Alberta Transportation

BIM Supplemental Binder Index

Contact List for Bridge Inspections - Alberta Transportation				
First Name	**Second Name**	**Phone Number**	**Title**	**Area**
Alan	Saunders	(780)618-4379	Bridge Manager	Peace Region
Brent	Herrick	(780)305-2419	Acting Bridge Manager	North Central Region
Donald	Saunders	(403)340-5579	Bridge Manager	Central Region
Ralph	Witten	(403)382-4061	Bridge Manager	Southern Region
Bryan	Wai	(780)415-1079	Bridge Management Engineer	Province
Matt	Spratlin	(780)644-5413	Bridge Preservation Specialist	Province

BRIDGE INSPECTION AND MAINTENANCE (BIM) SYSTEM INSPECTOR CERTIFICATION PROCESS

Background

The integrity and effectiveness of the BIM system depends on the quality of inspection provided by the bridge inspector. All inspections entered into the BIM system must be performed and reviewed by certified bridge inspectors. Alberta Transportation maintains a comprehensive bridge inspector certification process that must be successfully completed by each candidate prior to becoming certified. There are two classes of bridge inspectors (Class A and Class B). The roles and qualification requirements for each inspector class are outlined in Alberta Transportation's BIM Inspection Manual.

This document details the requirements for obtaining and maintaining inspector certification status and supersedes any requirements detailed in the BIM Inspection Manual.

Class B Certification Process

To become certified as a Class B bridge inspector, candidates must meet the following requirements:

Education

- High School Diploma or an equivalent combination of education and experience acceptable to Alberta Transportation.

Bridge Inspection Training

Class B bridge inspection training must be completed in the following stages:

- Stage 1: Alberta Transportation Class B BIM Training Course (5 day course)
  - Minimum 70% average score required

- Stage 2: Alberta Transportation Class B BIM Field Training Course (3 day course) or Alberta Transportation approved equivalent
  - Field trainer recommendation required

- Stage 3: Mentorship program - details of the mentorship program shall be as follows:

    - Candidates shall select a mentor that is a Class A Inspector; or a Class B inspector that has been certified for a minimum of 9 years; or a Class B inspector that has completed greater than 150 inspections over a 6 year period;

    - Candidates that have attended the Alberta Transportation Class B Field Training Course shall complete a minimum of 25 training inspections under the guidance of a mentor. The training inspections shall be completed within two years of completion of the Class B Field Training Course. For every year beyond the two year period an additional 10 training inspections will be required;

    - Candidates that have completed an Alberta Transportation approved equivalent Class B Field Training Course shall complete a minimum of 35 training inspections under the guidance of a mentor. The training inspections shall be completed within two years of completion of the Alberta Transportation approved equivalent Class B Field Training Course. For every year beyond the two year period an additional 10 training inspections will be required;;

    - Selection of all training inspections shall be reviewed and recommended by the mentor. A minimum of 75% of the selected sites for training inspections shall have a maximum structural condition rating of 45% and superstructure/barrel elements must be accessible;

    - To commence the mentorship program a minimum of 5 different types of bridge structures shall be inspected by the candidate and mentor together. The initial 5 inspections completed with the mentor can be included in the total number sites of the mentorship program;

    - Training inspections shall be completed in lots. Lots shall be no greater than 7 sites. The mentor shall thoroughly review, document and discuss each training inspection lot with the candidate prior to commencement of subsequent lots. Mentor inspection review comments shall be documented on inspection forms (including photo reports) and all communication/feedback with the trainee recorded. The trainee may at any time during the mentorship program submit received mentorship documentation to the bridge preservation specialist to confirm its acceptability;

- The number and type of inspection should be consistent with recommendations received from Stage 2 of the certification process, but may be increased if required by the mentor. At a minimum, training inspections shall be completed in the following categories and quantities:
  - Timber Bridges (TT) 2 - 5;
  - Culverts (CUL 1, CULM, CULE) 10- 15;
    (A variety of culvert types is required- i.e. BP/CP, FP/CSP, MP/CSP, RP/SPCSP, SPE/ SPCSP, SP/SPCSP etc.);
  - Standard Precast Bridges (PCS) 10 - 15;
    (A variety concrete girder bridges with the majority having timber substructures is required- HC, PG, VS, PE, SL etc.).

- *Letter of recommendation from mentor stating trainee has completed a mentorship program meeting the above requirements and in his/her opinion is ready to write the certification exam and test sites & electronic PDF scans of original inspection reports with review comments and all other communication/ feedback in PDF format. The submission of inspection reports, including photos, shall be submitted in individual PDF files for each lot as well as an excel spreadsheet summarizing the lot number, BF, span type, structural condition rating, inspection date, mentor review date, mentor comments on acceptability feedback /discussion date).*

- Stage 4*: Class B certification exam
  - *Minimum 75% score required.*

- Stage 5*: Test Inspections – three test inspections completed in one day
  - *Scored for acceptability by a* Alberta Transportation *Class A inspector*

** Note: Stage 4 and 5 may be completed in reverse order.*

Class A Certification Process

To become certified as a Class A bridge inspector, candidates must meet the following requirements:

Education

- Civil Engineering Degree, or Civil Engineering Technical Diploma plus 2 years bridge related experience, or an equivalent combination of education and experience acceptable to Alberta Transportation.

Bridge Inspection Training

All Class A candidates must have valid Class B certification and completed a minimum of 75 inspections as a Class B inspector. Class A bridge inspection training must be completed in the following stages:

- Stage 1 : Alberta Transportation Class A BIM Training Course (5 day course)
  - *Minimum 70% average score required*

- Stage 2: Mentorship program - details of the mentorship program shall be as follows:
  - Candidates shall select a mentor that has been certified as a Class A Inspector for 6 years or more;
  - Candidates shall complete a minimum of 45 training inspections under the guidance of a mentor;
  - Selection of all training inspections shall be reviewed and recommended by the mentor. A minimum of 60% of the 45 selected sites Selected sites for training inspections shall have a maximum structural condition rating of 45% and superstructure elements must be accessible;
  - To commence the mentorship program a minimum of 10 different types of bridge structures shall be inspected by the candidate and mentor together. The initial 10 inspections completed with the mentor can be included in the total number sites of the mentorship program;
  - Training inspections shall be completed in lots. Lots shall be no greater than 7 sites. The mentor shall thoroughly review, document and discuss each training inspection lot with the candidate prior to commencement of subsequent lots. Mentor inspection review comments shall be documented on inspection forms (including photo reports) and all communication/feedback

with the trainee recorded. The trainee may at any time during the mentorship program submit received mentorship documentation to the bridge preservation specialist to confirm its acceptability;

- At a minimum, training inspections shall be completed in the following categories and quantities: :
  - Steel Truss Bridges (DT, TH, PT) 5- 10;
    (One of each type as a minimum);
  - Steel Girder Bridges (SG) 1 0 - 20;
    (A variety of types is required- i.e. FR, RB, WG, RG, etc.);
  - Prestressed Concrete Girder Bridges (PSR) 1 0 - 20;
    (A variety of types is required- i.e. NU, DBT, CBT, PO, FC, RD, etc.);
  - Cast-in-place Concrete Girder Bridges (CON) 2 - 5;

- *Letter of recommendation from mentor stating trainee has completed a mentorship program meeting the above requirements and in his/her opinion is ready to write the certification exam and test sites & electronic PDF scans of original inspection reports with review comments and all other communication/ feedback in PDF format. The submission of inspection reports, including photos, shall be submitted in individual PDF files for each lot as well as an excel spreadsheet summarizing the lot number, BF, span type, structural condition rating, inspection date, mentor review date, mentor comments on acceptability feedback/discussion date).*

- Stage 3**: Class A certification exam
  - *Minimum 75% score required.*

- Stage 4**: Test Inspections – three test inspections completed in one day
  - *Scored for acceptability by a* Alberta Transportation *Class A inspector*

*** Note: Stage 3 and 4 may be completed in reverse order.*

Class A and B candidates will be certified once all requirements have been met. Certification will remain valid until the next certification renewal date. Candidates that fail any stage have the opportunity to re-try that stage. A second failure at a given stage will require the process to be re-started at Stage 1.

Re-Certification Process

Re-certification requires active involvement in the BIM program and acceptable performance. The status of all certified inspectors will be reviewed by Alberta Transportation personnel (Bridge Preservation Specialist and Bridge Management Engineer in Technical Standards Branch) every 3 years. Decisions on re-certification will be rendered and activated prior to the certification renewal date.

The Bridge Engineering Section of Alberta Transportation's Technical Standards Branch Bridge (TSB) will administer the re-certification process with assistance from regional bridge staff. Inspectors that clearly meet re-certification requirements will be re-certified until the next renewal date following formal approval by the Director of Bridge Engineering. Inspectors will be notified by e-mail of re-certification results. Hard-copy certificates will be provided by Alberta Transportation, if requested.

Inspectors that do not meet re-certification criteria may be asked if they intend to maintain their certification. If so, a panel comprised of three members of Alberta Transportation's BIM committee will be convened to review the inspector's status and render recommendation on certification renewal to the Director of Bridge Engineering. If re-certification is approved, the candidate will be informed by e-mail of re-certification results. Hard-copy certificates will be provided from by Alberta Transportation, if requested. If certification is not granted, a remedial plan to renew certification may be developed by the panel. A typical remedial plan would consist of a completion of a written re-certification exam (minimum 75% score required) and 5 test inspections. The test inspections would be reviewed by an Alberta Transportation certified Class A inspector for acceptance. Additional training may also be required if deemed necessary by the panel.

Re-certification criteria for Class A and Class B bridge inspectors

In order to be re-certified, inspectors must satisfy one of the following:

- Performed a minimum average rate of 2 BIM inspections (Level 1 or Level 2) per month during previous 3 year period. Class A inspectors must have completed 50% of the inspections for major bridges; or
- Performed a minimum average rate of 1 BIM inspection (Level 1 or Level 2) per month during previous 3 year period and have been active in the management, design, or construction of bridges. Class A inspectors must have completed 50% of the inspections for major bridges; or
- Acted as a reviewer for a minimum average rate of 2.5 inspections per month during the previous 3 year period and have been active in the management, design, or construction of bridges; or

- Acted as Department reviewer for a minimum average rate of 5 inspections per month during the previous 3 year period and have been active in the management, design, or construction of bridges.

In addition, to be re-certified, inspectors must have:

- Attended any formal BIM training sessions deemed mandatory by Alberta Transportation; and
- Completed any improvement plans developed by Alberta Transportation based on observed performance issues.

This process is effective as of **March 22, 2016**

Dave Besuyen, P. Eng.
Bridge Engineering, Technical Standards Branch
Alberta Transportation
Government of Alberta

BIM Advisory Bulletin #1/2012

Focus on Maintenance Recommendations

Results from recent quality assurance inspections have shown some deficiencies in the maintenance recommendations section. In some cases, multiple recommendations were missed in the original inspections. Most of the missing items were operational in nature (hazard markers, approach rail, remove beaver dam, trim old piles…) or life extension related (seal deck, repair curb spall, add riprap…), with no immediate impact on safety.

However, the Department would like to re-emphasize the importance of this component of the BIM system. Thorough and timely maintenance will enhance operations and preserve structural integrity to ensure optimal future expenditures on bridges. Details on the maintenance recommendation component can be found in Chapter 11 of Version 3.1 of the BIM Inspection Manual.

If you have any questions on this matter, please contact the Bridge Preservation Specialist (Byron Chelak, 780-415-1032).

Effective Date: October 22, 2012

Des Williamson
Director, Bridge Engineering and Water Management
Technical Standards Branch

BIM Advisory Bulletin #2 – January 08, 2015

Section 2.5 of Bridge Inspection and Maintenance System - Inspection Manual (Version 3.1 - March 2008) will be replaced in its entirety with the following **effective April 1, 2015.**

2.5 Frequency of Bridge Inspection

Bridge structures are to be inspected in accordance with the following intervals to ensure an appropriate level of safety and to assist in effective maintenance and management of the bridge inventory:

1. Bridge structures located on roadways that are designated as Level 1 or Level 2 in accordance with the Provincial Highway Service Classification - 21 months.
2. Bridge structures located on roadways that are designated as Level 3 or Level 4 in accordance with the Provincial Highway Service Classification - 39 months.
3. Major Bridges on Local Roads - 39 months.
4. Standard Bridges and Culverts on Local Roads – 57 months.
5. All new bridge structures as part of final construction completion.
6. All bridge structures are to be inspected after significant maintenance (the work affects superstructure or substructure general ratings) or rehabilitation has been completed.

It is intended that these cycles will provide the benefit of inspection under different seasonal conditions. In special circumstances some structures may be exposed to unique conditions or only accessible at specific times of the year (i.e. park roads with summer only access). In special circumstances the Department will modify inspection intervals to suit site specific requirements.

Grade separation and ramp structures that have over and under passing roadways with different Provincial Highway Service Classifications will be assigned the inspection frequency associated with the higher roadway classification/more frequent inspection interval.

The inspector may recommend a shorter or modified inspection interval depending on the age, traffic characteristics, known deficiencies, etc. of the bridge. The Department will review and either accept or reject the recommendation.

If you have any questions on this matter, please contact the Bridge Preservation Specialist.

Des Williamson
Director, Bridge Engineering
Technical Standards Branch

BIM Advisory Bulletin #3 – January 20, 2016

The Bridge Inspection and Maintenance System (BIM) Manual describes various bearing types but is not an exhaustive listing of all bearing types contained within the Provincial bridge inventory. Recent performance issues related to sliding steel plate bearings with self-lubricating bronze plates are noted within this BIM advisory bulletin as well as supplements to condition rating guidelines for bearing and concrete abutment and pier cap/seat/corbel condition sections of the BIM manual.

Sliding steel plate bearings with self-lubricating bronze plates were primarily utilized for PO type girders between the years of 1955 and 1965. The bearings consisted of details similar to Standard Drawing S-701. Variations to these details are found in some site specific designs and reference drawings should be reviewed when required.

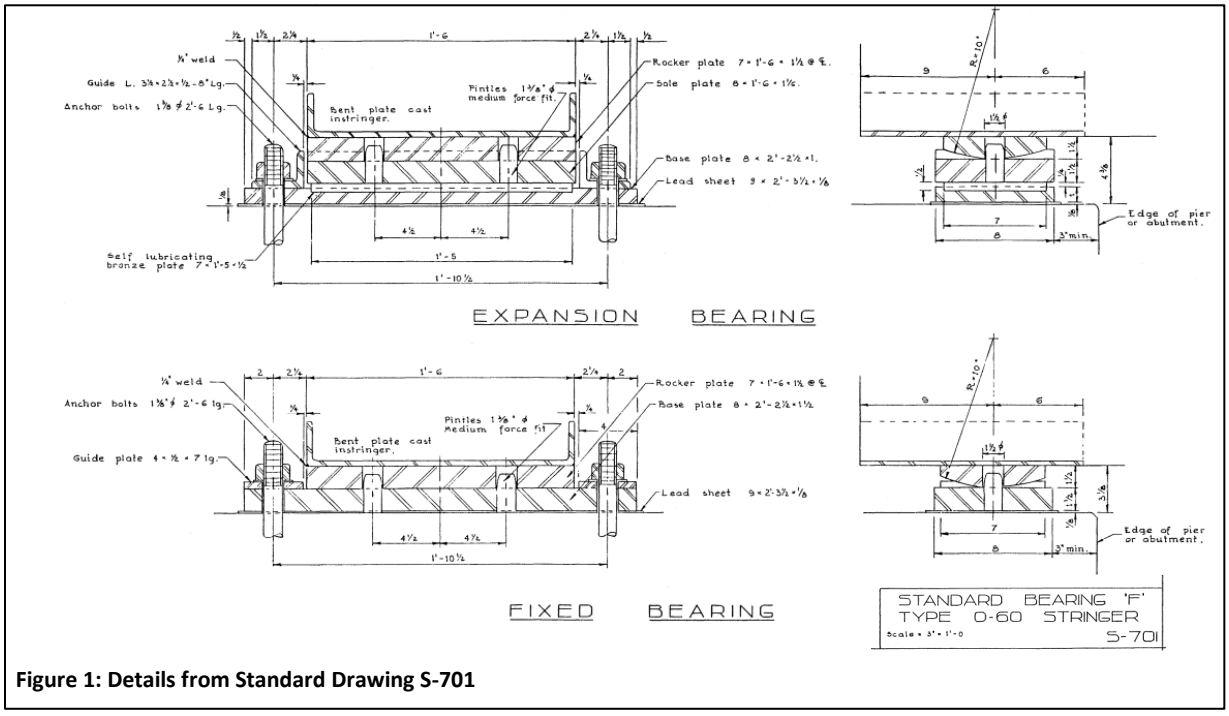

Figure 1: Details from Standard Drawing S-701

The self-lubricating bronze plates were intended to provide the sliding surface between the base/masonry and girder sole & rocker steel plates. Under actual field conditions the bearing system has not functioned as well as intended resulting in additional stresses being introduced to bearing components and substructure elements. These additional stresses combined with site specific abutment and pier seat/cap/corbel designs, as-constructed conditions, and deterioration over the past 60 years has resulted in failures.

