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Ministry of Forests, Lands
and Natural Resource
Operations

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DETERMINATION OF UNIDENTIFIABLE BRIDGE COMPONENTS – K1629

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1. Introduction

The ministry has a number of concrete slab girder bridge superstructures where there are no documents which can be used to determine their respective load capacities. These structures have been “inherited” from various parties through administrative transfers. The ministry is seeking to develop a methodology to be able to efficiently assess these concrete slab girder superstructures for load capacity. This project was undertaken as a pilot to assess the viability of destructive testing of concrete slab bridges to determine reinforcing steel placement. This project was conducted in cooperation with and funding from BC Timber Sales (BCTS), Okanagan Shuswap.

This report summarizes the process undertaken for assessing the load rating on bridge K1629, under the administration of BCTS, located in the Okanagan Shuswap Natural Resource District (CBR Project File ID # 7654 Br. 32). This is a permanent 9 metre span, precast concrete slab girder bridge, consisting of 5 concrete slab girders with welded shear connectors, founded on precast concrete cap, steel pipe and precast concrete footing abutments.

K1629 has no available documentation to support the determination of an accurate load rating of the bridge superstructure. There are no design drawings, specifications available and no accurate dimensions had been taken during the course of three routine inspections, dated 2014, 2015, and 2016. It is noted that one of the abutment caps is tilted and in need of repair. Presently, the structure has a posted load rating of 10 tonnes.

The field portion of this project needed to be completed before snowfall began, when access on the forest roads becomes difficult and repair work is hindered by cold temperatures. Due to this, some stages of the “Paper Trail” section were not conducted in order to complete destructive testing prior to colder temperatures and weather.

In order to assess reinforced concrete slab bridges for load capacity, it is necessary to identify the location and sizing of reinforcing steel. As no known means is available to accurately measure, it was determined to destructively test a concrete slab bridge to expose critical rebar on the bottom surface, which acts in tension. It was hypothesized by exposing and measuring the size and spacing of the reinforcing steel, that it can be matched to historical standard drawings which would then provide a definable load capacity. If no match could be made, additional testing such as Non-Destructive Testing (NDT) may be appropriate. If necessary, a detailed structural analysis could be undertaken knowing the size and spacing of reinforcing steel.

The objective for this project is the development and testing of a methodology that can be used to assess the load carrying capacity of other similar bridge superstructures where there is an absence of adequate documentation. Load rating a full bridge would also require the capacity evaluation of underlying abutments and foundations. This report focusses only on evaluating the bridge superstructure.

The proposed superstructure evaluation procedure flow chart can be seen in Figure 1.

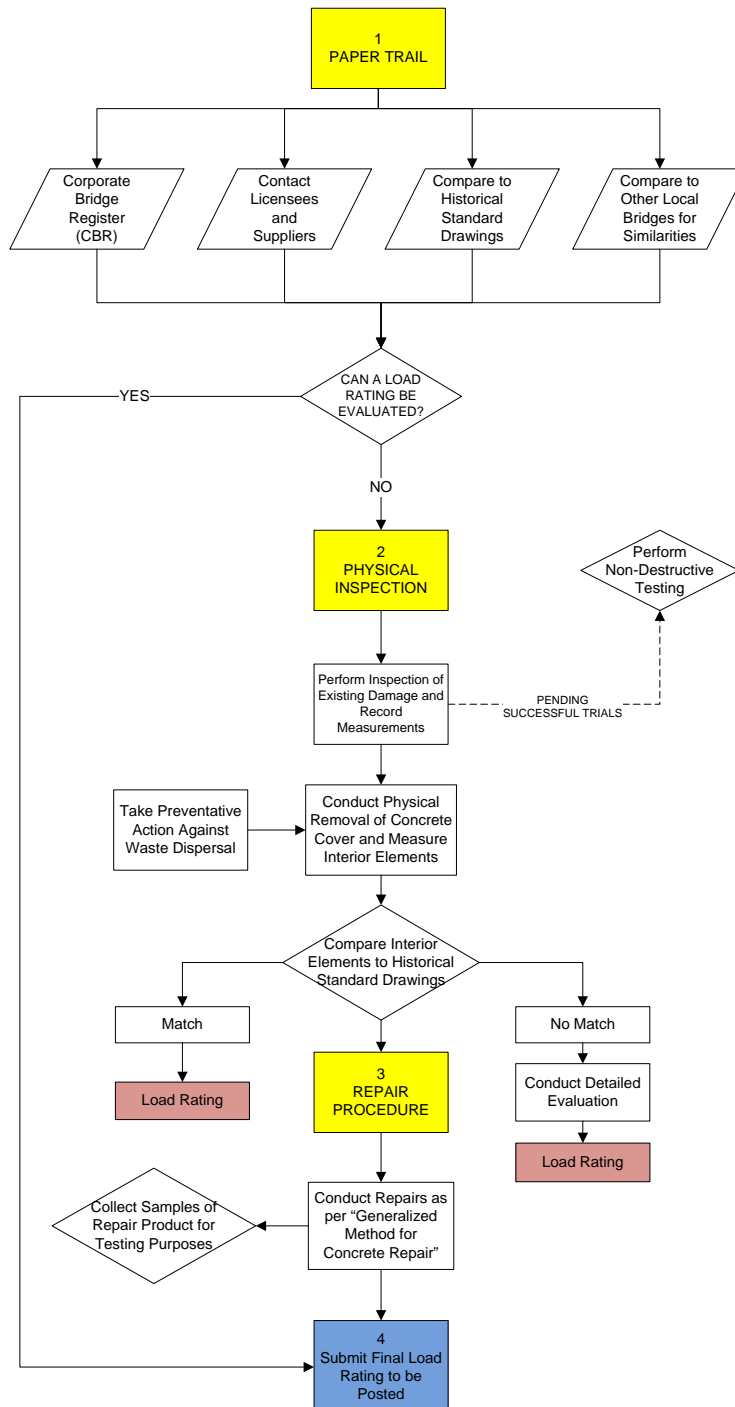


Figure 1: Proposed Superstructure Evaluation Procedure

2. Paper Trail

2.1. Search in the *Corporate Bridge Register (CBR)*

The search in CBR revealed very little information. After reviewing all previous inspection reports and available photos, the following observations were made:

