, geometry, and material behavior of the structure, and, where appropriate, response characteristics of the foundation." Modelling the footing as rigid does not include material behavior. Article 5.4.2.4 provides a compliant modulus of elasticity that could be used in the analysis of the footing. The footing is not infinitely rigid. Article 5.13.2 states, "Meros footing supports more than one column, pier or wall, the footing shall be designed for the actual conditions of continuity and restraint". Modeling the footing as rigid is not designing for the actual conditions. Article 10.5.3.1 states, "Design of foundations at strength limit states shall not consideration of the nominal geotechnical and structural resistances of the 3 foundation elements. Design at strength limit states shall not consider the deformations required to mobilize the nominal resistance of the 3 foundation elements. Design at strength limit states shall not consider the deformations required to mobilize the nominal resistances of the 3 foundatio			Geotechnical capacity of the shafts is verified based on a conventional rigid cap assumption which is a safe plastic analysis method employing conventional redistribution of loads between shafts to verify that the overall capacity of the group is sufficient to satisfy equilibrium without exceedance of the drilled shaft capacity. Structural capacity is verified by enveloping both rigid cap and flexible cap analyses to ensure that structural capacity is not exceeded in the event that drilled shafts mobilize higher than the design geotechnical capacity. For the flexible cap analysis (described in Section 4 of the calculations), loads are applied at each tower leg concurrently. Rev 01 - Disagree with comment. The comment represents design interference by seeking to impose preferential design methodologies supported by erroneous inferences drawn from AASHTO LRFD. The design method which is described above was presented at an Over The Shoulder meeting on 12th January 2021. The design method is conventional and is compliant with the contract documents. Rev 02 - Refer to Arup-CFC letter dated 12th March 2021 which provides further explanation regarding distribution of forces to individual shafts within a pile group. Rev 03 - None of the content of TxDOT's Directive Letter No. 12 is relevant to the subject of this comment which is whether the use of a rigid pile cap assumption for the tower footings represents Good industry Practice. TxDOT has not responded Arup-CFC letter dated 12th March 2021 - please respond. We are not clear whether TxDOT still support the Rev 01 comment which states that a rigid pile cap approach is not compliant with AASHTO LRFD because on 18th March 2021 we received an email from John Becker representing TxDOT which included an attachment which stated amongst other things "The modeling as a rigid footing is a simplification, and not appropriate for this application." Please clarify TxDOT position - is it that the use of a rigid footing is non compliant with AASHTO LRFD or is it that the use of	Refer to TxDOT's letter dated 6/28/21		
16 Appendix		M02-00 Drilled hafts Calculation	Design	2	TxDOT/HNTE	3 Please provide more of an explanation as to how this analysis was conducted.			A presentation was given at an Over The Shoulder meeting on 12th January 2021 which gave more of an explanation as to how the analysis was conducted.	√		V
17 NHB-32B to 32D	NHB- Drill	illed Shaft Details	Design	2	TxDOT/HNTE	Compression Load Capacity indicated in Drilled Shaft Schedule for north tower drilled shafts does not match the Geotechnical Report. The Allowable Capacity indicated in the Geotechnical Report is 4,751 tons, but plans indicate 6,317.5 tons. Regardless of any allowable increase in basic unit stress for specific load cases/groups, the Allowable Capacity remains unchanged and should be consistent with the Geotechnical Report as shown for the south tower drilled shafts.			New comment on old information. Comment was received on 02/03/2021 which is 61 days after the submittal was provided to TxDOT on 12/04/2020 and outside of the 14 day review period. However, as a courtesy the following response is provided. Allowable capacity shown on drawings is consistent with the demand. Allowable capacity has not been changed compared to the previously accepted version of the drawing. The New Lead Engineering Firm has reviewed and sign/sealed the drawing.	٧		
18 24923 of 2	6022 N	77609-NHB-CAL- M02-00 Drilled hafts Calculation Report	Design	2	TxDOT/HNTE	ASD analysis of geotechnical capacity is limited to 3x load cases for south tower, 4x load cases for north tower. Previous designs accounted for dozens of load cases, with loading in opposing directions to address foundation asymmetry. It is unclear how these load cases were developed or selected, and how they adequately represent the full performance and controlling load cases for all shafts.			New comment on old information. Comment was received on 02/03/2021 which is 61 days after the submittal was provided to TxDOT on 12/04/2020. Comment is outside of the 14 day review period and does not require a response. However, as a courtesy the following response is provided. The Engineer of Record selected critical load cases based on review of demands on the foundation.	٧		
19 25772 of 2	6022 N	7609-NHB-CAL- M02-00 Drilled hafts Calculation Report	Design	2	TxDOT/HNTE	LRFD analysis of geotechnical capacity is limited to 1x STR-III load case for each tower. It is unclear how these single load cases were developed or 3 selected, how the represent all required LRFD load cases, how they account for pier asymmetry at north tower, and how they adequately represent the full performance and controlling load cases for all shafts.			New comment on old information. Comment was received on 02/03/2021 which is 61 days after the submittal was provided to TxDOT on 12/04/2020. Comment is outside of the 14 day review period and does not require a response. However, as a courtesy the following response is provided. The Engineer of Record selected critical load cases based on review of demands on the foundation. STRENOTH III is governing - wind buffeting was orientated to create maximum demands on the drilled shafts taking consideration of the 8ft corner shaft on the North Tower.	V		
20 25772 of 2	6022 N	77609-NHB-CAL- M02-00 Drilled hafts Calculation Report	Design	1	TxDOT/HNTE	LRFD geotechnical analysis results indicate a maximum factored shaft demand/load of 13,552 kips for south tower, 13,198 kips for north tower, both under STR-III load case. LRFD-based Oasys foundation models in Appendix B indicate maximum factored axial demands of 16,380 kips on South Tower, 16,850 at North Tower (at 8' OD corner shaft with tested Ultimate Capacity/Nominal Resistance of only 14,559 kips!). These analyses appear contradictory, and North Tower Oasys model appears to indicate that the 8' corner shaft will be loaded beyond both the factored and nominal geotechnical resistance of the shaft.			New comment on old information. Comment was received on 02/03/2021 which is 61 days after the submittal was provided to TxDOT on 12/04/2020. Comment is outside of the 14 day review period and does not require a response. However, as a courtesy the following response is provided. At the Over The Shoulder meeting on 12th January 2021 the Engineer of Record presented the design approach to footing flexibility which envelopes rigid and flexible assumptions for structural demands whilst utilizing a rigid assumption for geotechnical demands.	V		
21 25772 of 2	6022 N	7609-NHB-CAL- M02-00 Drilled hafts Calculation Report	Design	1	TxDOT/HNTE	analysis is shown to be significantly overloaded (see comment above).			New comment on old information. Comment was received on 02/03/2021 which is 61 days after the submittal was provided to TxDOT on 12/04/2020. Comment is outside of the 14 day review period and does not require a response. However, as a courtesy the following response is provided. Pile 7 was analyzed as an 8ft shaft (refer p. 25775 for Pile Property designation and pp. 25777 to 25781 for Pile Property description). The factored geotechnical demand on pile 7 is 9,402 kips compared to a factored geotechnical capacity of 10,192 kips.	V		