Figure 2: Steel sliding plate expansion bearings with self-lubricating bronze plates

Figure 3: Concrete pier with shafts and arched cap.

Figure 4: Wide crack in concrete cap at expansion bearing with staining.

Figure 5: Concrete cap failure with girder drop in elevation.

The Department completed a review of other bridges of similar vintage and design details. During the review process, discrepancies in BIM element ratings were noted. Supplements to the BIM manual have been developed and are provided in this bulletin for use on all future inspections completed by certified inspectors and Consultants providing bridge inspection, maintenance and rehabilitation services.

Bridge Bearings

Bridge bearings are inspected and rated in accordance with section 7.20 of the BIM manual.

Excerpt from Section 7.20.1 of the BIM Manual:

- Bearings are designed to transmit loads to the substructure and permit rotational movement of the superstructure relative to the substructure. Certain types of bearings (expansion) must also permit longitudinal movement due to temperature changes and loading conditions. An effective expansion bearing allows movement with little frictional resistance. In many cases, metal expansion bearings freeze (lock-up) due to corrosion when salt, water, and debris are present. Once the bearing has frozen, high stresses may be induced in the girders, abutments, and piers. The result is generally cracks or spalls in the caps or seats, or tilting of the piers or abutments.

Supplement to 7.20.1 of the BIM Manual:

- Bearings are designed to transmit loads to the substructure and permit rotational movement of the superstructure relative to the substructure. Certain types of bearings (expansion) must also permit longitudinal movement due to temperature changes and loading conditions. An effective expansion bearing allows movement with little frictional resistance. In many cases, expansion bearings freeze (lock-up) due to corrosion when salt, water, and debris are present. *In some cases, expansion bearings may appear to be in adequate condition due to surface refurbishment, but are frozen due to previous exposure conditions such as leaky deck joints. In either case, o*nce *bearings have* frozen, high stresses may be induced in the girders, abutments, and piers. The result is generally cracks or spalls in the caps or seats, or tilting of the piers or abutments.

Excerpt from Section 7.20.3 of the BIM Manual:

- Check all steel components for rust, corrosion, sheared bolts, cracked welds, and evidence of frozen bearings or connections.
- Deterioration caused by leaking deck joints or cracks in the caps or seats caused by frozen bearings should be noted.

Supplement to 7.20.3 of the BIM Manual:

- *Deterioration caused by leaking deck joints should be noted.*
- *Cracks, delaminations, or spalls in concrete abutment and pier caps/seats/corbels emanating from bearing components should be noted and comments on suspected or confirmed reduced bearing functionality provided.*

Abutment and Pier Seat/Caps/Corbels

Concrete abutment and pier seats/caps/corbels are inspected and rated in accordance section 8.5 of the BIM manual.

Excerpt from Section 8.5.2 of the BIM Manual:

- Check concrete seats/caps for cracks, spalls, corrosion of reinforcement, and disintegration of the concrete.

Supplement to 8.5.2 of the BIM Manual:

- Check concrete seats/caps for cracks, *delaminations,* spalls, corrosion of reinforcement, and *other signs of concrete deterioration*.

Excerpt from Section 8.5.3 of the BIM Manual:

- Any deficiencies that would reduce the ability of these elements to transmit loads, rate 4 or less.

Supplement to 8.5.3 of the BIM Manual:

- Any deficiencies that would reduce the ability of these elements to transmit loads, rate 4 or less.
- *Bearing functionality should be considered in conjunction with the bearing seat/cap/corbel rating. If at bearing locations, concrete with visual signs of damage has not been sounded or wide cracks have not been marked for monitoring, rate 3 or less and recommend a more detailed inspection with appropriate access. Timelines for the detailed inspection and/or a reduced inspection cycle should be included. Recommendations may also include an engineering review of construction details and drawings to determine effects of existing conditions. Wide cracks that have been marked for monitoring and have not changed for a period of 5 years or more may have their rating increased by 1 rating point.*

Rating guidelines are provided throughout the BIM manual that requires certified inspectors and reviewers to use their extensive training, experience, and education to rate elements when conditions are such that a rating of 4 or less is to be assigned. Conditions that, in the inspector/reviewer's judgment, affect load carrying functions should also be rated in consideration of repair and maintenance priorities outlined in Section 11.2.1 of the BIM manual.

Examples are provided below:

Figure 5: Wide cracks and concrete delamination in concrete S3G6 – P3. Pier cap and expansion bearing rated 3.

Figure 6: Wide cracks and delamination in bearing area of concrete cap at S2G1 - P2. Pier cap and fixed bearing rated 3.

If you have any questions on this matter, please contact the undersigned.

Dave Besuyen, P.Eng.
Bridge Preservation Specialist
Technical Standards Branch
780 415 1037

BIM Advisory Bulletin #4
Department Review of Local Road Bridge Inspections

Under Section 18(1) of the Municipal Government Act in the Province of Alberta, a municipality has the direction, control and management of all local roads within the municipality. As such, municipalities are responsible for inspecting and maintaining all local road bridges within the municipality. Alberta Transportation completes inspections of major bridges on local roads, but the responsibility for managing and maintaining these bridges still lies with the municipality.

Many municipalities choose to use Alberta Transportation's Bridge Information System (BIS) tool to store and manage bridge inspection data that is collected in accordance with Alberta Transportation's Bridge Inspection and Maintenance (BIM) System. Currently, the name of an approved Alberta Transportation representative must be entered as the Department Reviewer before any BIM report will be accepted into BIS, and this has led to confusion over the level of responsibility assumed by the Department Reviewer. In the case of bridges under the direction, control and management of a municipality, the Department Reviewer's only responsibility is to check that the report can be acceptably entered into the system, and the Department Reviewer takes no responsibility for the content or accuracy of the report. The municipality is responsible for ensuring the completeness and accuracy of inspection reports for its bridges, regardless of who completes the inspections, and is also responsible for ensuring that all comments or recommendations contained in the reports are addressed. In the future, Alberta Transportation hopes to review the need to complete the Department Reviewer field on reports for local road bridges. In the meantime, this advisory bulletin shall clarify the roles and responsibilities of the individual noted as Department Reviewer on local road bridge inspection reports.

If you have any questions on this matter, please contact the undersigned.

Matthew Spratlin
Bridge Preservation Specialist
Technical Standards Branch
(780) 644-5413

BIM Advisory Bulletin #5 – January 15, 2017

Alberta Environment and Parks (AEP) released the Roadway Watercourse Crossing Inspection Manual in 2015. The intent of the manual is to better manage the road-related risks to fish in Alberta and it provides a standardized protocol to assess crossing sites for erosion / sedimentation concerns and for fish passage. Most of the data required to complete these assessments is already contained in BIS as inventory data, or collected as part of regular Level 1 BIM inspections. To ensure that we have ***all*** data required to complete the assessments we now require BIM inspectors to record some additional data on the BIM forms. The additional data to be recorded, and where to record it, is detailed in the following sections of this bulletin.

Erosion / Sedimentation

Additional data to assess the erosion / sedimentation risk at a crossing is to be recorded for all crossings (bridge and culvert) in the Explanation of Condition section for Channel - Bank Stability. Note if there is ***active erosion*** or ***potential erosion*** (no evidence of soil movement, but exposed earth on fill slopes or in ditches leading to stream) in the vicinity of the crossing. Note the source of the erosion (eg. ditch gully, bank slump, fill slope, road surface, other) and indicate whether it is occurring at the inlet, the outlet or both. Note if there is any intact erosion control or established vegetation between the erosion area and the stream and note the size of the erosion area (m^2). See Figure 1 for an example. Bank Stability shall still be rated according to Section 9.2 or Section 13.7.2 of the BIM Inspection Manual.

Structure Usage				
		Last	**Now**	**Explanation of Condition**
Channel (U/S and D/S)				
Alignment		6	6	
Bank Stability		7	5	Active erosion, outlet end, bank slump, 3m^2 Potential erosion, inlet end, bare fill slope, 6m^2, intact silt fence protecting stream
HWM (m below Top of Culvert)				No HWM visible
Drift (Y/N)	No			
Channel Bottom Degrading/Aggrading	Degrading			
Beavers (Y/N)	No			
(Fish Compensation Measure 1 : **NONE**)				
(Fish Compensation Measure 2 : **NONE**)				
Channel General Rating			6	

Figure 1. Sample record of Erosion / Sedimentation data

Culvert Status

The following additional information shall be recorded in the Explanation of Condition section for Culvert Barrel – Fish Passage Adequacy for all stream crossing culvert sites. For multiple culvert sites, record the information for the primary culvert only, or for the worst case culvert (from a fish passage perspective) when no obvious primary structure exists. For all culvert sites, use the headings shown in Figure 2 to identify each of the following four sets of data. Also note if any fish are observed in the stream adjacent to the culvert or in the culvert itself. Fish Passage Adequacy shall still be rated according to Section 13.6.12 of the BIM Inspection Manual.

Debris Blockage: If the culvert is obstructed by debris at any point, indicate the percentage of the culvert diameter that is obstructed and the cause of the obstruction.

Substrate in Culvert: Note if there is substrate in the culvert and the dominant type (sand, gravel, cobble, boulder, silt, other). Estimate and note the percentage of the culvert length that contains substrate.

Backwater in Culvert: Backwater is the upstream extension of the standing water outlet pool into the culvert. Flowing water in the culvert is not backwater. Estimate and record how far up into the culvert (% of culvert length from the outlet) backwater can be found.

Outlet Pool Depth: Measure the depth of the pool to the nearest centimeter at the outlet of the culvert. The measurement should be taken within one culvert diameter of the end of the culvert. If the outlet pool depth is highly variable, take several measurements and record the average.

Bridge Culvert Barrel				
Culvert Component		**Last**	**Now**	**Explanation of Condition**
(Pipe # : **1, Primary Span, Location Code: MAIN, Span (mm): 5080, Rise (mm): 2388, Type: CPA**)				
Ponding (Y/N)	No			
Fish Passage Adequacy		7	7	Blockage: 20% Drift Substrate: 25% Sand Backwater: 50% Pool Depth: 35 cm
Baffle		X	X	
(Type:)				

Figure 2. Sample record of culvert status data

It is anticipated that future modifications to the BIM forms will allow for direct collection and input of the data. Until these modifications are complete, we ask that the data be collected and recorded as outlined above.

If you have any questions on this matter, please contact the undersigned.

Matthew Spratlin, M.Sc., P.Eng.
Bridge Preservation Specialist
Technical Standards Branch
(780) 644-5413

BIM Advisory Bulletin #6 – February, 2017

In 2012, Alberta Transportation was informed of 6 SC girder bridges that were showing signs of accelerated freeze thaw deterioration on exterior girders. Further investigation revealed that the deterioration was due to the use of substandard aggregates in the concrete mixes used in girders fabricated between 2003 and 2007, and that there were 88 SC girder bridges built in this time frame. 36 of these 88 bridges are now showing signs of deterioration with various degrees of severity. 16 bridges are exhibiting significant premature deterioration and 20 are showing signs that deterioration may soon become severe. The most severe deterioration is typically found on exterior girders, especially those exposed to direct sunlight, but interior girders are also affected. Immediate issues include failure of the bridgerail where it anchors into the exterior girder, and structural capacity of the exterior girders due to loss of concrete and reinforcing steel embedment. In addition, there are signs that damage to the tops of girders may soon become a concern for sites with no wearing surface. Guidelines for BIM Ratings and Maintenance Recommendations for SC girder bridges showing signs of premature freeze thaw deterioration are presented in the following sections of this bulletin.

BIM Rating Guidelines

The current guidelines for rating prestressed concrete girders do not address the freeze thaw issues that are occurring with the SC girder bridges. The following recommendations are intended to supplement the BIM Inspection Manual guidelines to address specific concerns with these SC girder bridges and to assist with using the Management Strategy Flow Chart presented in the following section. BIM rating guidelines are presented in Table 1 below. The one rating point increase for curb girders described in Section 7.15.2.7 of the BIM Inspection Manual shall not be applied to SC girders showing signs of freeze thaw damage. Example photographs are provided in the Appendix.

Table 1: Level 1 BIM Rating for SC Girders

Element	Rating	Defects
Interior and exterior girders	4	• Aggregate popouts, minor scaling and other signs of freeze thaw damage with no visible signs of concrete section loss.
	3	• Section loss along the top and bottom corners of girders. • Section loss at girder end face. • Extensive scaling of girder surfaces.
	2	• Exposed steel stirrups. • Exposed prestressing strands. • Significant section loss on all surfaces.
Bridgerail posts	3	• Section loss at the top corner of the exterior girder but not yet to the edge of the bridgerail post base plate. • Concrete section loss of the bridgerail post plinth.
	2	• Concrete girder section loss extends up to or underneath the edge of the bridgerail post base plate.

Maintenance Recommendation Guidelines

The following Flow Chart (Figure 1) was developed to provide a simple method for determining a suitable management strategy for SC girder bridges affected by freeze thaw damage based on an AT Level 1 BIM Inspection and the rating guidelines discussed above. For strategies that involve installing precast barriers or relocating the existing bridgerail, it may be necessary to recommend the installation of narrow structure warning signs (WA-24) as well. Due to the rapid nature of the concrete deterioration, it is recommended that for all affected SC girder bridges, the inspection frequency be increased to a minimum of once every 21 months. This shorter cycle between inspections will help evaluate the rate at which the girders may be deteriorating and allow action to be taken before deterioration proceeds too far.

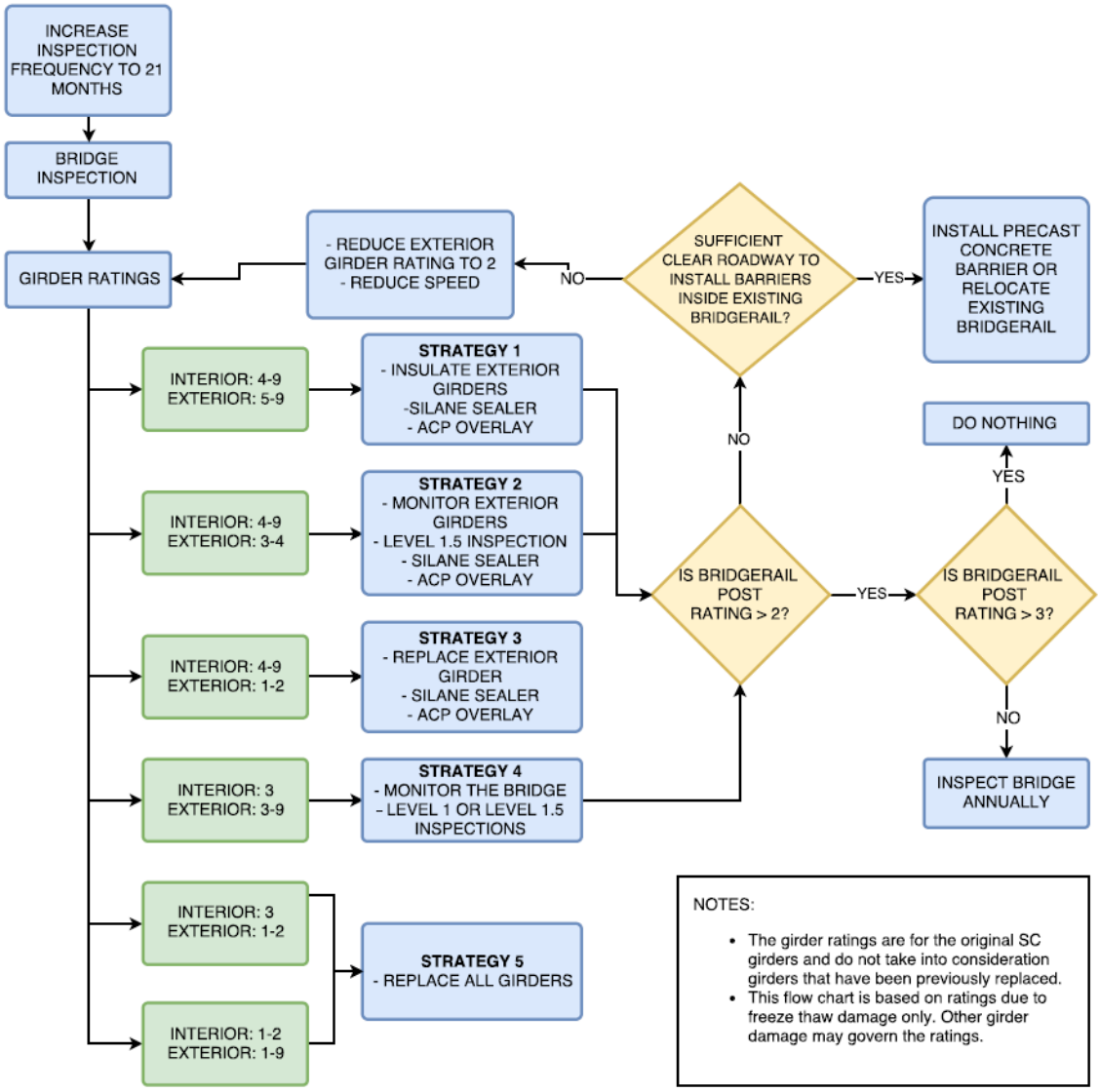

Figure 1: Management Strategy Flow Chart

If you have any questions on this matter, please contact the undersigned.