- No standard drawings or specifications were available on-file or electronically.
- No measurements had previously been recorded other than the span and width of the bridge deck.
- No information on the foundation type was available other than speculation by inspectors.
- One of the abutments is in poor condition (leaning), which may impact load rating.

Access to detailed inspection reports can be found in Appendix A.

2.1.1. Contact District and Engineering Branch Engineering Staff

The purpose of contacting engineering staff is to obtain hardcopy records of bridge structures. For the case of K1629, no such documents could be found.

2.1.2. Field Inspection to Obtain Dimensions and Make Observations

As per procedure, measurement of all bridge dimensions and a condition inspection should be conducted (if not already completed at a recent date). Additionally, detailed components and dimension information should be gathered for the full structure, including abutments and foundations. Any markings related to manufacturers or suppliers should be noted. No such initial inspection was undertaken for this project. Recent inspections had not revealed information regarding dimensions or supplier markings.

2.2. Contacting Suppliers and Licensees

For K1629, bridge fabrication markings were not previously noted or recorded. During the course of this project, Western Concrete Products (WCP) was noted on the side of one of the exterior slab girders. As WCP went out of business in the early 2000's, they could not be contacted to obtain information related to K1629. However, drawings for two similar bridges (K871 and K872 manufactured in 1997) which WCP speculate were manufactured in the same year as K1629 were discovered. The measured dimensions of K1629 were compared with the dimensions shown in these drawings, but they did not accurately match.

2.3. Comparison to Historical Drawings

Due to lack of dimensions taken during inspections, the bridge could not be confidently compared to historical drawings. Attempts were made by "scaling" the bridge dimensions based on standard size objects found in inspection photos (i.e. delineators, timber curbs, etc. were used as a scaling reference). The results of this method were not relied upon, though eventually deemed to be correct.

2.4. Comparison to Similar Local Bridges

This avenue was not explored in detail, with the exception of a comparison to WCP's K871 and K872.

3. Field Works

3.1. Initial Inspection

The initial inspection included measurements of all superstructure components and the identification of damaged areas.

3.1.1. Superstructure Dimensions

Measurements taken during the initial inspection are listed in Table 1.

Table 1: Observed Superstructure Dimensions

Superstructure Component	Measurement (mm)
Total Length	9600
Span	Approx. 8660
Deck Width	4285
Slab Width (Total of 5 Slabs)	845-851
Slab Depth	394-397

3.1.2. Existing Structure Damage and Deficiencies

The damage observed by the initial inspection is summarized below:

- Minor spall damage around formerly present lifting loops (Figure 2)
- Deck surface chipping damage likely from tracked equipment crossing(s) (Figures 3, 4)
- Significant leaning of left (woods) side abutment (Figures 5, 6)



Figure 2: Minor Spalling Around Pre-existent Loops



Figure 3: Chipping Damage from Track (Left Side)



Figure 4: Chipping Damage from Track (Right Side)



Figure 5: Rotated Left Abutment (observe gap between super- and substructure)



Figure 6: Measurement of Cap Beam Movement as a Result of Abutment Rotation

3.2. Procedure for Concrete Removal

The test location was selected for minimum impact. Structural analysis suggests that the centre slab is subject to the greatest bending moment, rendering this the least ideal test location. Access for chipping and repairs was also a consideration. The outermost slab was chosen as it satisfied both these criteria.

The procedure undertaken for exposing tension reinforcing steel was as follows:

1. Guide lines were marked within 3 metres of the town side end of the bridge on the underside of the outermost upstream slab girder. These were approximately 100m wide and extended past the slab's longitudinal centreline (roughly 500-600mm) – as the reinforcing steel would be expected to be symmetrical about centre line, there was no need to fully expose the full width. Guide lines continued up the side face of the slab past mid-height (roughly 200mm). The width on the side of the slab was increased to approximately 150mm to provide for increased tamping rod maneuverability and grout work in the repair phase. The guide lines can be seen below in Figure 7.