Matthew Spratlin, M.Sc., P.Eng.
Bridge Preservation Specialist
Technical Standards Branch
(780) 644-5413

Appendix – Example Photographs

Example 1: Extensive scaling of exterior girder surfaces with section loss along top and bottom corners, but not extending up to the edge of the bridgerail post base plate. No exposed steel stirrups or prestressing strand. Concrete section loss of bridgerail post plinth. Girder rated 3. Bridgerail posts rated 3.

Example 2: Section loss along top and bottom corners of exterior girder. Girder rated 3. Bridgerail posts rated 3.

Example 3: Section loss along top corners and top surfaces of interior girders. Interior girders rated 3.

Example 4: Significant section loss on all surfaces extending beneath bridgerail post baseplate. Exposed steel stirrups. Extrerior girder rated 2. Bridgerail post rated 2.

Example 5: Scaling of exterior girder face with section loss on top and bottom corners extending beneath the bridgerail post base plates. No exposed steel strands or stirrups. Exterior girder rated 3. Bridgerail posts rated 2.

Example 6: Section loss at the top corner of exterior girder that does not extend to the edge of the bridgerail post base plate. Aggregate popouts on exterior face of girder. Concrete section loss of bridgerail post plinth. Girder rated 3. Bridgerail post rated 3.

Bridge Inspection

Bridge File Number	73333 -1 Bridge	Form Type	PCS
Year Built/Year Supstr	1964/1964	Lot No.	
Bridge or Town Name	CREMONA	Inspector Name	G. Roberts
Located Over	GRAHAM CREEK, 3.89.22.1, WATERCRS-ST	Inspector Class	Cl. A
Located On	LOCAL ROAD	Assistant Name	Calvin Roberts
Water Body Cl./Year		Assistant Class	Cl. B
Navigabil. Cl./Year		Inspection Date	July 16 2014
Legal Land Location	SW SEC 15 TWP 30 RGE 5 W5M	Arrive Time	740 AM
Longitude, Latitude	-114:37:59, 51:33:43	Depart Time	10 AM
Road Authority	MOUNTAIN VIEW COUNTY	Data Entry By	
Contract Main. Area	UNDEFINED CMA	Data Entry Date	
Clear Roadway/Skew	6.4 /	Reviewer Name	
(*) AADT/Year	200 ~~1207 1995 (E)~~ 2014	Review Date	
Road Classification	RLU-207G-60	Dept. Reviewer Name	
Detour Length (km)	7	Dept. Review Date	
		Follow-Up By	

Allowable Load (t):	Single	CS1 28 GIRDER	Semi	CS2 49 GIRDER	Train	CS3 65 GIRDER	---> On Critical Spans --->Critical Member	
Design Loading:		HS20					---> Primary Span	

Posting Information

Required Load Posting (t)			Single		Semi		Truck Train	
Posted Loading (t)			Single		Semi		Truck Train	
Posted:	Lane	EB	At Junction (Y/N)	No	In Advance (Y/N)	No	At Bridge (Y/N)	No
Posted:	Lane	WB	At Junction (Y/N)	No	In Advance (Y/N)	No	At Bridge (Y/N)	No
Remarks	Not required.							

Hazard Marker At Bridge (Y/N)	Yes
Remarks	
Other Sign Types	

Utilities (Located at)

Utility Attachments	TELEPHONE UTILITIES-PHONE LINE		
Telephone	On ~~2 cables~~ South curb. and ROW	Gas	
Power	2 wires North r/w.	Municipal	
Others		Problem (Y/N)	No
Remarks			

Approach Road

		Last	Now	Explanation of Condition
Horizontal Alignment		7	7	Local road intersection 70m West. Hill to East.
Vertical Alignment		7	7	
Roadway Width (m)	6.600			
Approach Bump		6	5	
Guardrail (Y/N)	No			
Guardrail		X	X	
Length (m)				
Current Standard (Y/N)				
Termination Type				
Drainage		7	7	
Approach Road General Rating		7	7	

(*) = Inventory Update required

2 NOTIFICATION

Superstructure					
Bridge Component			**Last**	**Now**	**Explanation of Condition**
(Primary Span : **HC, 1 Spans, Lengths(m): 6.1, A-Ident Number:**)					
Special Features					
Special Feature				X	
(Type :)					
Special Feature				X	
(Type :)					
Wearing Surface/Deck Top Detail Ratings					
	N (%)	1 (%)	2 (%)	3 (%)	
Last					
Now	0	0	0	0	
Wearing Surface			5	5	
(Material Type : ~~**ACP**~~ Chipseal)					
(Thickness(mm) : ~~**50**~~ 15)					
Lateral Connection Problem (Y/N)	No				Chipseal
Deck Top			N	N	~~ACP~~ covered.
Deck Rideability			6	6	
Deck Joints			N	N	~~90%~~ of buffer angles ~~paved over~~. covered 70%
Bump (Y/N)	No				
Deck Drainage			7	7	
Drains Clogged (Y/N)	No				
Curbs/Median			7	6	Minor scrapes
(Curb Type : **Standard**)					
Scaling (Percent Area)	0				
Bridge Rail			5	3	~~Cracked~~ at NE ~~but still functional.~~ Rot
(Type : **BRIDGE SOLID BEAM (EX. TIMBER RAILS)**)					
Bridge Rail Posts			7	7	
(Type : **POST STEEL;POST STEEL**)					
Bridge Rail/Posts Coating			4	3	~~Peeling~~ at timber rail and posts. 80% paint loss
(Type : **PAINT**)					
Sidewalk			X	X	
Girder Detail Ratings					
	N (count)	1 (count)	2 (count)	3 (count)	
Last					
Now	0	0	0	2	
Girders			4	3	G2 has wide cracks and spall in AZ. G1, G3, G4 & G6 wide crack in AZ of 1 leg only.
Last Complete Inspection Date	~~15-Jul-2009~~ 2014				G2 and G3 have spalls or wide cracks in un-sound Concrete in AZ, Rated 3.
Cracking (Y/N)	Yes				G6, G7 have wide cracks in sound concrete = 4
Spalling (Percent Area)	2				
Lift or Connector Pocket Grouted (Y/N)	No				
(Number Of Girders : **8**)					
Span Alignment Problems					
Vertical (Y/N)	No				
Horizontal (Y/N)	No				
Superstructure General Rating			4	3	

G1 - W/C SC +1 = 5
G2 - Sp = 3
G3 - W/C US = 3
G4 W/C SC 1 leg = 5
G5 ✓
G6 ✓ WC SC = 4
G7 - WC SC = 4
G8 WC SC +1 = 5

Substructure

Bridge Component		Last	Now	Explanation of Condition
Abutments				
(Extended Backwall Piles (Y/N) : **Y**)				
(Extended Backwall Piles Spacing(mm) : **1500**)				
(Total Number of Caps/Corbels : **1:1**)				Caps cored July 16, 2014. No rot.
Bearing Seats/Caps/Corbels Detail Ratings				
	N (count)	1 (count)	2 (count)	3 (count)
Last				
Now	0	0	0	0
Bearing Seats/Caps/Corbels		5	6	
(Type : **TREATED TIMBER**)				
(Depth(mm) : **305**)				
(Width(mm) : **305**)				
Backwalls/Breastwalls		3	3	East Undermined at ~~both~~ abutments and ~~East~~ breastwall planks missing and detached.
Greatest Height (m)	3.10			
Wingwalls		5	5	
(Total Number of Bearing Piles : **6:6**)				~~#4 pile on west abutment split & banded.~~ Piles cored July 16, 2014.
Piles Detail Ratings				A1 - P1 is bowing and has not full height. P6 is cracked and bulging at groundline and has not full height. P3 has rot, P4, P5 beginning rot. A2 - P1, P6 have rot. P4, P5 have beginning rot.
	N (count)	1 (count)	2 (count)	3 (count)
Last				
Now	0	0	2	3
Piles		5	2	
Paint/Coating		X	X	
Abutment Stability		5	3	Rotted and bulging piles
Scour/Erosion		3	3	Undermined and eroded at A2
Piers/Bents				
(Type :)				
(Total Number of Caps/Corbels :)				
Bearing Seats/Caps/Corbels Detail Ratings				
	N (count)	1 (count)	2 (count)	3 (count)
Last				
Now				
Bearing Seats/Caps/Corbels		X	X	
(Type :)				
(Depth(mm) :)				
(Width(mm) :)				
(Total Number of Bearing Piles :)				
Piles Detail Ratings				
	N (count)	1 (count)	2 (count)	3 (count)
Last				
Now				
Pier Shaft/Piles		X	X	
Greatest Height (m)				
Bracing/Struts/Sheathing		6	6	6 struts 200mm x 160 mm.
Nose Plate		X	X	
Paint/Coating		X	X	
(Colour Description :)				
(Colour Code :)				
Pier Stability		X	X	

Substructure				
Bridge Component		**Last**	**Now**	**Explanation of Condition**
Scour		X	X	
Debris (Y/N)	No			
Substructure General Rating		**5**	2	

Structure Usage				
		Last	**Now**	**Explanation of Condition**
Channel				
(U/S Direction : **N**)				
(D/S Direction : **S**)				
Alignment		6	6	
Bank Stability		6	7	Shallow banks
HWM (m below Top of Curb)				No visible HWM.
Drift (Y/N)	No			
Slope Protection		5	5	
(Type : **NATURAL; NATURAL**)				
Guidebank/Spurs		X	X	
Adequacy of Opening		6	6	
(Fish Compensation Measure 1 : **NONE**)				
(Fish Compensation Measure 2 : **NONE**)				
Channel General Rating		**5**	5	

Maintenance Recommendations

Inspector Recommendations	Year	Inspector Comments	Department Comments	Target Year	Est. Cost	Cat #
REPAIR/REPLACE BRIDGE RAIL	2014	Replace rails with CCA plank or flexbeam - if bridge is not replaced				
SEAL CURBS						
PATCH DECK	~~2010~~	~~Grout min. 13 lift/connector pockets (9 on deck).~~				
OVERLAY DECK						
STRAIGHTEN/REPLACE MEMBERS	2014	Pile splices at A1 - P1, P3, P4, P5, P6 and A2 - P1, P4, P5, P6				
WASHING						
SHOTCRETE REPAIRS						
CORE TIMBER CAPS/CORBELS						
REPAIR/REPLACE TIMBER CAPS						
REPAIR ABUTMENT SCOUR/EROSION	~~2010~~ 2014	Reinstall East breastwall planks, add 2.0m additional planks, attach with lag screws.	if bridge is not replaced			
PLACE ADDITIONAL RIP RAP	2014	10 m3 CI at A2				
REMOVE DRIFT ACCUMULATION						
INSTALL STRUTS						
OTHER ACTION	~~2010~~	~~Install breastwall planks at West abutment 3 rows x 10m of 75 x 305 plank.~~				
OTHER ACTION						
OTHER ACTION						
OTHER ACTION						

Structural Condition Rating (Last/Now) (%)	50.0/	**Sufficiency Rating (Last/Now) (%)**	60.1/	Est. Repl. Yr	~~2020~~ 2015	Maint. Reqd. (Y/N)	Yes

Special Comments for Next Inspection	Caps and piles coved July 15, 2016. See coring report for details. 2 Notification for piles with bulging and bowing sent to MAC Ryan Morrison and AT Donald Saunders July 14, 2014 - copy attached.	Department Comments	
Maintenance Reviewed By	No action at present for girders rated 3	Date	Estimated Total 0
Proposed Long-Term Strategy			
On 3-Year Program (Y/N)			
Proposed Action			

Previous Inspector's Name	Garry Roberts	Previous Assistant's Name	
Next Inspection Date	15-Apr-2014	Previous Inspection Date	15-Jul-2009
Inspection Cycle (Default) (months)	57		
Comment			

BOW VALLEY BRIDGE SERVICES LTD.

BIM Inspection Contract - Notification of Structural Element Rated 2

Date:	July 16, 2014	**Bridge File No.:**	73333
Legal Land Loc.:	SW Sec15 Twp30 Rge 5 W5M	**Road Name:**	Local Road
		Stream:	Graham Ck.
		Town:	Cremona
Subject:	Rotted and Bulging/Bowing Abutment Piles		

Structure Information: 1 – 6.1 M Type HC Girder Span Bridge on TT Substructure
Construction Date: 1964

The July 16, 2014 Level 1 and Level 2 timber coring inspection completed by Bow Valley Bridge Services Ltd. found two (2) abutment piles with bulging, bowing and rot as follows:

- A1-P1 is bowing and has rot in the bottom approx. 1.5 m section.
- A1 – P6 is bulging at the ground-line with 15 mm vertical displacement and rot full height.

Both piles are located under the curb units.

This deficiency resulted in a 2 rating of the abutment piles and bridge Substructure General Rating, as per Alberta Transportation's Bridge Inspection and Maintenance (BIM) Manual.

To note; A1-P3, A2-P1, P6 also have rot and A1-P4,P5 and A2-P4, P5 have beginning rot.

It is recommended to either repair the piles, or schedule bridge replacement in the near future (within 2-3 years) due to the overall poor condition and age. In the interim, the bridge should be inspected annually until repaired or replaced.

The BIM inspection report and photos will be forwarded in the near future.

Inspected By:

Garry Roberts
Bow Valley Bridge Services Ltd.

Sent to: Ryan Morrison, Mountain View County
Donald Saunders, AT Red Deer

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Bridge Inspection

Bridge File Number	01275 -1 Bridge ✓	Form Type	TT
Year Built/Year Supstr	1978/1978 ✓	Lot No.	3
Bridge or Town Name	TORRINGTON ✓	Inspector Name	Calvin Robe/As
Located Over	SPRUCE CREEK, 3.46.24, WATERCRS-ST	Inspector Class	A
Located On	LOCAL ROAD ✓	Assistant Name	
Water Body Cl./Year		Assistant Class	
Navigabil. Cl./Year		Inspection Date	May. 4/15
Legal Land Location	NW SEC 26 TWP 32 RGE 27 W4M ✓	Arrive Time	9:50 AM
Longitude, Latitude	-113:44:14, 51:46:41	Depart Time	11:00 AM
Road Authority	KNEEHILL COUNTY	Data Entry By	[illegible]
Contract Main. Area	UNDEFINED CMA	Data Entry Date	May 22/15
Clear Roadway/Skew	7.3 / 0 deg.	Reviewer Name	G. Roberts
(*) AADT/Year	10 / ~~2010~~ (E) 2015	Review Date	May 8/15
Road Classification	RLU-207G-60	Dept. Reviewer Name	
Detour Length (km)	3	Dept. Review Date	
		Follow-Up By	

Allowable Load (t):	Single	CS1 33 STRINGER	Semi	CS2 58 STRINGER	Train	CS3 84 STRINGER	--> On Critical Spans -->Critical Member
Design Loading:							--> Primary Span

Posting Information

Required Load Posting (t)			Single		Semi		Truck Train	
Posted Loading (t)			Single		Semi		Truck Train	
Posted:	Lane	NB	At Junction (Y/N)	No	In Advance (Y/N)	No	At Bridge (Y/N)	No
Posted:	Lane	SB	At Junction (Y/N)	No	In Advance (Y/N)	No	At Bridge (Y/N)	No
Remarks	No posted loading. ✓							

Hazard Marker At Bridge (Y/N)	Yes ✓
Remarks	~~SE set too low.~~
Other Sign Types	

Utilities (Located at)

Utility Attachments			
Telephone		Gas	
Power		Municipal	
Others		Problem (Y/N)	No
Remarks			

Approach Road

		Last	Now	Explanation of Condition
Horizontal Alignment		5	5	Sharp curves & steep hills 200mm from bridge going North & South. Dirt trail to N. ✓
Vertical Alignment		5	5	
Roadway Width (m)	5.000 ✓			
Approach Bump		6	4	pothole forming at NE approach
Guardrail (Y/N)	No ✓			
Guardrail		X	X	
Length (m)				
Current Standard (Y/N)	No			
Termination Type	None			
Drainage		7	7	
Approach Road General Rating		5	5	

(*) INV update 5/9/15

(Maintenance)

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Superstructure

Bridge Component	Last	Now	Explanation of Condition
(Primary Span : TT, 1 Spans, Lengths(m): 8.5, A-Ident Number:)			
Special Features			
Special Feature		X	
(Type :)			
Special Feature		X	
(Type :)			
Wearing Surface/Deck Top Detail Ratings			
N (%) / 1 (%) / 2 (%) / 3 (%)			
Last: 0 / 0 / 0 / 0			
Now: 30 / 0 / 0 / 0			
Wearing Surface/Deck Top	6	5	CCA treated. Strip deck widths vary. Centre running boards are 300mm wide. Both shoulders are 200mm.
(Material Type : **TREATED TIMBER**)			
(Plank Thickness(mm) : **75**)			
(Plank Width(mm) : **200**)			
Deck Rideability	7	7	
Wheel Guards	6	5	On 150mm blocks. Split block at NE - still functional
(Curb Type : **Standard**)			
(Type : **TREATED TIMBER**)			
(Thickness(mm) : **100**)			
(Width(mm) : **300**)			
Bridge Rail	6	6	150 x 200mm treated posts installed on flat.
(Type : **GALVANIZED STEEL FLEX BEAM**)			
Bridge Rail Posts	6	6	
(Type : **TREATED TIMBER;TREATED TIMBER**)			
Bridge Rail/Posts Coating	7	7	
(Type : **GALVANIZED**)			500mm long
(No. of Stringers : **13**)			S6 and S8 both cracked for 500mm extending out from A1 cap. S6 also has large splinter missing out of it in same location. S10 has has splinter in base near A2. S9 has reduced bearing on cap of 150mm
Stringer Detail Ratings			
N (count) / 1 (count) / 2 (count) / 3 (count)			
Last: 0 / 0 / 0 / 0			
Now: 0 / 0 / 0 / 7			
Stringers	5	3	
(Type : **TREATED TIMBER**)			
(Width(mm) : **200**)			
(Depth(mm) : **500**)			
(Spacing(mm) : **600**)			
Sub Deck/Deck Underside	5	5	Tongue and groove.
(Material Type : **TREATED TIMBER**)			
(Plank Thickness(mm) : **100**)			
(Plank Width(mm) : **250**)			
Defects (Percent Area)	1		
Span Alignment Problems			
Vertical (Y/N)	No		
Horizontal (Y/N)	No		
Superstructure General Rating	5	3	

Substructure

Bridge Component	Last	Now	Explanation of Condition
Abutments			
(Extended Backwall Piles (Y/N) : **Y**)			
(Extended Backwall Piles Spacing(mm) : **1800**)			

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Substructure

Bridge Component	Last	Now	Explanation of Condition
(Total Number of Caps/Corbels : **3:3**) ✓			Caps are 300Dx350W. ✓
Bearing Seats/Caps/Corbels Detail Ratings			
	N (count)	1 (count)	2 (count)	3 (count)
Last	0	0	0	0
Now	0	0	0	0
Bearing Seats/Caps/Corbels	5	5	
(Type : **TREATED TIMBER**) ✓			
(Depth(mm) : **300**) ✓			
(Width(mm) : **350**) ✓			
Backwalls/Breastwalls	3	3	Tongue & groove installed horiz. ✓ Stream has degraded below N backwall. - exposed fill material
Greatest Height (m) 1.80 ✓			
Wingwalls	6	5	
(Total Number of Bearing Piles : **5:5**) ✓			Wide check in P2 A2, runs full height. ✓
Piles Detail Ratings			
	N (count)	1 (count)	2 (count)	3 (count)
Last	0	0	0	0
Now	0	0	0	0
Piles	5	5	
Paint/Coating	X	X	
Abutment Stability	6	6	Piles are strutted ✓
Scour/Erosion	5	5	
Piers/Bents			
(Type :)			
(Total Number of Caps/Corbels :)			
Bearing Seats/Caps/Corbels Detail Ratings			
	N (count)	1 (count)	2 (count)	3 (count)
Last				
Now				
Bearing Seats/Caps/Corbels	X	X	
(Type :)			
(Depth(mm) :)			
(Width(mm) :)			
(Total Number of Bearing Piles :)			
Piles Detail Ratings			
	N (count)	1 (count)	2 (count)	3 (count)
Last				
Now				
Pier Shaft/Piles	X	X	
Greatest Height (m)			
Bracing/Struts/Sheathing	6	6	150x200mm TT struts, 1 at each bearing pile ✓
Nose Plate	X	X	
Paint/Coating	X	X	
(Colour Description :)			
(Colour Code :)			
Pier Stability	X	X	
Scour	X	X	

Substructure				
Bridge Component		**Last**	**Now**	**Explanation of Condition**
Debris (Y/N)	No ✓			
Substructure General Rating		5	5	

Structure Usage				
		Last	**Now**	**Explanation of Condition**
Channel				
(U/S Direction : **W**) ✓				
(D/S Direction : **E**) ✓				
Alignment		6	6	
Bank Stability		7	7	
HWM (m below Top of Curb)				(HWM 0.8m. 20Jul2005). HWM not visible. ✓
Drift (Y/N)	No ✓			
Slope Protection		4	4	Stream degraded below sheathing at N abut. ✓
(Type : **NONE; NONE**) ✓				
Guidebank/Spurs		X	X	
Adequacy of Opening		5	5	
(Fish Compensation Measure 1 : **NONE**) ✓				
(Fish Compensation Measure 2 : **NONE**) ✓				
Channel General Rating		4	4	

Maintenance Recommendations

Inspector Recommendations	Year	Inspector Comments	Department Comments	Target Year	Est. Cost	Cat #
REPAIR/REPLACE BRIDGE RAIL						
PATCH DECK						
REPLACE STRIP DECK						
REPLACE SUB DECK						
STRAIGHTEN/REPLACE MEMBERS	2015	Replace cracked stringers - High Priority				
WASHING						
CORE TIMBER CAPS/CORBELS						
REPAIR/REPLACE TIMBER CAPS						
REPAIR ABUTMENT SCOUR/EROSION						
PLACE ADDITIONAL RIP RAP						
REMOVE DRIFT ACCUMULATION						
INSTALL STRUTS						
OTHER ACTION	2015 ~~2011~~	Lower sheathing at N abut. - Approx 8-10 LM of sheathing required - fasten to front steel piles as breastwall				
OTHER ACTION	~~2011~~	~~Reset SE HM to std.~~				
OTHER ACTION						
OTHER ACTION						

Structural Condition Rating (Last/Now) (%)	55.6/	**Sufficiency Rating (Last/Now) (%)**	74.3/	Est. Repl. Yr	2025✓	Maint. Reqd. (Y/N)	Yes

Special Comments for Next Inspection		Department Comments	

Maintenance Reviewed By		Date		Estimated Total	0
Proposed Long-Term Strategy					
On 3-Year Program (Y/N)					
Proposed Action					

Previous Inspector's Name	Claude Jutras	Previous Assistant's Name	
Next Inspection Date	01-Jun-2015	Previous Inspection Date	01-Sep-2010
Inspection Cycle (Default) (months)	57		
Comment			

Bridge Culvert Inspection

Bridge File Number	70576 -1 Bridge Culvert	Form Type	CUL1
Year Built	1953	Lot No.	
Bridge or Town Name	THREE HILLS	Inspector Name	G. Roberts
Located Over	TRIBUTARY TO THREEHILLS CREEK, 3.50.2.14, WATERCRS-ST	Inspector Class	Cl. A
Located On	LOCAL ROAD	Assistant Name	
Water Body Cl./Year		Assistant Class	
Navigabil. Cl./Year		Inspection Date	Oct 6/14
Legal Land Location	SW SEC 25 TWP 32 RGE 25 W4M	Arrive Time	5:15 PM
Longitude, Latitude	-113:25:48, 51:46:11	Depart Time	6:30 PM
Road Authority	KNEEHILL COUNTY	Data Entry By	
Contract Main. Area	UNDEFINED CMA	Data Entry Date	
Clear Roadway/Skew	9.6 / 20 deg. (RHF)	Reviewer Name	
(*) AADT/Year	250 / ~~2009~~ (E) 2014	Review Date	
Road Classification	RLU-208-100	Dept. Reviewer Name	
Detour Length (km)	3	Dept. Review Date	
		Follow-Up By	

Bridge Culvert Information

Number of Culverts		1						
Pipe #	Barrel	Span	Rise (or Dia.)	Type	Length	Corr. Profile	Pl./Slab Thickness	Shape
1	MAIN	2973	2007	RPP	25.2	152X51	4.0	PIPE ARCH
Special Features		VERT TIMBER STRUTS						
Special Features Comment								

Utilities (Located at)

Utility Attachments			
Telephone		Gas	
Power	East ROW	Municipal	
Others		Problem (Y/N)	NO
Remarks			

Approach Road / Embankment

		Last	Now	Explanation of Condition.
Horizontal Alignment		8	7	Paved road. Residential access at SW and NE
Vertical Alignment		9	8	
Roadway Width (m)	9.600			
Embankment		6	6	
Sideslope (__:1)	1.9			
(Height of Cover(m) : 2.4)				
Guardrail (Y/N)	No			
Approach Road / Embankment General Rating		8	7	

Upstream End

Culvert Component		Last	Now	Explanation of Condition
Direction		W		
End Treatment (Concrete, Steel, Others, None)	STEEL			
Headwall		X	X	
Collar		X	X	
Wingwalls		X	X	
(Shape :)				
Cutoff Wall		X	X	

(*) = Inventory Update required

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Upstream End				
Culvert Component		**Last**	**Now**	**Explanation of Condition**
Bevel End		6	7	
Heaving (mm)	~~0~~ 150			
Invert Above/Below Stream Bed	BELOW ✓			
Above/Below (mm)	300 ✓			
Scour Protection		7	7	
(Type : **RIP RAP**)	✓			
(Avg. Rock Size(mm) : **200**)	✓			
Scour/Erosion		7	7	
Beavers (Y/N)	No ✓			
Upstream End General Rating		**6**	**7**	

Bridge Culvert Barrel				
Culvert Component		**Last**	**Now**	**Explanation of Condition**
(Pipe # : **1, Primary Span, Location Code: MAIN, Span (mm): 2973, Rise (mm): 2007, Type: RPP**)				
Barrel Last Accessible Date	~~25 Aug 2009~~ Oct 6/14			
Special Features				
Special Feature		7	6	
(Type : **VERT TIMBER STRUTS**)	✓			
Special Feature			X	
(Type :)				
Roof		4	4	
Measured Rise (mm)	~~1858~~ 1840			
Measured At Ring No.	3 ✓			
Sag (mm)	~~149~~ 167			
Percent Sag	~~7~~ 8			~~7.4%~~
Sidewall		3	3	~~R1 & R2 have cracks on 2 seam with 58mm of steel remaining. Cracks have changed since last inspection.~~ Cracked seams
Measured Span (mm)	~~3005~~ 3050			
Measured At Ring No.	3 ✓			
Deflection (mm)	~~92~~ 77			~~4.1%~~ 2 isolated corrosion spots at south side of R4 could become perforations.
Percent Deflection	~~4~~ 3			
Floor		5	6	
Bulge (mm)	0 ✓			
Measured At Ring No.	~~3~~			
Abrasion (Y/N)	No ✓			
Circumferential Seams		6	7	
Separation (mm)	0 ✓			
Longitudinal Seams		3	3	~~R1 has 6 of 24 cracked valley bolts with 78mm steel remaining. R2 has 18 of 24 valley bolts cracked with 55mm steel remaining.~~ All cracks on south wall. ~~Report of 28Sep2004 showed 84mm as worst case.~~ Cracks in R1 and R2 with 70 mm remaining in R2. Appears previous measurements may have been crack length rather than remaining steel ✓
Total No. of Cracked Rings	2 ✓			
Total No. of Rings with Two Cracked Seams	0 ✓			
Min. Remaining Steel Between Cracks (mm)	~~55~~ 70			
Proper Lap (Y/N)	No ✓			
Longitudinal Stagger (Y/N)	Yes ✓			
Coating		5	5	Superficial corrosion. at isolated upper seams and at floor
Corrosion By Soil (Y/N)	~~No~~ Yes			
Corrosion By Water (Y/N)	Yes			
Camber POS/ZERO/NEG	~~ZERO~~ Neg			
Ponding (Y/N)	No ✓			

Bridge Culvert Barrel				
Culvert Component		**Last**	**Now**	**Explanation of Condition**
(Pipe # : **1, Primary Span, Location Code: MAIN, Span (mm): 2973, Rise (mm): 2007, Type: RPP**)				
Fish Passage Adequacy		5	5	
Baffle		X	X	
(Type :)				
Waterway Adequacy		8	4	Grass to near top of struts
Icing (Y/N)	No			
Silting (Y/N)	No			
Drift (Y/N)	No			
Barrel General Rating		3	4	Increase for struts

Downstream End				
Culvert Component		**Last**	**Now**	**Explanation of Condition**
Direction	E			
End Treatment (Concrete, Steel, Others, None)	STEEL			
Headwall		X	X	
Collar		X	X	
Wingwalls		X	X	
(Shape :)				
Cutoff Wall		X	X	
Bevel End		5	6	
Heaving (mm)	~~0~~ 70			
Invert Above/Below Stream Bed	BELOW			
Above/Below (mm)	200			
Scour Protection		6	6	
(Type : **RIP RAP**)				
(Avg. Rock Size(mm) : **200**)				
Scour/Erosion		6	6	Scour hole 10m D/S. not affecting pipe
Beavers (Y/N)	No			
Downstream End General Rating		5	6	

Structure Usage				
		Last	**Now**	**Explanation of Condition**
Channel (U/S and D/S)				
Alignment		7	7	
Bank Stability		7	7	
HWM (m below Top of Culvert)				HWM not visible.
Drift (Y/N)	No			
Channel Bottom Degrading/Aggrading	~~DEGRADING~~ None			
Beavers (Y/N)	No			
(Fish Compensation Measure 1 : **NONE**)				
(Fish Compensation Measure 2 : **NONE**)				
Channel General Rating		7	7	

Maintenance Recommendations

Inspector Recommendations	Year	Inspector Comments	Department Comments	Target Year	Est. Cost	Cat #
SHOTCRETE REPAIRS						
PLACE ADDITIONAL RIP RAP						
REMOVE DRIFT ACCUMULATION						
INSTALL CONCRETE/STEEL LINING						
INSTALL STRUTS						
INSTALL CONCRETE COLLAR/CUTOFF						
REPAIR SEAMS						
OTHER ACTION						
OTHER ACTION						
OTHER ACTION						
OTHER ACTION						

Structural Condition Rating (Last/Now) (%)	33.3/	**Sufficiency Rating (Last/Now) (%)**	57.8/	Est. Repl. Yr	~~2019~~ 2025	Maint. Reqd. (Y/N)	NO

Special Comments for Next Inspection	~~Reduce inspection cycle to 24 until cracks are stable.~~	Department Comments	

Maintenance Reviewed By		Date		Estimated Total	0
Proposed Long-Term Strategy					
On 3-Year Program (Y/N)					
Proposed Action					

Previous Inspector's Name	Claude Jutras	Previous Assistant's Name	
Next Inspection Date	25-May-2014	Previous Inspection Date	25-Aug-2009
Inspection Cycle (Default) (months)	57		
Comment			

Bridge Culvert Inspection

Bridge File Number	13476 -1 Bridge Culvert	Form Type	CULM
Year Built	1952	Lot No.	
Bridge or Town Name	TROCHU	Inspector Name	G. Roberts
Located Over	TRIBUTARY TO GHOSTPINE CREEK, 3.50.11, WATERCRS-ST	Inspector Class	Cl. A
Located On	LOCAL ROAD	Assistant Name	
Water Body Cl./Year		Assistant Class	
Navigabil. Cl./Year		Inspection Date	Oct 10, 2014
Legal Land Location	SW SEC 28 TWP 32 RGE 23 W4M	Arrive Time	2:35 PM
Longitude, Latitude	-113:13:03, 51:45:59	Depart Time	3:50 PM
Road Authority	KNEEHILL COUNTY	Data Entry By	
Contract Main. Area	UNDEFINED CMA	Data Entry Date	
Clear Roadway/Skew	7.6 /	Reviewer Name	
AADT/Year	60 ~~100 / 2007~~ (E) 2014	Review Date	
Road Classification	RLU-208G-60	Dept. Reviewer Name	
Detour Length (km)	3	Dept. Review Date	
		Follow-Up By	

Bridge Culvert Information

Number of Culverts: 2

Pipe #	Barrel	Span	Rise (or Dia.)	Type	Length	Corr. Profile	Pl./Slab Thickness	Shape
1	MAIN	-	1810	SP	21.1	152X51	3.0	ROUND
2	MAIN	-	1219	MP	20.5	68X13	3.0	ROUND

Special Features:

Special Features Comment:

Utilities (Located at)

Utility Attachments

Telephone	West r/w.	Gas	
Power	East ~~r/w 3 wire OH~~ ROW and crosses South	Municipal	
Others		Problem (Y/N)	No
Remarks			

Approach Road / Embankment

		Last	Now	Explanation of Condition
Horizontal Alignment		7	6	Located 100 M north of local road intersection
Vertical Alignment		6	6	Grade to north
Roadway Width (m)	7.600			
Embankment		5	5	
Sideslope (__:1)	2.0			~~Very~~ sharp shoulder.
(Height of Cover(m) : 2.1)				1.7 M HOC at 1200 pipe
Guardrail (Y/N)	No			
Approach Road / Embankment General Rating		6	6	

Upstream End

Culvert Component		Last	Now	Explanation of Condition
(Pipe # : 1, Span Type: Primary Span)				
Direction		W		S pipe. - 1810 SPCSP
End Treatment (Concrete, Steel, Others, None)	STEEL			
Headwall		X	X	
Collar		X	X	
Wingwalls		X	X	
(Shape :)				

Check 1219 or 1200?