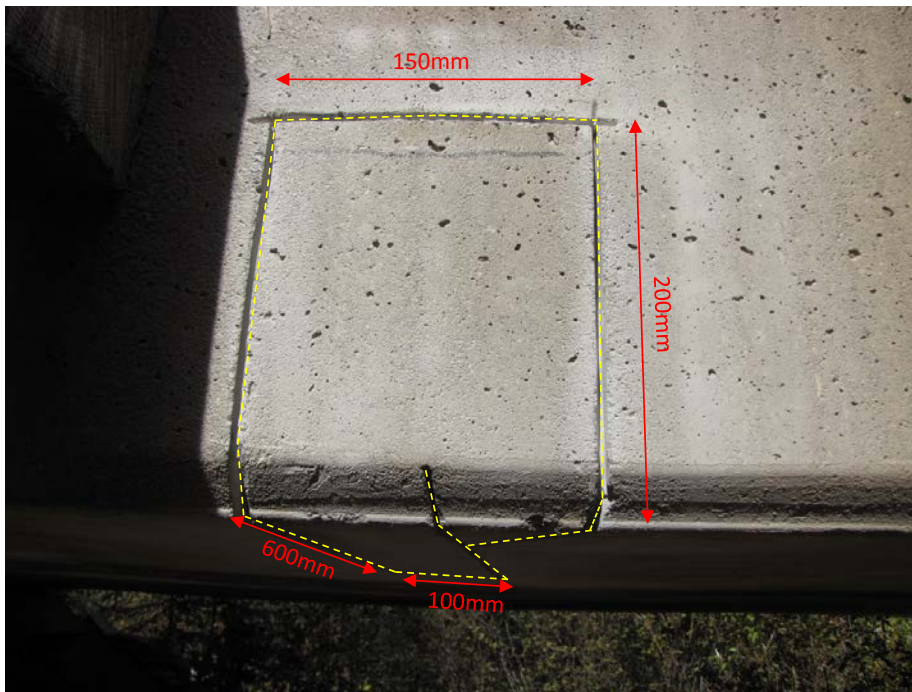


Figure 7: Sawcutting Guidelines Marked Onto Exterior Girder

2. A plywood board overlain with plastic sheeting was placed beneath the work area to capture debris during the sawcutting, chipping and repair works. See Figure 8.



Figure 8: Containment Field for Debris Collection

3. To control the chipping area and have a good quality patch, it is necessary to have a clean edge. To obtain a clean edge, an angle grinder equipped with a 4-inch diamond sawblade, similar to that shown in Figure 9, was used to cut to a depth of approximately 25mm. In carrying out the concrete cutting, it was important to avoid contacting and potentially damaging the reinforcing steel which was estimated to have nominally 50mm of concrete cover depth.
4. Chipping of concrete between the saw cuts then took place using a handheld jack-hammer similar to that in Figure 10. The chipping was performed until at least half of the reinforcement diameter was revealed on both the underside and side faces. Finally, a small hammer drill with a chipping bit, similar to that in Figure 10, was used to remove any remaining concrete on the reinforcement surface, permitting accurate measurement.



Figure 9: Angle Grinder Used for Sawcutting [1]



Figure 10: Handheld Jack Hammer Used for Chipping [2]



Figure 11: Chipping Hammer Drill Used for Concrete Blemish Removal [3]

The total depth of removed concrete was approximately 62.5mm on the underside (50mm cover + 12.5mm reinforcement radius) and 52.5mm on the side face (45mm cover + 7.5mm reinforcement radius). The exposed reinforcement can be seen below in Figures 12 (side face) and 13 (underside).



Figure 12: Side Face Exposed Reinforcement

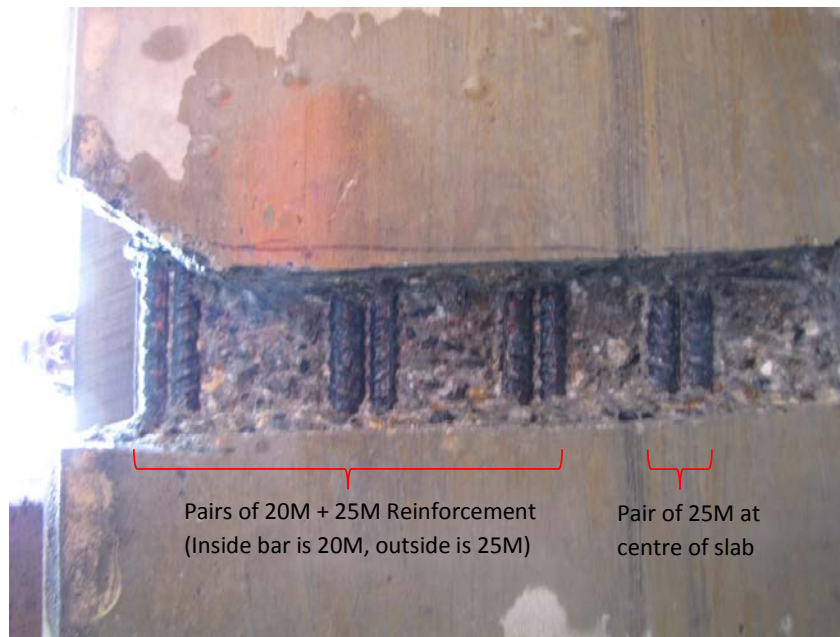


Figure 13: Underside Exposed Reinforcement

3.3. Results

After chipping, it was observed that the underside reinforcement matrix is arranged as three pairs of 20M + 25M and one pair of 25M in the centre. Presuming that the slab is symmetrical about the longitudinal centreline, there would be three pairs of 20M + 25M on either side of the 25M pair. The shear reinforcement (side face) was found to be one 15M bar longitudinally accompanied by 10M stirrups. The top reinforcement and spacing between the stirrups was not observed.

No rust or corrosion was noted on the reinforcement.

This configuration can be seen in the attached Figures 25-28 of Appendix B, and directly below in Figure 14. These results and the measurements taken initially provide a comfortable match with the deck configurations shown in Figure 10 (specifically, the configuration highlighted in green). This figure also provides a hand-drawn sketch of what was observed in the field.