Upstream End				
Culvert Component		**Last**	**Now**	**Explanation of Condition**
(Pipe # : **1, Span Type: Primary Span**)				
Cutoff Wall		X	X	
Bevel End		4	4	~~Rust, abrasion, silt/fine deposits & holes in side (No/#).~~ Minor damage at invert and minor hole north side and floor
Heaving (mm)	~~0~~ 100			
Invert Above/Below Stream Bed	BELOW			
Above/Below (mm)	350			
Scour Protection		3	3	No protection both sides
(Type : **NONE**)				
(Avg. Rock Size(mm) :)				
Scour/Erosion		3	3	~~Embankment erosion~~ Scour on each side of bevel, 1.8m ~~silted~~. with potential for piping
Beavers (Y/N)	No			
Upstream End General Rating		**3**	3	

Bridge Culvert Barrel				
Culvert Component		**Last**	**Now**	**Explanation of Condition**
(Pipe # : **1, Primary Span, Location Code: MAIN, Span (mm):** , **Rise (mm): 1810, Type: SP**)				
Barrel Last Accessible Date	~~14 Feb 2012~~ Oct 10, 2014			S pipe.
Special Features				
Special Feature			X	
(Type :)				
Special Feature			X	
(Type :)				
Roof		N	3	Bulges in roof, sagging & wavy. Deflections ~~Unusual to have rise & span measurements vary this much in a round pipe with no visual shape issues.~~ Adjust sag to 1910 dia. ~~(14.3%, 282mm deflection 29Aug2007) Unable to confirm due to ice~~
Measured Rise (mm)	~~1566~~ 1570			
Measured At Ring No.	5			
Sag (mm)	~~244~~ 240			
Percent Sag	~~14~~ 13			
Sidewall		3	3	Holes in sidewalls & dents throughout; holes in plate 4 & 5. from construction, ~~Adjust deflection for 1810mm dia. 10.9%~~ Deflections.
Measured Span (mm)	~~2007~~ 2030			
Measured At Ring No.	5			
Deflection (mm)	~~187~~ 220			
Percent Deflection	~~11~~ 12			
Floor		N	5	~~700mm of ice~~.
Bulge (mm)	0			
Measured At Ring No.				
Abrasion (Y/N)	No			
Circumferential Seams		6	6	
Separation (mm)	0			Isolated
Longitudinal Seams		6	6	~~Yes~~ some bolts missing.
Total No. of Cracked Rings	0			
Total No. of Rings with Two Cracked Seams	0			
Min. Remaining Steel Between Cracks (mm)				
Proper Lap (Y/N)	No			
Longitudinal Stagger (Y/N)	Yes			
Coating		5	4	Soil staining at upper seams
Corrosion By Soil (Y/N)	~~No~~ Yes			
Corrosion By Water (Y/N)	Yes			Corrosion with pitting on floor

Bridge Culvert Barrel				
Culvert Component		**Last**	**Now**	**Explanation of Condition**
(Pipe # : **1, Primary Span, Location Code: MAIN, Span (mm):** , **Rise (mm): 1810, Type: SP**)				
Camber POS/ZERO/NEG	~~ZERO~~ Neg			
Ponding (Y/N)	No ✓			
Fish Passage Adequacy		7	4	Hanging bevel D/S
Baffle		X	X	
(Type :)				
Waterway Adequacy		4	5	~~Pipe appears to run full.~~
Icing (Y/N)	No ✓			
Silting (Y/N)	No ✓			
Drift (Y/N)	No ✓			
Barrel General Rating		3	3	

Downstream End				
Culvert Component		**Last**	**Now**	**Explanation of Condition**
(Pipe # : **1, Span Type: Primary Span**)				
Direction		E ✓		S pipe. ✓
End Treatment (Concrete, Steel, Others, None)	STEEL ✓			
Headwall		X	X	
Collar		X	X	
Wingwalls		X	X	
(Shape :)				
Cutoff Wall		X	X	
Bevel End		4	5	Isolated ✓ ~~Damaged rust & abrasion present.~~ Bolts missing ~~bevel end is filled~~ underneath with rock. Narrow plate at north side
Heaving (mm)	✓ 200			
Invert Above/Below Stream Bed	ABOVE ✓			
Above/Below (mm)	300 ✓			
Scour Protection		N	4	Shallow ✓ rock filled ~~Large~~ scour hole present, ~~(does not appear to be growing, filled with rock. 29Aug2007).~~ ~~Scour hole appears shallow.~~
(Type : **RIP RAP**) ✓				Partial erosion due to cattle action. ✓
(Avg. Rock Size(mm) : **400**) ✓				
Scour/Erosion		N	4	
Beavers (Y/N)	No ✓			
Downstream End General Rating		4	4	

Upstream End				
Culvert Component		**Last**	**Now**	**Explanation of Condition**
(Pipe # : **2, Span Type: Secondary Span**)				
Direction		W ✓		N pipe. ✓ Located 20 m North of Primary
End Treatment (Concrete, Steel, Others, None)	STEEL ✓			
Headwall		X	X	
Collar		X	X	
Wingwalls		X	X	
(Shape :)				
Cutoff Wall		X	X	

Upstream End				
Culvert Component		**Last**	**Now**	**Explanation of Condition**
(Pipe # : **2, Span Type: Secondary Span**)				
Bevel End		5	5	
Heaving (mm)	100 ✓			
Invert Above/Below Stream Bed				At streambed. ✓
Above/Below (mm)	0 ✓			
Scour Protection		5	5	
(Type : ~~NONE~~ Natural)				
(Avg. Rock Size(mm) :)				
Scour/Erosion		5	5	
Beavers (Y/N)	No ✓			
Upstream End General Rating		**5**	5 ✓	

Bridge Culvert Barrel				
Culvert Component		**Last**	**Now**	**Explanation of Condition**
(Pipe # : **2, Secondary Span, Location Code: MAIN, Span (mm):** , **Rise (mm): 1219, Type: MP**) ✓				
Barrel Last Accessible Date	~~14 Feb 2012~~ OCT 10, 2014			N pipe. ✓
Special Features				
Special Feature			X	
(Type :)				
Special Feature			X	
(Type :)				Isolated
Roof		2	3	Bulges in roof, sagging & wavy.
Measured Rise (mm)	~~1025~~ 1030			~~At barrel section 3 from u/s (photo).~~
Measured At Ring No.	4			
Sag (mm)	~~184~~ 159			
Percent Sag	~~16~~ 13			Deflections
Sidewall		3	3	Damaged sidewall at barrel section 4 - repaired. ✓
Measured Span (mm)	~~1380~~ 1375			~~At barrel section 3 from u/s.~~
Measured At Ring No.	4			
Deflection (mm)	~~161~~ 156			
Percent Deflection	(13) ✓			Deflections
Floor		4	4	Isolated perforation at R2 coupler. Remainder of floor is adequate
Bulge (mm)	0 ✓			
Measured At Ring No.				
Abrasion (Y/N)	No ✓			
Circumferential Seams		4	4	Coupler corroded through at floor at seam 2 from u/s ~~(photo).~~ ~~Floor has pitting~~.
Separation (mm)	160 ✓			
Longitudinal Seams		6	6	Rivetted seams. ✓
Total No. of Cracked Rings	0 ✓			
Total No. of Rings with Two Cracked Seams	0 ✓			
Min. Remaining Steel Between Cracks (mm)				
Proper Lap (Y/N)	No ✓			
Longitudinal Stagger (Y/N)	Yes ✓			Isolated
Coating		4	3	Rust ~~with pitting~~. Perforated coupler at R2
Corrosion By Soil (Y/N)	No ✓			
Corrosion By Water (Y/N)	Yes ✓			
Camber POS/ZERO/NEG	ZERO ✓			

R 1100 L 1210 R2 1090 R3 R 1030 R4

Bridge Culvert Barrel				
Culvert Component		**Last**	**Now**	**Explanation of Condition**
(Pipe # : **2, Secondary Span, Location Code: MAIN, Span (mm):** , **Rise (mm): 1219, Type: MP**)				
Ponding (Y/N)	No			
Fish Passage Adequacy		4	4	D/S invert 700mm above ~~ice level~~. localized scour hole
Baffle		X	X	
(Type :)				
Waterway Adequacy		5	5	Dry this inspection. Pipe serves as overflow
Icing (Y/N)	No ✓			
Silting (Y/N)	No ✓			
Drift (Y/N)	No ✓			
Barrel General Rating		**2**	**3**	~~"2" rating notification sent to LDA & AT.~~

Downstream End				
Culvert Component		**Last**	**Now**	**Explanation of Condition**
(Pipe # : **2, Span Type: Secondary Span**)				
Direction		E ✓		N pipe. ✓
End Treatment (Concrete, Steel, Others, None)	STEEL ✓			
Headwall		X	X	
Collar		X	X	
Wingwalls		X	X	
(Shape :)				
Cutoff Wall		X	X	
Bevel End		4	5	Bevel end replaced - ~~poor install & has settled~~. minor settlement
Heaving (mm)	0 ✓			
Invert Above/Below Stream Bed	~~ABOVE~~ AT			At SB
Above/Below (mm)	~~500~~ 0			
Scour Protection		3	4	Protection around pipe is adequate - Minor scour D/S,
(Type : **RIP RAP**) ✓				Minor localized
(Avg. Rock Size(mm) : **400**) ✓				Not affecting pipe
Scour/Erosion		3	4	~~Large~~ scour hole, ~~measures 15m~~ dia., ~~depth 700mm (depth to ice from invert) photo~~
Beavers (Y/N)	No ✓			
Downstream End General Rating		**3**	**4**	

Structure Usage				
		Last	**Now**	**Explanation of Condition**
Channel (U/S and D/S)				
Alignment		4	5	SPCSP structure ~~ahs~~ has straight alignment, ~~however~~ MP outlet makes a 90 deg. bend to the N.
Bank Stability		5	4	Slufffing bank at u/s of SPCSP
HWM (m below Top of Culvert)				HWM not visible. ✓
Drift (Y/N)	No ✓			
Channel Bottom Degrading/Aggrading	DEGRADING ✓			D/S of both pipes. ✓
Beavers (Y/N)	No ✓			
(Fish Compensation Measure 1 : **NONE**)				
(Fish Compensation Measure 2 : **NONE**)				

Structure Usage			
	Last	Now	Explanation of Condition
Channel General Rating	4	4	

Maintenance Recommendations

Inspector Recommendations	Year	Inspector Comments	Department Comments	Target Year	Est. Cost	Cat #
SHOTCRETE REPAIRS		approx 5m³ clay and 5m³ Cl.1				
PLACE ADDITIONAL RIP RAP	~~2012~~ 2015	Place ~~100mm Blvd~~ at u/s bevel of ~~main span &~~ at both d/s ends ~~—~~ High priority due	primary pipe to piping potential			
REMOVE DRIFT ACCUMULATION						
INSTALL CONCRETE/STEEL LINING	2015	Seal floor perforation in RH of 1200 pipe with galv. plate section.				
INSTALL STRUTS						
INSTALL CONCRETE COLLAR/CUTOFF						
REPAIR SEAMS						
OTHER ACTION	~~2017~~	~~Consider replacing pipes in 5yrs.~~				
OTHER ACTION						
OTHER ACTION						
OTHER ACTION						

Structural Condition Rating (Last/Now) (%)	22.2/	**Sufficiency Rating (Last/Now) (%)**	28.0/	Est. Repl. Yr	~~2017~~ 2023	Maint. Reqd. (Y/N)	Yes

Special Comments for Next Inspection	Department Comments
~~Replace in conjunction with LRA road program~~. Monitor & replace when condition warrants action; no action recommended for ~~93~~ 3 rating. Monitor deflections at current 27 month cycle (Revise inspection cycle to 27mths. CB - 2002/08/06) - Next inspection should take place in summer/fall to confirm rise measurement in main span; place on 27mth cycle. 72" notification sent to LRA & AT on 17Feb2012; contacted Brad Buchart at the County & Donald Saunders at AT.	Inspection Cycle changed to 27mths as per contractor inspection

Maintenance Reviewed By	Darron Ahlstedt	Date	20-Jul-2012	Estimated Total	0
Proposed Long-Term Strategy					
On 3-Year Program (Y/N)					
Proposed Action					

Previous Inspector's Name	Glen Mikesh	Previous Assistant's Name	
Next Inspection Date	14-May-2014	Previous Inspection Date	14-Feb-2012
Inspection Cycle (Modified) (months)	27		
Comment	Inspection Cycle changed to 27mths as per contractor inspection		

High Priority

30

AADT Hourly Conversion Factors for Local Roads – 1988									
	Hour Ending								
Month	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**
January	21.81	20.42	19.26	18.46	19.59	16.84	18.11	15.00	14.33
February	21.79	20.24	16.66	17.34	18.88	16.66	16.03	13.49	13.28
March	20.24	18.47	17.34	17.34	18.08	15.45	15.45	13.93	12.68
April	19.31	17.34	16.34	17.80	17.34	15.17	15.17	13.70	12.88
May	15.45	16.03	15.45	16.03	16.03	14.46	13.93	12.32	12.14
June	16.34	15.74	14.65	14.65	16.03	13.93	14.16	12.50	11.97
July	20.73	17.34	16.03	16.03	17.00	14.91	14.65	14.40	13.07
August	20.73	17.34	14.91	14.91	16.03	13.28	13.28	13.07	11.97
September	19.31	18.47	16.66	16.66	17.34	15.17	14.65	13.93	13.07
October	15.33	13.80	15.33	14.68	15.00	13.53	13.26	11.69	11.50
November	20.29	18.15	16.04	16.42	16.82	15.33	14.68	13.52	12.77
December	23.79	19.71	15.68	15.68	16.82	14.37	14.37	14.08	13.26

Table 4.1 - AADT Conversion Table

Example:

In the month of March, 12 vehicles are counted passing over a structure in a half hour time period between 1 and 2 o'clock in the afternoon (hour 13 to hour 14).

Estimated count = (number of vehicle/hours)*factor
= (12/.5)*15.45
= 371

Rating		Commentary	Maintenance Priority
9	Very Good	New condition.	No repairs in foreseeable future.
8		Almost new condition.	No repairs in foreseeable future.
7	Good	Could be upgraded to new condition with very little effort.	No repairs necessary at this time.
6		Generally good condition. Functioning as designed with no signs of distress or deterioration.	No repairs necessary at this time.
5	Adequate	Acceptable condition and functioning as intended.	No repairs necessary at this time.
4		Below minimum acceptable condition.	Low priority for repairs.
3	Poor	Presence of distress or deterioration. Not functioning as intended.	Medium priority for replacement, repair, and/or signing.
2		Hazardous condition or severe distress or deterioration.	High priority for replacement, repair, and/or signing.
1	Immediate Action	Danger of collapse and/or danger to users.	Bridge closure, replacement, repair, and/or signing required as soon as possible.
N	Not Accessible	Element cannot be visually inspected.	
X	Not Applicable	Element not applicable to this bridge.	

Table 1.2 - Condition Rating System

The rating also reflects the priority or urgency for maintenance. The urgency for maintenance also depends heavily on the importance of the element relative to the safe function of the structure. As a general guideline the ratings could be related to the following priorities:

4 - low priority
3 - medium priority
2 - high priority
1 - immediate action

See section 11.2.2 for more details on maintenance recommendations.