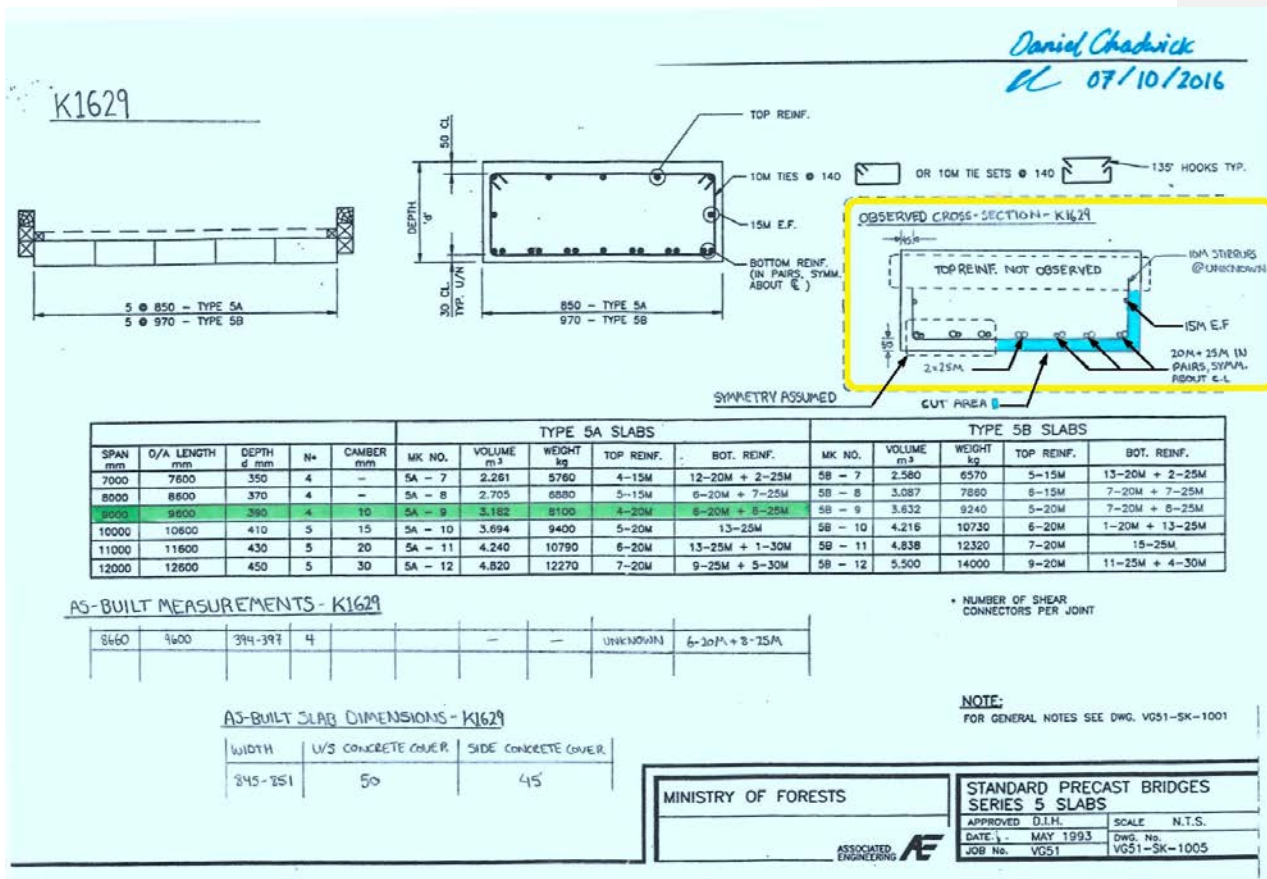


Figure 14: Ministry Standard Bridge Deck Configurations, Type 5 Slabs

3.4. Repairs Performed

3.4.1. Procedure

The repair procedure followed the FLNRO document "Standardized Method for Concrete Repair [draft]." Target Traffic Patch Coarse was selected due to the repair depth being greater than 25mm. The exposed concrete and rebar section, herein referred to as the "exposed area," was repaired as follows:

1. The exposed area was rinsed with water in order to remove any dust and debris. This was then allowed to dry, achieving a saturated surface-dry condition. This would permit greater bond quality with the grout.
2. Weldbond, as seen in Figure 15, was selected as a bonding agent for the concrete-grout interface. This was prepared using a one-to-five ratio of product-to-water. The solution was applied to the exposed area surface, as seen in Figure 16, and allowed to set for a short time (up to an hour according to manufacturer instructions). At some stage, the solution appeared to have a blue sheen, at which point it was ideal to apply the grout.



Figure 15: Weldbond Concrete Bonding Agent Used for Patching



Figure 16: Exposed Rebar Section with Applied Weldbond Concrete Bonding Agent

3. Formwork was constructed around the exposed area with painted plywood. The form consisted of an underside plywood board approximately 650mm long x 200mm wide. This was fastened by drilling pilot holes into the concrete and fixing with nails and pieces of wire for friction development. Two small holes were drilled in the board near the end of the exposed area. This

would allow for the contractor to estimate when the grout had filled its form. The form can be seen in Figure 17.



Figure 17: Underside Form for Concrete Repair (Relief Holes Are at the Top of This Image)

4. Approximately half a bag of Target Traffic Patch Coarse grout was mixed with water. Roughly 1.5 Litres of water was measured using a 1 litre water bottle and added to the dry grout and mixed. The mixed grout consistency was mud-like and packable. Through the opening on the side face, the grout mixture was inserted until it could be seen escaping through the end-holes, at which point it was determined to be full. The grout was consolidated with a tamping rod and applying hammer blows on the formwork to force vibratory consolidation. A small piece of plywood was cut to match the end opening on the edge of the concrete slab and added to the formwork and sealed using the same fastening technique described for the underside.
5. Five grout samples were cast following *MFR Bridge Structural Grout Field Sampling Procedure*. Further information on the samples can be seen in Section 3.4.2, "Results of Grout Sampling."
6. Due to cold temperatures at higher elevations, hoarding and heating was deemed necessary to maintain acceptable curing conditions for the initial setting of the grout repair. Two large plywood sheets were erected against the underside of the bridge, which were enclosed by a polyurethane sheet. A Tiger Torch was placed on the ground within the enclosure. The heat would be trapped by the hoarding apparatus and rise to the grout repair. This setup was left overnight to allow the grout to set (approximately 18 hours). The hoarding apparatus and propane tank supplying the Tiger Torch fuel source can be seen below in Figure 18.



Figure 18: Heating and Hoarding Performed on Repair Works

7. The forms were removed after overnight setting was completed. The patch at this stage can be seen below in Figure 19.



Figure 19: Concrete Repair Patch Following the Removal of Formwork

8. Grinding was then performed to improve finish quality. This was accomplished using the same angle grinder previously seen in Figure 9. The holes remaining from nail inserts were addressed with Sikaflex 1a Construction Sealant. The finished surfaces can be seen in Figures 20 and 21.



Figure 20: Side Face Repair Surface Following Grinding and Sealant Application



Figure 21: Underside Repair Surface Following Grinding and Sealant Application

9. The soundness of the concrete patch was tested by “sounding” with a hammer after 18 hours. No hollow sounds were noted over the full patch areas.

3.4.2. Results of Grout Sampling

Five grout samples were taken intermittently as the patch was being placed. These were wrapped in a damp cloth, as recommended by the *MFR Bridge Structural Grout Field Sampling Procedure*, and placed on an elevated rock within the hoarding apparatus overnight (step 6 of the previous section). This allowed initial curing conditions of the grout samples to be consistent with the patched area. Samples were then taken to KamTech Consulting Inc. for testing. Time frames did not allow testing at 1 day as recommended (typical testing interval is 1 day, 3 days, 7 days, 28 days), instead the cycle was initiated at 4 days.

The results of compressive strength tests are shown below in Table 2. From the information provided with Target Traffic Patch products [4], the grout was expected to attain a compressive strength of 34.5 MPa at one day. The results from the first two samples exhibited approximately 31 MPa at four days which is lower than expected. This may be due to the inaccuracy of water to dry grout ratio and addition of too much water in mixing, cold curing conditions in the field, insufficient sample consolidation, or a variety of other factors.

The 7 and 28 day sample breaks were adequate to demonstrate attaining the required compressive strength.

Table 2: Grout Sample Compressive Test Results

Lab ID Number	Date Tested	Age of Sample at Test (Days)	Compressive Strength (MPa)
861	03/10/2016	4	31.6
862	03/10/2016	4	30.4
863	06/10/2016	7	38.7
864	27/10/2016	28	44.6
865	27/10/2016	28	46.1

4. Time Estimates and Costs

The total time taken for the concrete removal/repair was approximately 24 hours. The total cost invoiced by the contractor was \$2005.50. Estimated time spans and related costs are broken down in Tables 3 and 4.

Table 3: Time Span Estimates

Process	Time (Minutes)
Initial Inspection	15
Setup	60
Sawcutting	45
Chipping	60
Formwork	30
Mixing and Placing Grout	30
Setting up Heating and Hoarding	60

Grout Setting	18 Hours
Removing Forms and Grinding Patch	30
Cleanup	30

Table 4: Cost Estimates

Description	Cost (\$)
Concrete Technician	1200
Equipment Rental	300
Materials	90
Hoarding and Heating	200
Accommodations (1 Night)	120
Tax (5%)	95.50

5. Challenges and Sources of Error

The following challenges were faced and appropriate mitigating measures provided:

1. Superstructure measurements were difficult to accurately measure due to surface damage. Measurements were taken at the most intact locations.
2. Working time was limited to approximately 20 minutes with the grout, so placement and sampling took place quickly and abruptly.
3. As per the Grout Sampling Procedure, samples should be wrapped in a damp cloth for curing. No such cloth was brought to the worksite and instead a sweater, dampened in the stream, was used.
4. Temperature measurement was difficult and therefore curing conditions were hard to maintain.
5. Bond strength between the concrete-grout interface could not be measured.
6. It was impossible to ensure that grout had completely filled the form, though sounding with a hammer did not reveal any potential voids.

Potential errors resulting from these challenges and other sources are as follows:

1. Dry grout measurement was estimated (roughly 1/3 to 1/2 of the bag mixed with 1.5 Litre of water), not measured. This would likely yield an imperfect final product and lower compressive strength test results.
2. Formation of the steel reinforcement matrix was difficult to record accurately, as a portion of the matrix remained encased in concrete. Only one stirrup was exposed, so no assumptions could be made regarding shear reinforcement spacing. If assumptions are incorrect then that will impact the final load rating evaluation.
3. Five samples were taken, contrary to the procedural six samples (two tests per test-day). This could skew results if the odd sample was poorly placed, cured, etc.
4. Difficulty in maintaining temperature could lead to imperfect curing conditions, adversely affecting strength gain.
5. Difference in proximity of the patch and grout samples to the Tiger Torch heat source could affect results. The torch and samples were both placed on the ground, and heat was allowed to rise up to deck underside. It is possible that the samples received inadequate heating during the initial curing phase.