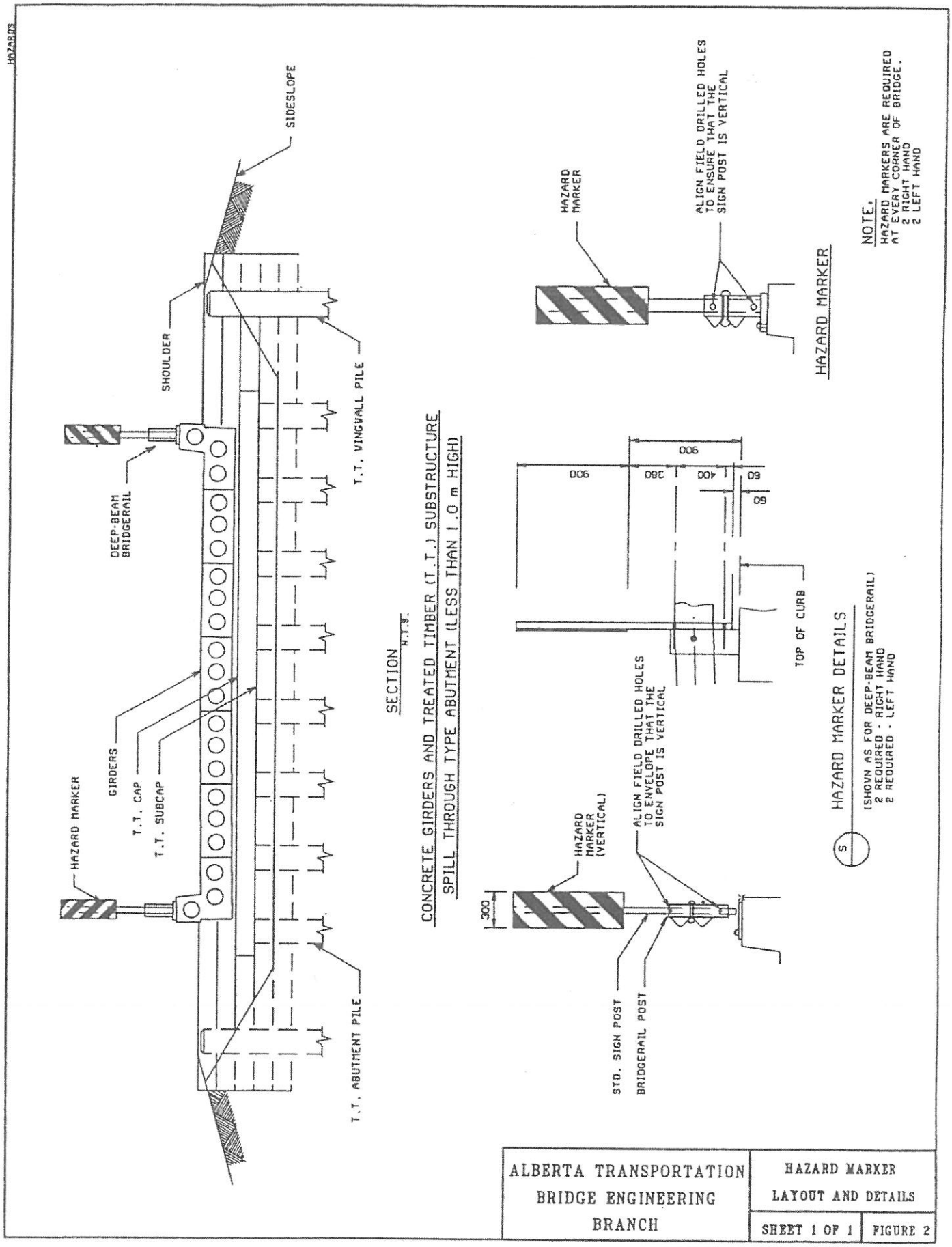
1.10. GENERAL RATING

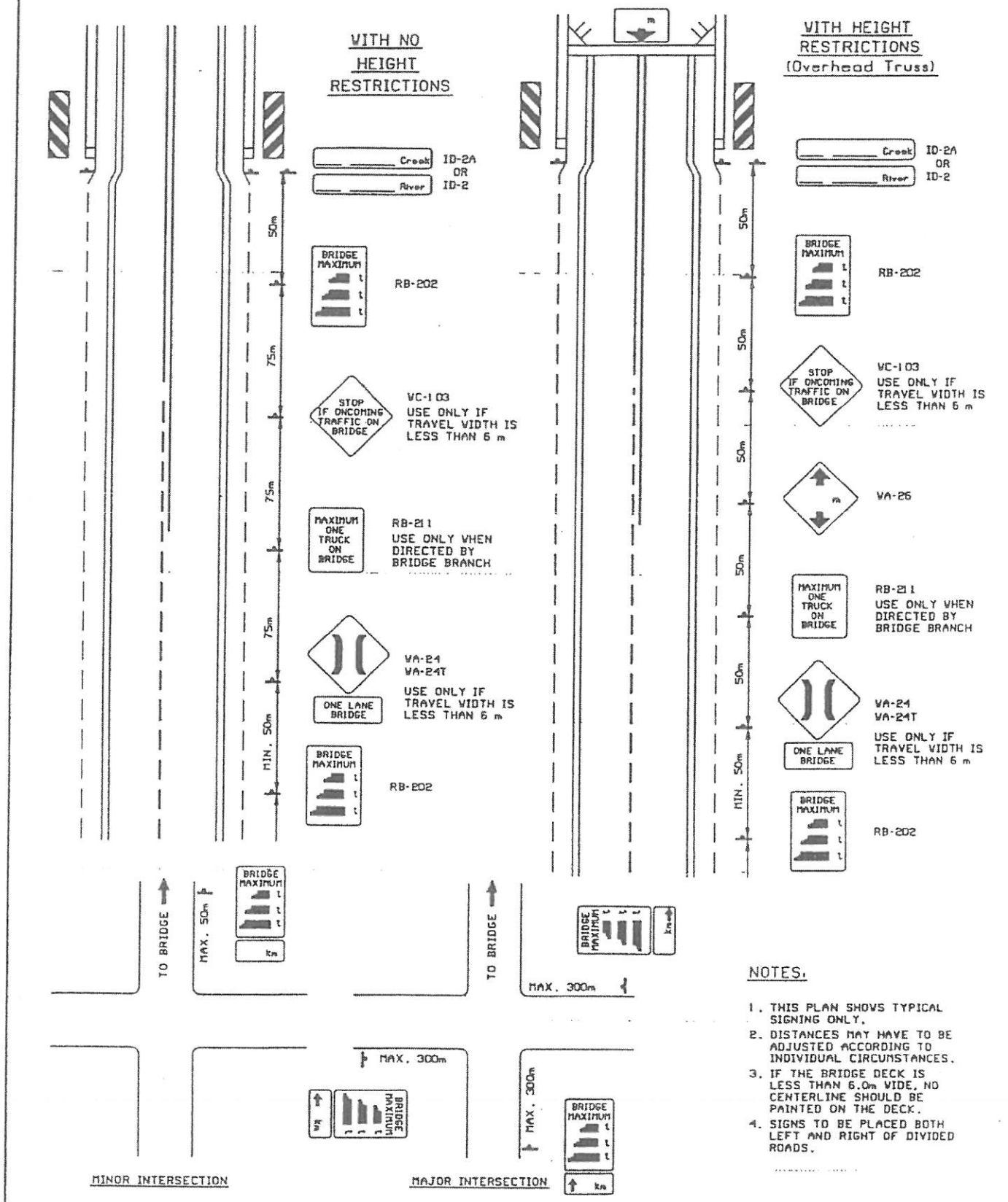
The inspector is required to provide a general condition rating after rating all the individual elements for categories of approach road, superstructure, substructure, channel, grade separation, culvert ends and barrel. It should reflect the condition of each category in accordance with Table 1.2, and includes the impact of the condition of key elements within the category on the structural integrity and safety of the bridge. For example, a timber cap with a rating of 2 would indicate a substructure general rating of 2 as well. On

Legal Loads

Highway Type	CS1 Truck Single Unit	CS2 Truck Semi-Trailer	CS3 Truck Truck-Trains
Primary	28	49	63.5
Secondary	28	49	63.5
Local	28	49	54

Note: Loads are expressed in tonnes


HAZARD MARKER
GIRDERS
T.T. CAP
T.T. SUBCAP
DEEP-BEAM BRIDGERAIL
SHOULDER
SIDESLOPE
T.T. VINGWALL PILE
T.T. ABUTMENT PILE
SECTION
N.T.S.
CONCRETE GIRDERS AND TREATED TIMBER (T.T.) SUBSTRUCTURE
SPILL THROUGH TYPE ABUTMENT (LESS THAN 1.0 m HIGH)
HAZARD MARKER
ALIGN FIELD DRILLED HOLES TO ENSURE THAT THE SIGN POST IS VERTICAL
HAZARD MARKER
NOTE,
HAZARD MARKERS ARE REQUIRED AT EVERY CORNER OF BRIDGE.
2 RIGHT HAND
2 LEFT HAND
HAZARD MARKER
(VERTICAL)
ALIGN FIELD DRILLED HOLES TO ENVELOPE THAT THE SIGN POST IS VERTICAL
STD. SIGN POST
BRIDGERAIL POST
300
900
900
360
400
60
60
TOP OF CURB
HAZARD MARKER DETAILS
(SHOWN AS FOR DEEP-BEAM BRIDGERAIL)
2 REQUIRED - RIGHT HAND
2 REQUIRED - LEFT HAND
ALBERTA TRANSPORTATION
BRIDGE ENGINEERING
BRANCH
HAZARD MARKER
LAYOUT AND DETAILS
SHEET 1 OF 1
FIGURE 2



NOTES.

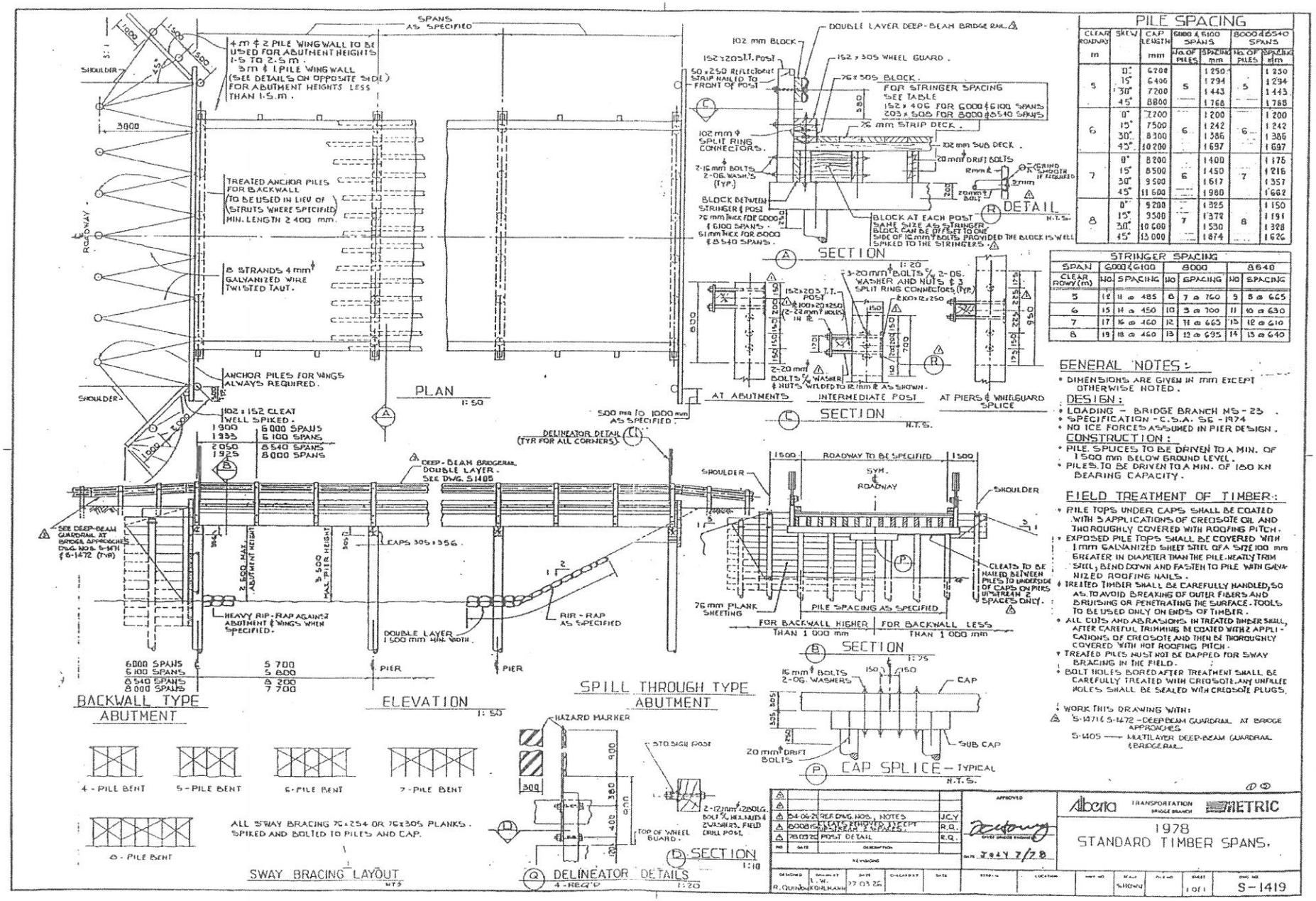
1. THIS PLAN SHOWS TYPICAL SIGNING ONLY.
2. DISTANCES MAY HAVE TO BE ADJUSTED ACCORDING TO INDIVIDUAL CIRCUMSTANCES.
3. IF THE BRIDGE DECK IS LESS THAN 6.0m WIDE, NO CENTERLINE SHOULD BE PAINTED ON THE DECK.
4. SIGNS TO BE PLACED BOTH LEFT AND RIGHT OF DIVIDED ROADS.

SIGNING DETAIL FOR LAST INTERSECTION IN ADVANCE OF BRIDGE

ALBERTA TRANSPORTATION
TRAFFIC OPERATIONS
ENGINEERING BRANCH

TYPICAL SIGNING FOR BRIDGE APPROACHES

SHEET 1 OF 1 | TEB-1.28



PILE SPACING

CLEAR ROADWAY m	SKEW	CAP LENGTH mm	6000 & 6100 SPANS No. OF PILES	6000 & 6100 SPANS SPACING mm	8000 & 8540 SPANS No. OF PILES	8000 & 8540 SPANS SPACING mm
5	0°	6200	5	1 250	5	1 250
	15°	6400		1 294		1 294
	30°	7200		1 443		1 443
	45°	8800		1 768		1 768
6	0°	7200	6	1 200	6	1 200
	15°	7500		1 242		1 242
	30°	8300		1 386		1 386
	45°	10 200		1 697		1 697
7	0°	8200	6	1 400	7	1 176
	15°	8500		1 450		1 216
	30°	9500		1 617		1 357
	45°	11 600		1 980		1 662
8	0°	9200	7	1 325	8	1 150
	15°	9500		1 378		1 191
	30°	10 600		1 530		1 328
	45°	13 000		1 874		1 626

STRINGER SPACING

SPAN	6000 & 6100		8000		8640	
CLEAR ROWY (m)	NO.	SPACING	NO	SPACING	NO	SPACING
5	12	11 @ 485	8	7 @ 760	9	8 @ 665
6	15	14 @ 450	10	9 @ 700	11	10 @ 630
7	17	16 @ 460	12	11 @ 665	13	12 @ 610
8	19	18 @ 460	13	12 @ 695	14	13 @ 640

GENERAL NOTES:

- DIMENSIONS ARE GIVEN IN mm EXCEPT OTHERWISE NOTED.

DESIGN:

- LOADING — BRIDGE BRANCH MS-25 .
- SPECIFICATION — C.S.A. S6-1974
- NO ICE FORCES ASSUMED IN PIER DESIGN .

CONSTRUCTION:

- PILE SPLICES TO BE DRIVEN TO A MIN. OF 1 500 mm BELOW GROUND LEVEL.
- PILES TO BE DRIVEN TO A MIN. OF 180 kN BEARING CAPACITY.

FIELD TREATMENT OF TIMBER:

- PILE TOPS UNDER CAPS SHALL BE COATED WITH 3 APPLICATIONS OF CREOSOTE OIL AND THOROUGHLY COVERED WITH ROOFING PITCH.
- EXPOSED PILE TOPS SHALL BE COVERED WITH 1 mm GALVANIZED SHEET STEEL OF A SIZE 100 mm GREATER IN DIAMETER THAN THE PILE. NEATLY TRIM STEEL, BEND DOWN AND FASTEN TO PILE WITH GALVANIZED ROOFING NAILS.
- TREATED TIMBER SHALL BE CAREFULLY HANDLED, SO AS TO AVOID BREAKING OF OUTER FIBERS AND BRUISING OR PENETRATING THE SURFACE. TOOLS TO BE USED ONLY ON ENDS OF TIMBER.
- ALL CUTS AND ABRASIONS IN TREATED TIMBER SHALL, AFTER CAREFUL TRIMMING BE COATED WITH 2 APPLICATIONS OF CREOSOTE AND THEN BE THOROUGHLY COVERED WITH HOT ROOFING PITCH.
- TREATED PILES MUST NOT BE DAPPED FOR SWAY BRACING IN THE FIELD.
- BOLT HOLES BORED AFTER TREATMENT SHALL BE CAREFULLY TREATED WITH CREOSOTE. ANY UNFILLED HOLES SHALL BE SEALED WITH CREOSOTE PLUGS.

WORK THIS DRAWING WITH:

⚠ S-1471 & S-1472 — DEEP BEAM GUARDRAIL AT BRIDGE APPROACHES.

S-1405 — MULTILAYER DEEP-BEAM GUARDRAIL & BRIDGERAIL.

NO	DATE	DESCRIPTION
⚠		
⚠		
⚠	84-06-21	REF. DWG. NOS., NOTES
⚠	80-08-15	SLOPES REVISED TO 1½:1 EXCEPT UPSTREAM & SPACERS.
⚠	78-02-22	POST DETAIL

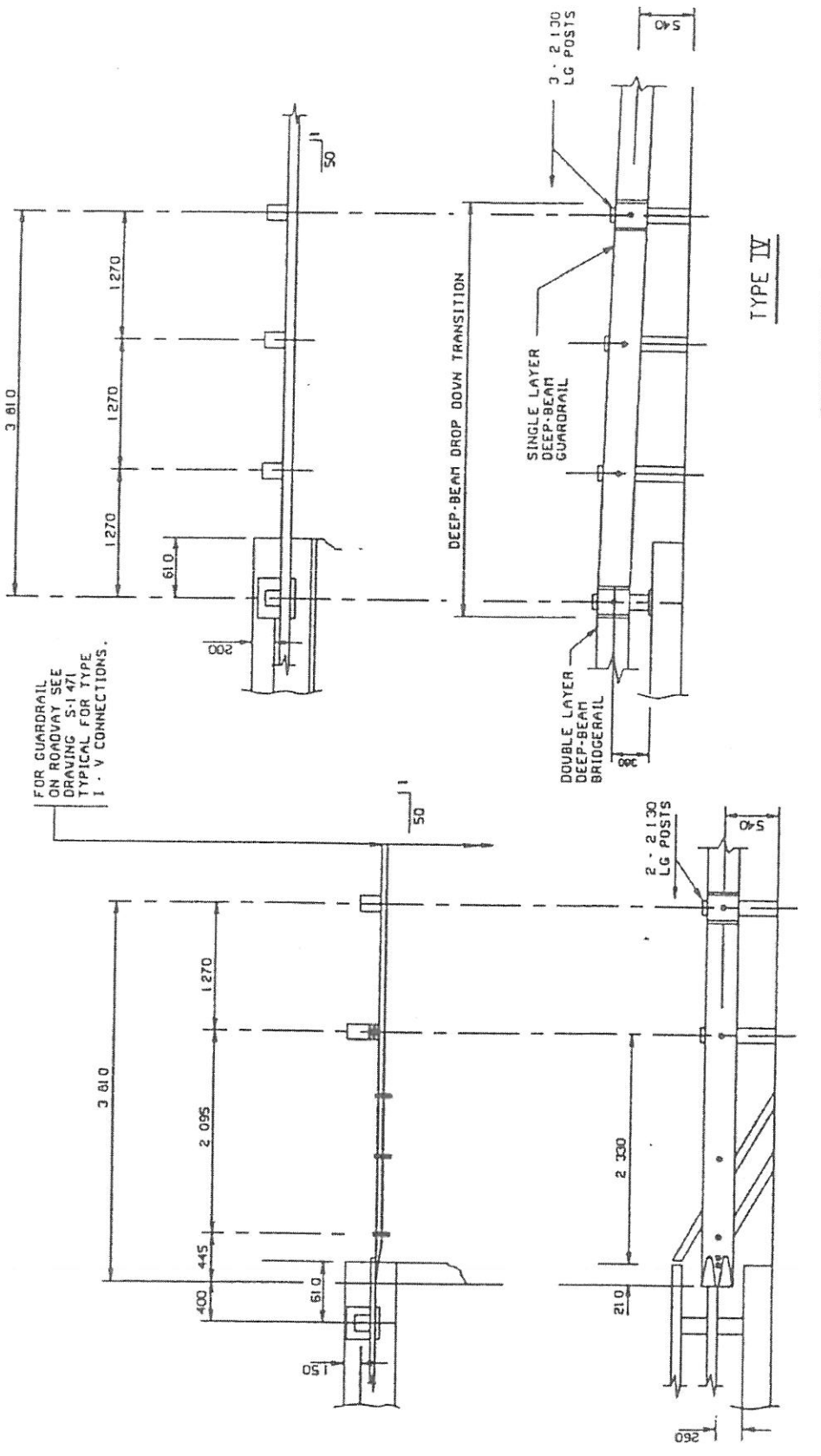
REVISIONS

APPROVED — DATE 78 04 7/28

Alberta TRANSPORTATION BRIDGE BRANCH — METRIC

1978 STANDARD TIMBER SPANS.

DESIGNED	DRAWN	DATE	CHECKED	DATE	STRUCTURE	LOCATION	DWG NO	SCALE	FILE NO	SHEET	DWG NO
R. QUINN	L.W. KOHLMANN	77 03 25						AS SHOWN		1 OF 1	S-1419



TYPE IV

CONNECTION TO DEEP-BEAM BRIDGERAIL

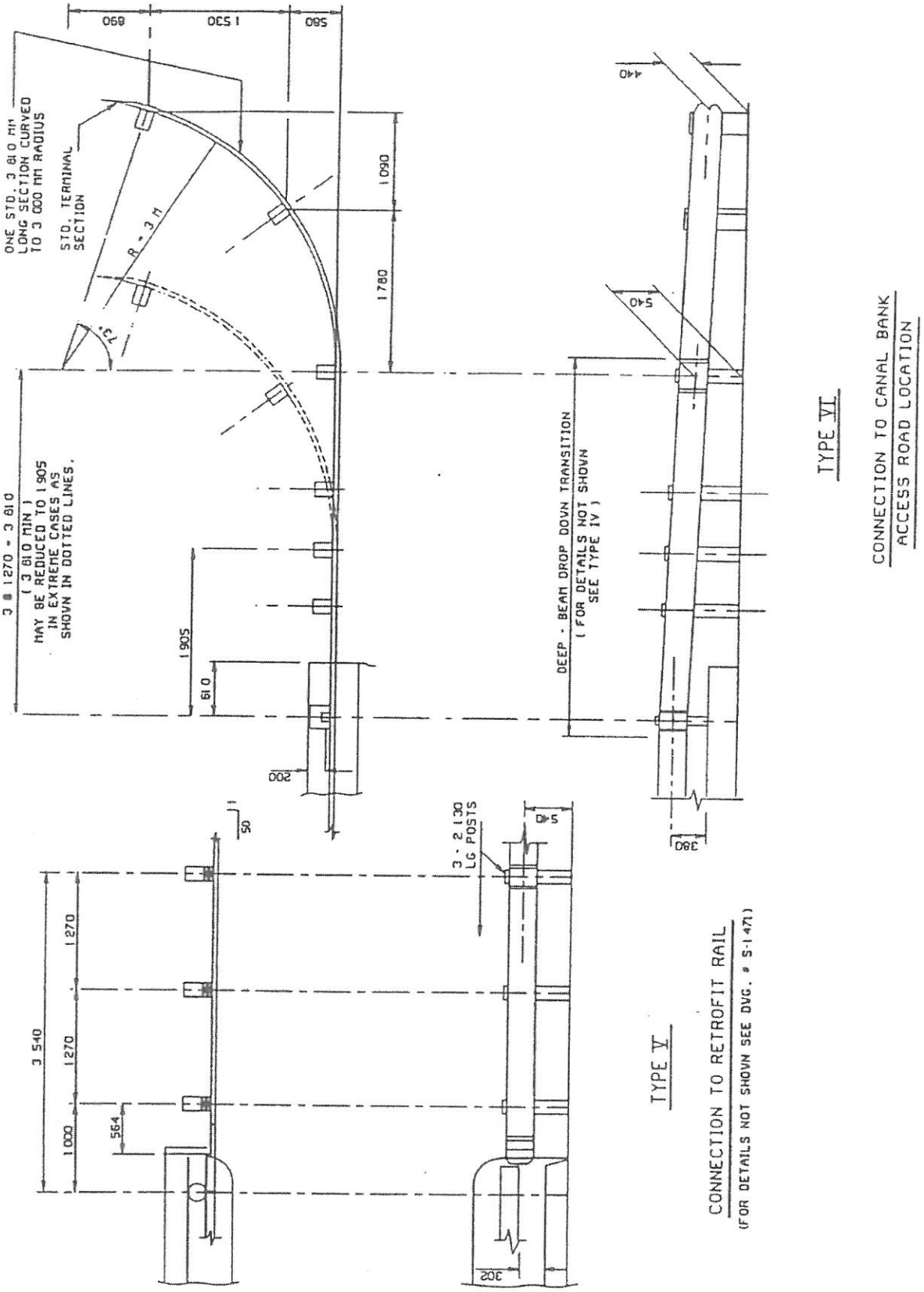
TYPE III

CONNECTION TO 700mm TUBE RAIL

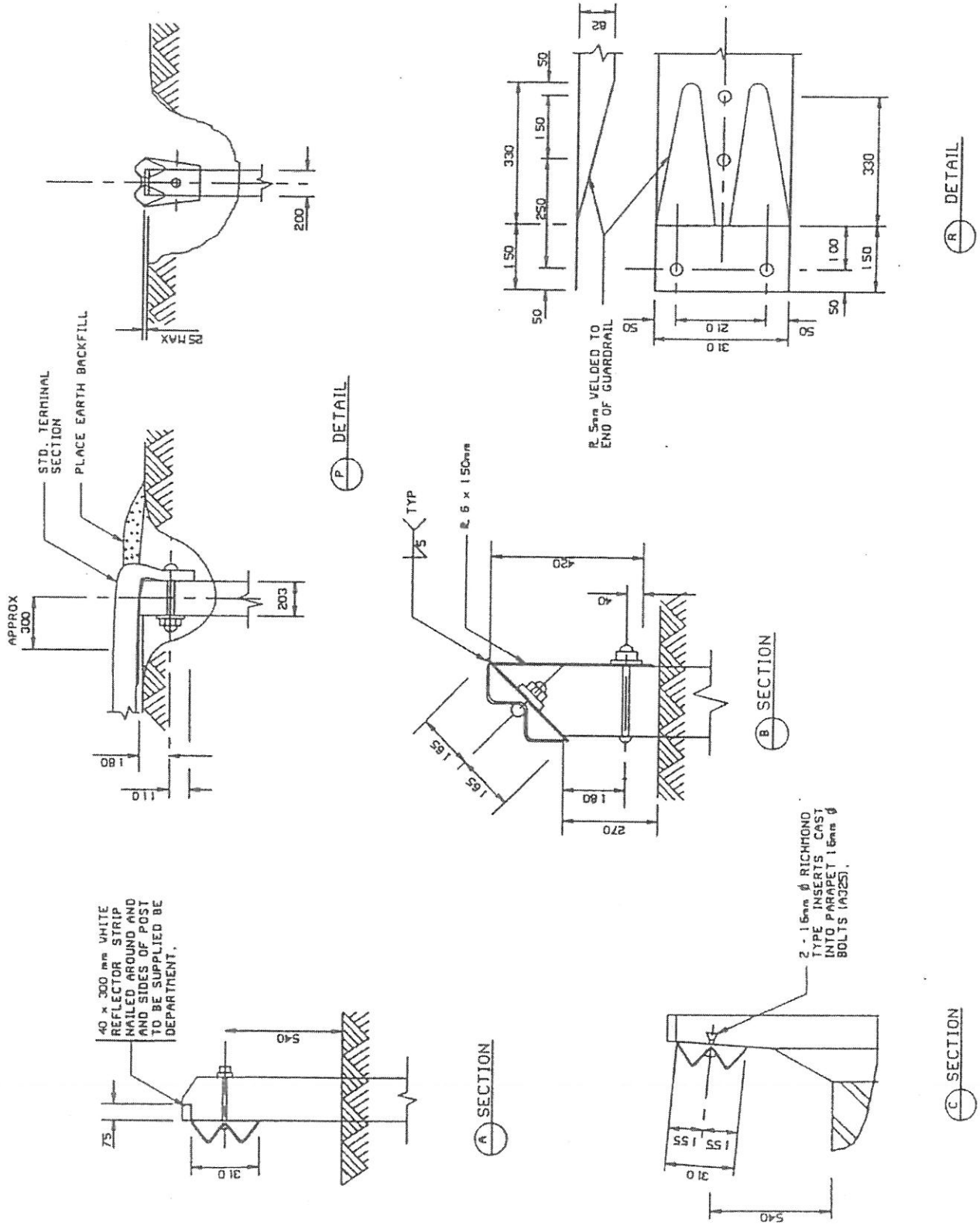
GENERAL NOTES:

- DIMENSIONS ARE GIVEN IN mm UNLESS OTHERWISE NOTED.
- RAIL SECTIONS TO BE LAPPED IN DIRECTION OF TRAFFIC.
- POSTS ARE 1.52 m LONG EXCEPT AS NOTED.
- POSTS TO BE FIRMLY TAMPED INTO GROUND.
- WORK THIS DVG. IN CONJUNCTION WITH DVG. #S - 1471.
- LENGTH OF GUARDRAIL SHOWN ARE MINIMUMS.
- LENGTHS TO BE INCREASED AS REQUIRED BY ROADWAY AND TRAFFIC CONDITIONS.

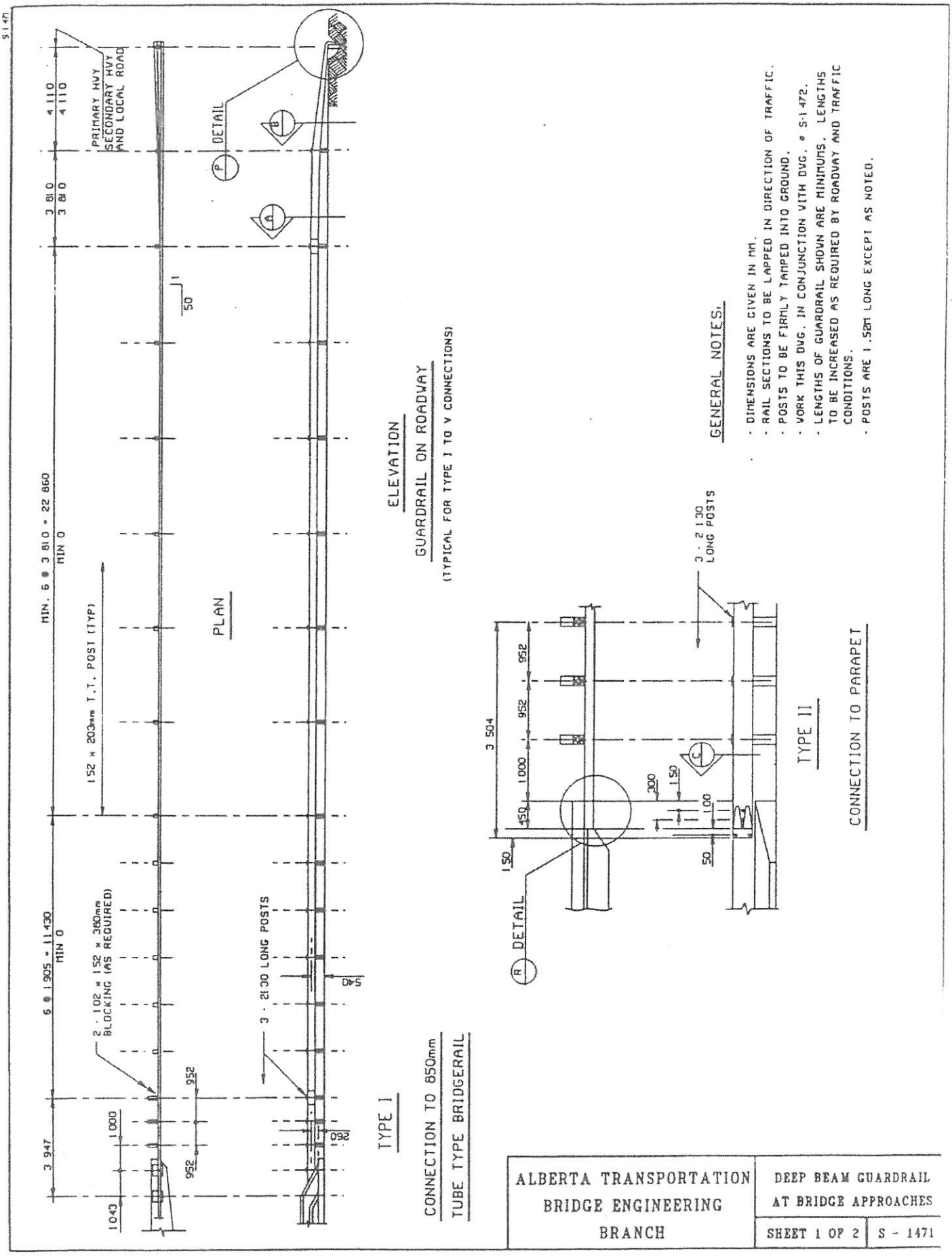
ALBERTA TRANSPORTATION BRIDGE ENGINEERING BRANCH	DEEP BEAM GUARDRAIL AT BRIDGE APPROACHES	
	SHEET 1 OF 2	S - 1472