6. The uncertainty in whether grout has completely filled the form (i.e. well packed and consolidated all throughout) could lead to bond strength deficiencies.
7. It is possible that the grout mixture was poorly mixed in its source bag, as certain particle sizes may settle in the bag, so measurements wouldn't be completely accurate unless the entire bag was used.

6. Non-Destructive Testing (NDT)

NDT options were not explored in this project, as this method is pending further trials to prove its effectiveness.

7. Load Rating Evaluation

It is reasonable, given the field measured precast bridge slabs dimensions, coupled with the observed sizing and orientation of the exposed reinforcing steel as sufficient evidence, to conclude that the precast concrete bridge slabs were fabricated to the matching ministry standard bridge drawings, produced by Associated Engineering Services Limited, series VG51, Standard Precast Bridges, from May 1993. The exposed reinforcing steel matches that on the ministry standard drawings VG51-SK-1005 which is not likely a coincidence.

The VG51, Standard Precast Bridges, drawings were designed for BCFS L75 loading and thus the superstructure for K1629 can be assumed to be designed and fabricated to these drawings and the associated design loading.

The load carrying capacity of the superstructure might already be known, based on other structures of the same type and length. Otherwise it should be easily calculable now that the configuration of reinforcement is known and assuming the concrete compressive strength is a minimum of 35MPa (which is the standard design strength). Given that one of the abutments has rotated, however, the load rating should remain at 10 tonnes until such a time that the abutment has been corrected. A new load rating is yet to be evaluated, posted for K1629.

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8. Recommendations

Recommendations resulting from the encountered challenges, results, and further discussion are as follows:

- A visual inspection should be conducted prior to any field work being performed, to aid in the search for documentation.
- If accessible, the cutting and chipping should be performed away from the bridge centre to minimize impact on deck strength.
- Six samples should be taken for testing as opposed to five.
- Where entire bags of dry grout are not used, means to accurately portion the dry grout and water mixture, such as weighing scales, should be used in order to have the appropriate water to dry grout proportions.

- Monitoring should continue on the grout repair patch to study the effectiveness of Target Traffic Patch and Weldbond products for overhead applications. The grout patch should be sounded during routine condition inspections to confirm its integrity.
- Explore non-destructive test methods to assess the compressive strength of the insitu precast concrete of precast bridge slabs
- Explore non-destructive testing alternatives to this method.
 - NDT tests could be performed to further confirm symmetry and other supplementary tasks, provided that trials are successful.


Appendix A – CBR Bridge Inspection Reports

		BC Ministry of Forests and Range <i>Permanent Bridge Inspection Report</i>				Page 1 of 3 Date Printed: 2016/10/04 User Id: IDIR\DCADWIC Database: PROD Report Id: CBR001A File:	
Structure #:	K1629	Site #:	K1629	Road Name:	EDGE	Inspection Date:	2016/08/12
KM:	7.55	User km:	110.20	Crossing Name:	Damfino Cr Tributary	Next Inspection Date:	2016/07/21
Project File ID #:	7654	Br.	32	Forest District:	Okanagan Shuswap Natural Resource District		
Deck Type:	Concrete			Running Surface:	Concrete		
Superstructure	Concrete Slab Girders			Abutments (Left/Right): <small>(looking downstream)</small>	Steel Pipe and Precast Pad		
Total Length (metres):	9.6	# Spans:	1	Span Length(s) (metres):	9.6		
UTM Zone:	11	UTM Easting:	369067	UTM Northing:	5520803		
Inspector Name:	Donovan J. A. Meln			Year Superstructure Installed:			
Access:	PB Jan21,2013 GPS coordinates should be confirmed at time of inspection. At 103km on 201 FSR turn South onto Edge FSR, travel to site at 110.2km						
ABUTMENTS							
Bearings	Poor	cap beam touching slabs					
Bracing	Not Applicable						
Ballast Wall	Good						
Corrosion Protection	Not Applicable						
Cape or Sills	Poor	leaning, cap beam is touching deck panel but n cracks found					
Fill	Good						
Hardware	Not Applicable						
Piles or Posts	Poor	leaning					
Riprap	Good						
Wing Wall	Not Applicable						
APPROACHES							
Alignment	Good						
Bridge Ahead Signs Missing	0						
Brushing Required	No						
Delineator Missing Left <small>(approaching structure)</small>	0						
Delineator Missing Right <small>(approaching structure)</small>	0						
Fender Condition	None						
Posted Load Rating	10						
Road Surface	Good						
DECK							
Span 1							
Corporate Bridge Register (CBR)							

Disclaimer:

- 1) Structure and site information is current at the time of report creation and may have changed since the inspection was submitted and/or accepted.
- 2) Historic Load Rating data not available, contact FLNRO Regional Office for detailed information.


Figure 22: K1629 2016 Inspection Report (Embedded File: Double-Click to open)

		BC Ministry of Forests and Range <i>Permanent Bridge Inspection Report</i>				Page 1 of 3 Date Printed: 2016/10/04 User Id: IDIR/DCHADWIC Database: PROD Report Id: CBR001A File:	
Structure #:	K1629	Site #:	K1629	Road Name:	EDGE	Inspection Date:	2015/07/21
KM:	7.55	User km:	110.20	Crossing Name:	Damfino Cr Tributary	Next Inspection Date:	2016/07/21
Project File ID #:	7654	Br.	32	Forest District:	Okanagan Shuswap Natural Resource District		
Deck Type:	Concrete			Running Surface:	Concrete		
Superstructure	Concrete Slab Girders			Abutments (Left/Right): <small>(looking downstream)</small>	Steel Pipe and Precast Pad		
Total Length (metres):	9.6	# Spans:	1	Span Length(s) (metres):	9.6		
UTM Zone:	11	UTM Easting:	369067	UTM Northing:	5520803		
Inspector Name:	Donovan J. A. Meln			Year Superstructure Installed:			
Access:	PB Jan21,2013 GPS coordinates should be confirmed at time of inspection. At 103km on 201 FSR turn South onto Edge FSR, travel to site at 110.2km						
ABUTMENTS							
Bearings	Fair	woods cap is leaning					
Bracing	Not Applicable						
Ballast Wall	Good						
Corrosion Protection	Not Applicable						
Caps or Sills	Poor	woods cap is leaning					
Fill	Good						
Hardware	Not Applicable						
Piles or Posts	Not Applicable						
Riprap	Good						
Wing Wall	Not Applicable						
APPROACHES							
Alignment	Good						
Bridge Ahead Signs Missing	0						
Brushing Required	No						
Delineator Missing Left <small>(approaching structure)</small>	0						
Delineator Missing Right <small>(approaching structure)</small>	0						
Fender Condition	None						
Posted Load Rating	10						
Road Surface	Poor	very rough					
DECK							
Span 1							
Corporate Bridge Register (CBR)							

Disclaimer:

- 1) Structure and site information is current at the time of report creation and may have changed since the inspection was submitted and/or accepted.
 2) Historic Load Rating data not available, contact FLNRO Regional Office for detailed information.

Figure 23: K1629 2015 Inspection Report (Embedded File: Double-Click to open)

		BC Ministry of Forests and Range <i>Permanent Bridge Inspection Report</i>		Page 1 of 3 Date Printed: 2016/10/04 User Id: IDIR/DCHADWIC Database: PROD Report Id: CBR001A File:	
Structure #:	K1629	Site #:	K1629	Road Name:	EDGE
KM:	7.55	User km:	110.20	Crossing Name:	Damfino Cr Tributary
Project File ID #:	7654	Br.	32	Forest District:	Okanagan Shuswap Natural Resource District
Deck Type:	Concrete		Running Surface:	Concrete	
Superstructure	Concrete Slab Girders		Abutments (Left/Right): <small>(looking downstream)</small>	Steel Pipe and Precast Pad	
Total Length (metres):	9.6	# Spans:	1	Span Length(s) (metres):	9.6
UTM Zone:	11	UTM Easting:	369067	UTM Northing:	5520803
Inspector Name:	Donovan J. A. Meln		Year Superstructure Installed:		
Access:	PB Jan21,2013 GPS coordinates should be confirmed at time of inspection. At 103km on 201 FSR turn South onto Edge FSR, travel to site at 110.2km				
ABUTMENTS					
Bearings	Fair	See note on woods cap beam lean			
Bracing	Not Applicable				
Ballast Wall	Good				
Corrosion Protection	Not Applicable				
Caps or Sills	Fair	See note on woods cap beam lean			
Fill	Good				
Hardware	Not Applicable				
Piles or Posts	Unrated	can't see			
Riprap	Good				
Wing Wall	Not Applicable				
APPROACHES					
Alignment	Good				
Bridge Ahead Signs Missing	0				
Brushing Required	No				
Delineator Missing Left <small>(approaching structure)</small>	0				
Delineator Missing Right <small>(approaching structure)</small>	0				
Fender Condition	None				
Road Surface	Good				
DECK					
Span 1					
Concrete Deck	Excellent				
Corporate Bridge Register (CBR)					

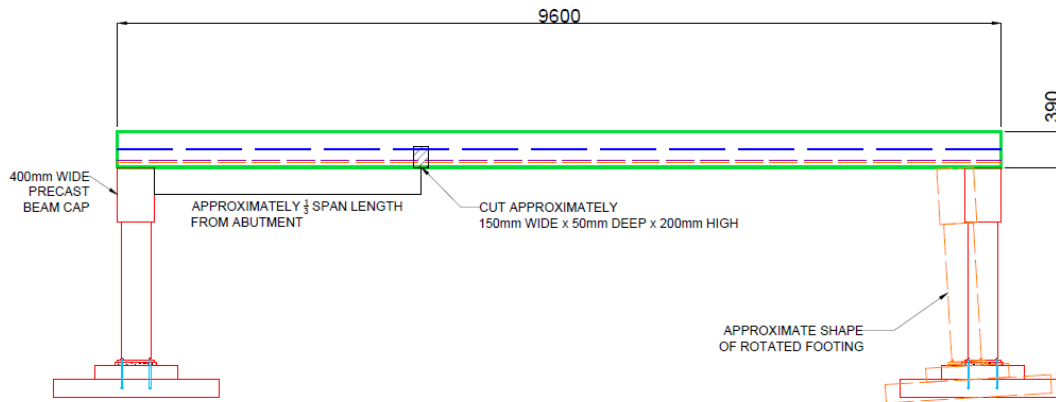
Disclaimer:

- 1) Structure and site information is current at the time of report creation and may have changed since the inspection was submitted and/or accepted.
 2) Historic Load Rating data not available, contact FLNRO Regional Office for detailed information.

Figure 24: K1629 2014 Inspection Report (Embedded File: Double-Click to open)

Appendix B – Supporting Visual Documentation

PROFILE

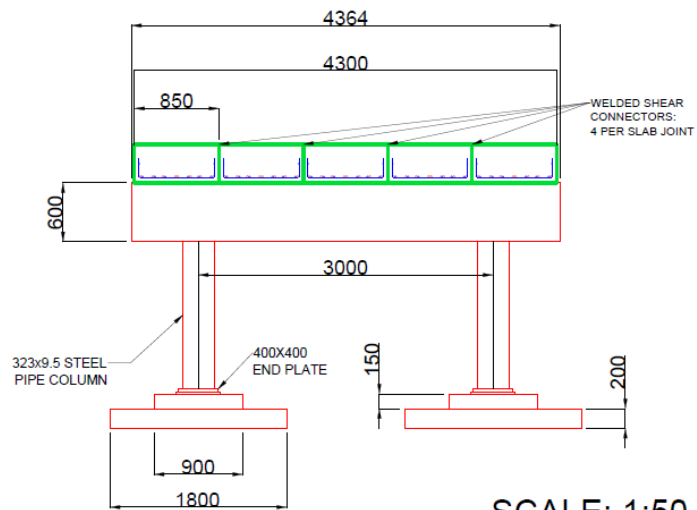


*FOUNDATION TYPE ASSUMED

SCALE: 1:50

Figure 25: Profile View of K1629; Note that Foundation Type is Assumed and Unobservable (Ignore Scale)

BRIDGE DECK CROSS-SECTION



SCALE: 1:50

Figure 26: Bridge Deck Cross-Section; Note that Foundation Type is Assumed and Unobservable (Ignore Scale)

UNDERSIDE

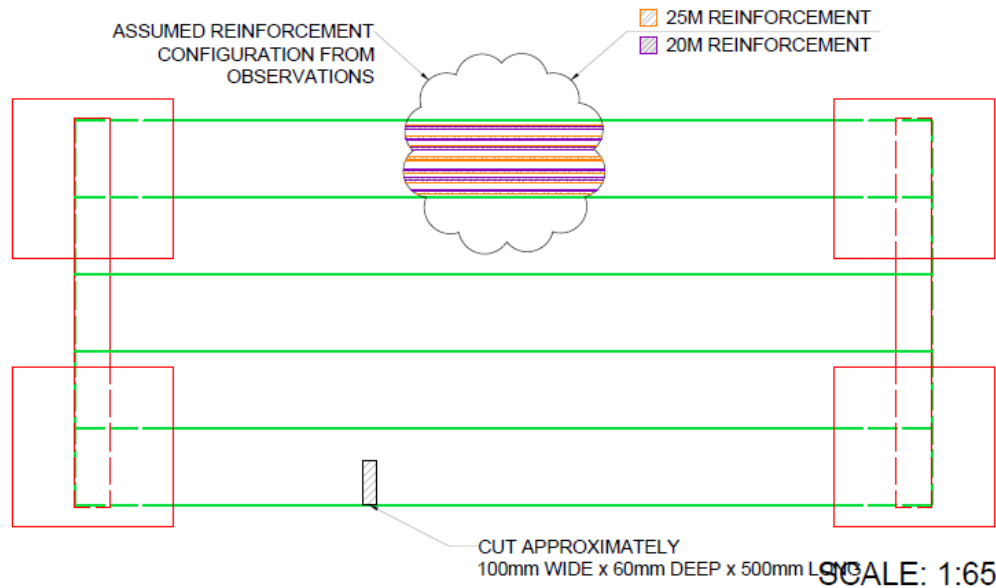
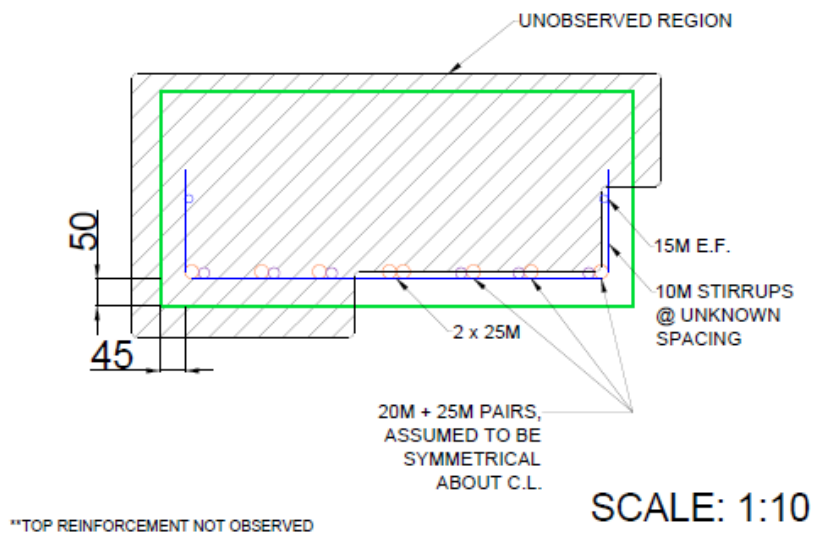


Figure 27: Underside of Bridge Deck; Note Reinforcement Configuration Imposed on Top Slab (Ignore Scale)

SLAB CROSS-SECTION



**TOP REINFORCEMENT NOT OBSERVED

Figure 28: Slab Cross-Section; Cut-out Section - Bottom-Right (Ignore Scale)

References

- [1] "5 in. Angle Grinder," Princess Auto, 2016. [Online]. Available: <http://www.princessauto.com/en/detail/5-in-angle-grinder/A-p8262446e>. [Accessed 05 10 2016].
- [2] "Electrical Jack Hammer," MAK Machinery, 2015. [Online]. Available: <http://www.makmachinery.com/Electrical-Jack-Hammer.php>. [Accessed 05 10 2016].
- [3] "Hammer Drill," BOSUN TOOLS, [Online]. Available: <http://diamondtoolinchina.com/2-5-hammer-drill.html>. [Accessed 05 10 2016].