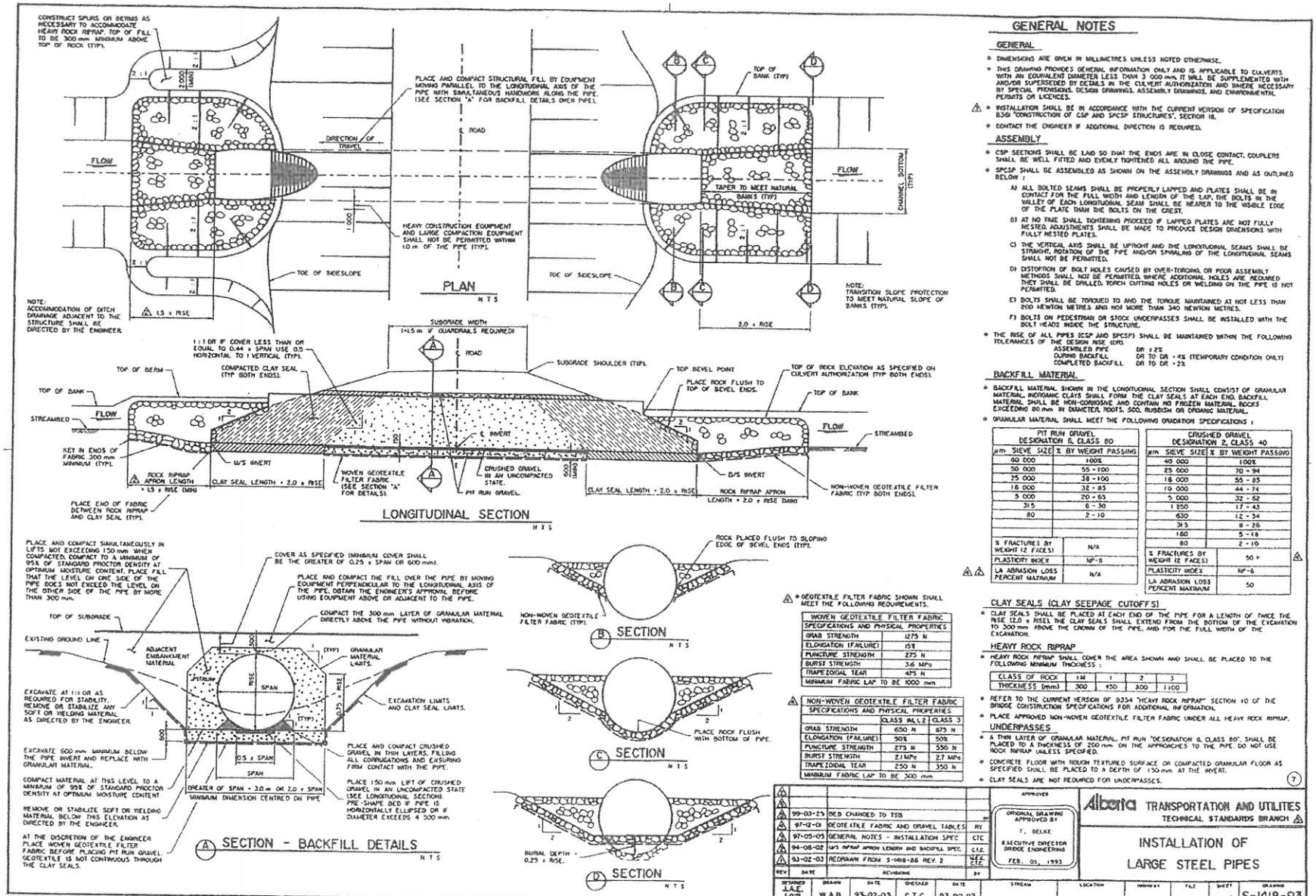


ALBERTA TRANSPORTATION BRIDGE ENGINEERING BRANCH	DEEP BEAM GUARDRAIL AT BRIDGE APPROACHES	
	SHEET 2 OF 2	S - 1472



ALBERTA TRANSPORTATION BRIDGE ENGINEERING BRANCH	DEEP BEAM GUARDRAIL AT BRIDGE APPROACHES	
	SHEET 2 OF 2	S - 1471


S-1471
PLAN
ELEVATION
GUARDRAIL ON ROADWAY
(TYPICAL FOR TYPE 1 TO V CONNECTIONS)
PRIMARY HWY
SECONDARY HWY
AND LOCAL ROAD
DETAIL
MIN. 6 @ 3 810 = 22 860
MIN 0
152 x 203mm T.T. POST (TYP)
6 @ 1 905 = 11 430
2 - 102 x 152 x 380mm
BLOCKING (AS REQUIRED)
3 - 2130 LONG POSTS
3 947
1 000
952
1043
TYPE 1
CONNECTION TO 850mm
TUBE TYPE BRIDGERAIL
GENERAL NOTES.
- DIMENSIONS ARE GIVEN IN MM.
- RAIL SECTIONS TO BE LAPPED IN DIRECTION OF TRAFFIC.
- POSTS TO BE FIRMLY TAMPED INTO GROUND.
- WORK THIS DWG. IN CONJUNCTION WITH DWG. # S-1472.
- LENGTHS OF GUARDRAIL SHOWN ARE MINIMUMS., LENGTHS TO BE INCREASED AS REQUIRED BY ROADWAY AND TRAFFIC CONDITIONS.
- POSTS ARE 1.52M LONG EXCEPT AS NOTED.
3 - 2130 LONG POSTS
3 504
1 000
300
150
100
50
TYPE 11
CONNECTION TO PARAPET
ALBERTA TRANSPORTATION
BRIDGE ENGINEERING
BRANCH
DEEP BEAM GUARDRAIL
AT BRIDGE APPROACHES
SHEET 1 OF 2
S - 1471



GENERAL NOTES

GENERAL

- DIMENSIONS ARE GIVEN IN MILLIMETRES UNLESS NOTED OTHERWISE.
- THIS DRAWING PROVIDES GENERAL INFORMATION ONLY AND IS APPLICABLE TO CULVERTS WITH AN EQUIVALENT DIAMETER LESS THAN 3 000 mm. IT WILL BE SUPPLEMENTED WITH AND/OR SUPERSEDED BY DETAILS IN THE CULVERT AUTHORIZATION AND WHERE NECESSARY BY SPECIAL PROVISIONS, DESIGN DRAWINGS, ASSEMBLY DRAWINGS, AND ENVIRONMENTAL PERMITS OR LICENCES.
- INSTALLATION SHALL BE IN ACCORDANCE WITH THE CURRENT VERSION OF SPECIFICATION B361 "CONSTRUCTION OF CSP AND SPCSP STRUCTURES", SECTION 18.
- CONTACT THE ENGINEER IF ADDITIONAL DIRECTION IS REQUIRED.

ASSEMBLY

- CSP SECTIONS SHALL BE LAID SO THAT THE ENDS ARE IN CLOSE CONTACT. COUPLERS SHALL BE WELL FITTED AND EVENLY TIGHTENED ALL AROUND THE PIPE.
- SPCSP SHALL BE ASSEMBLED AS SHOWN ON THE ASSEMBLY DRAWINGS AND AS OUTLINED BELOW :
  - A) ALL BOLTED SEAMS SHALL BE PROPERLY LAPPED AND PLATES SHALL BE IN CONTACT FOR THE FULL WIDTH AND LENGTH OF THE LAP. THE BOLTS IN THE VALLEY OF EACH LONGITUDINAL SEAM SHALL BE NEARER TO THE VISIBLE EDGE OF THE PLATE THAN THE BOLTS ON THE CREST.
  - B) AT NO TIME SHALL TIGHTENING PROCEED IF LAPPED PLATES ARE NOT FULLY NESTED. ADJUSTMENTS SHALL BE MADE TO PRODUCE DESIGN DIMENSIONS WITH FULLY NESTED PLATES.
  - C) THE VERTICAL AXIS SHALL BE UPRIGHT AND THE LONGITUDINAL SEAMS SHALL BE STRAIGHT. ROTATION OF THE PIPE AND/OR SPIRALING OF THE LONGITUDINAL SEAMS SHALL NOT BE PERMITTED.
  - D) DISTORTION OF BOLT HOLES CAUSED BY OVER-TORQUING OR POOR ASSEMBLY METHODS SHALL NOT BE PERMITTED. WHERE ADDITIONAL HOLES ARE REQUIRED THEY SHALL BE DRILLED. TORCH CUTTING HOLES OR WELDING ON THE PIPE IS NOT PERMITTED.
  - E) BOLTS SHALL BE TORQUED TO AND THE TORQUE MAINTAINED AT NOT LESS THAN 200 NEWTON METRES AND NOT MORE THAN 340 NEWTON METRES.
  - F) BOLTS ON PEDESTRIAN OR STOCK UNDERPASSES SHALL BE INSTALLED WITH THE BOLT HEADS INSIDE THE STRUCTURE.
- THE RISE OF ALL PIPES (CSP AND SPCSP) SHALL BE MAINTAINED WITHIN THE FOLLOWING TOLERANCES OF THE DESIGN RISE (DR).

ASSEMBLED PIPE	DR ± 2%
DURING BACKFILL	DR TO DR + 4% (TEMPORARY CONDITION ONLY)
COMPLETED BACKFILL	DR TO DR + 2%

BACKFILL MATERIAL

- BACKFILL MATERIAL SHOWN IN THE LONGITUDINAL SECTION SHALL CONSIST OF GRANULAR MATERIAL. INORGANIC CLAYS SHALL FORM THE CLAY SEALS AT EACH END. BACKFILL MATERIAL SHALL BE NON-CORROSIVE AND CONTAIN NO FROZEN MATERIAL, ROCKS EXCEEDING 80 mm IN DIAMETER, ROOTS, SOD, RUBBISH OR ORGANIC MATERIAL.
- GRANULAR MATERIAL SHALL MEET THE FOLLOWING GRADATION SPECIFICATIONS :

PIT RUN GRAVEL DESIGNATION 6, CLASS 80	
µm SIEVE SIZE	% BY WEIGHT PASSING
80 000	100%
50 000	55 - 100
25 000	38 - 100
16 000	32 - 83
5 000	20 - 65
315	8 - 30
80	2 - 10
% FRACTURES BY WEIGHT (2 FACES)	N/A
PLASTICITY INDEX	NP-6
LA ABRASION LOSS PERCENT MAXIMUM	N/A

CRUSHED GRAVEL DESIGNATION 2, CLASS 40	
µm SIEVE SIZE	% BY WEIGHT PASSING
40 000	100%
25 000	70 - 94
16 000	55 - 85
10 000	44 - 74
5 000	32 - 62
1 250	17 - 43
630	12 - 34
315	8 - 26
160	5 - 18
80	2 - 10
% FRACTURES BY WEIGHT (2 FACES)	50 +
PLASTICITY INDEX	NP-6
LA ABRASION LOSS PERCENT MAXIMUM	50

- GEOTEXTILE FILTER FABRIC SHOWN SHALL MEET THE FOLLOWING REQUIREMENTS.

WOVEN GEOTEXTILE FILTER FABRIC SPECIFICATIONS AND PHYSICAL PROPERTIES	
GRAB STRENGTH	1275 N
ELONGATION (FAILURE)	15%
PUNCTURE STRENGTH	275 N
BURST STRENGTH	3.6 MPa
TRAPEZOIDAL TEAR	475 N
MINIMUM FABRIC LAP TO BE 1000 mm	

NON-WOVEN GEOTEXTILE FILTER FABRIC SPECIFICATIONS AND PHYSICAL PROPERTIES		
	CLASS 1 & 2	CLASS 3
GRAB STRENGTH	650 N	875 N
ELONGATION (FAILURE)	50%	50%
PUNCTURE STRENGTH	275 N	350 N
BURST STRENGTH	2.1 MPa	2.7 MPa
TRAPEZOIDAL TEAR	250 N	350 N
MINIMUM FABRIC LAP TO BE 300 mm		

CLAY SEALS (CLAY SEEPAGE CUTOFFS)

- CLAY SEALS SHALL BE PLACED AT EACH END OF THE PIPE FOR A LENGTH OF TWICE THE RISE (2.0 x RISE). THE CLAY SEALS SHALL EXTEND FROM THE BOTTOM OF THE EXCAVATION TO 300 mm ABOVE THE CROWN OF THE PIPE, AND FOR THE FULL WIDTH OF THE EXCAVATION.

HEAVY ROCK RIPRAP

- HEAVY ROCK RIPRAP SHALL COVER THE AREA SHOWN AND SHALL BE PLACED TO THE FOLLOWING MINIMUM THICKNESS :

CLASS OF ROCK	1M	1	2	3
THICKNESS (mm)	300	450	800	1100

- REFER TO THE CURRENT VERSION OF B354 "HEAVY ROCK RIPRAP" SECTION 10 OF THE BRIDGE CONSTRUCTION SPECIFICATIONS FOR ADDITIONAL INFORMATION.
- PLACE APPROVED NON-WOVEN GEOTEXTILE FILTER FABRIC UNDER ALL HEAVY ROCK RIPRAP.

UNDERPASSES

- A THIN LAYER OF GRANULAR MATERIAL, PIT RUN "DESIGNATION 6, CLASS 80", SHALL BE PLACED TO A THICKNESS OF 200 mm ON THE APPROACHES TO THE PIPE. DO NOT USE ROCK RIPRAP UNLESS SPECIFIED.
- CONCRETE FLOOR WITH ROUGH TEXTURED SURFACE OR COMPACTED GRANULAR FLOOR AS SPECIFIED SHALL BE PLACED TO A DEPTH OF 150 mm AT THE INVERT.
- CLAY SEALS ARE NOT REQUIRED FOR UNDERPASSES. (7)

REV	DATE	REVISIONS	BY
5	99-03-25	DCD CHANGED TO TSB	
4	97-12-01	GEOTEXTILE FABRIC AND GRAVEL TABLES	RT
3	97-05-05	GENERAL NOTES - INSTALLATION SPEC	CTC
2	94-06-02	U/S RIPRAP APRON LENGTH AND BACKFILL SPEC	CTC
1	93-02-03	REDRAWN FROM S-1418-86 REV. 2	CTC

APPROVED
ORIGINAL DRAWING APPROVED BY
T. BELKE
EXECUTIVE DIRECTOR
BRIDGE ENGINEERING
FEB. 05, 1993

Alberta TRANSPORTATION AND UTILITIES
TECHNICAL STANDARDS BRANCH

INSTALLATION OF LARGE STEEL PIPES

DESIGNED	DRAWN	DATE	CHECKED	DATE	STREAM	LOCATION	HIGHWAY	FILE	SHEET	DRAWING
L.A.E. J.O.B.	W.A.B.	93-02-03	C.T.C.	93-02-03					1 of 1	S-1418-93

NOTE: THIS DRAWING HAS BEEN REDUCED TO 22" x 34". DO NOT SCALE

Bridges and Structures

Standard and Typical Detail Drawings

Standard Drawings are engineered documents. The Consultant shall refer directly to these documents on the project detailed drawings and shall include them in the drawing tender set. However, the Consultant shall be aware that these Standard Drawings often require project specific engineering and detailing which shall be included on the detailed drawings. Standard Drawings are occassionally updated and Consultants shall ensure they are including the latest verison of the drawings in their tender set.

Typical Detail Drawings are not engineered documents, rather are documents provided to demonstrate the Department's preferred details. Consultants shall utilize the preferred details unless otherwise permitted by the Department. Consultants are fully responsible to properly design and draft all details on the project detailed drawings. Typical Detail Drawings shall not be included in the drawing tender set.

All current Standard and Typical Detail Drawings can be found using the following links:

- Barriers
- Precast Girders
- Steel Girders
- Deck and Deck Joints
- Bearings
- Culverts
- Bridge Construction Specification Drawings
- Miscellaneous

All Active Standard and Typical Detail Drawings (sorted by drawing number)

Non-current archived Standard and Typical Detail Drawings are provided for use with bridge assessments and rehabiltations and can be found using the following link:

All Non-Current Archived Standard and Typical Detail Drawings (sorted by drawing number)

http://www.transportation.alberta.ca/4738.htm

Lacombe County
Item Listing
March 1, 2017

Item	Description	Type	Quantity On Hand	Price
loading tme	loading time	Service	0	90.00
59940	LUMBER TREATED 2X12X16'	Inventory Part	0	39.36
59945	LUMBER TREATED 3X8X14'	Inventory Part	0	33.92
59960	LUMBER TREATED 3X10X12'	Inventory Part	21	56.64
59965	LUMBER TREATED 3X10X14'	Inventory Part	53	65.38
59970	LUMBER TREATED 3X10X16'	Inventory Part	22	56.92
59975	LUMBER TREATED 3X10X18'	Inventory Part	60	72.96
59980	LUMBER TREATED 3X10X20'	Inventory Part	79	84.56
59985	LUMBER TREATED 3X10X22'	Inventory Part	0	103.83
59990	LUMBER TREATED 3X10X24	Inventory Part	66	101.46
59995	LUMBER TREATED 3X10X26'	Inventory Part	78	122.20
59997	LUMBER TREATED 3X12X10'	Inventory Part	0	57.00
60000	LUMBER TREATED 3X12X12'	Inventory Part	100	68.11
60005	LUMBER TREATED 3X12X14'	Inventory Part	42	78.58
60010	LUMBER TREATED 3X12X16'	Inventory Part	121	90.81
60015	LUMBER TREATED 3X12X18'	Inventory Part	45	102.16
60020	LUMBER TREATED 3X12X20'	Inventory Part	0	130.90
60025	LUMBER TREATED 3X12X22'	Inventory Part	0	143.96
60030	LUMBER TREATED 3X12X24'	Inventory Part	11	121.76
60045	LUMBER TREATED 4X6X16'	Inventory Part	27	49.14
60050	LUMBER TREATED 4X6X18'	Inventory Part	7	59.08
60055	LUMBER TREATED 4X6X20'	Inventory Part	37	66.71
60060	LUMBER TREATED 4X10X20'	Inventory Part	0	0.00
60070	LUMBER TREATED 4X12X16'	Inventory Part	0	101.71
60075	LUMBER TREATED 4X12X18'	Inventory Part	0	157.06
60080	LUMBER TREATED 4X12X20'	Inventory Part	1	174.52
60085	LUMBER TREATED 4X12X22	Inventory Part	0	191.97
60090	LUMBER TREATED 4X12X24'	Inventory Part	0	317.52
60095	LUMBER TREATED 4X12X26'	Inventory Part	0	200.62
60100	LUMBER TREATED 4X12X28'	Inventory Part	0	223.33
60120	LUMBER TREATED 6X8X18'	Inventory Part	0	103.09
60130	LUMBER TREATED 6X8X22' 88 FBM	Inventory Part	9	234.38
60135	LUMBER TREATED 6x8X28	Inventory Part	16	324.34
60145	LUMBER TREATED 6X12X12'	Inventory Part	0	131.73
60175	LUMBER TREATED 6X12X24'	Inventory Part	0	393.85
60180	LUMBER TREATED 6X12X26'	Inventory Part	5	519.42
60185	LUMBER TREATED 6X12X27'	Inventory Part	0	335.57
60205	LUMBER TREATED 6X16X20'	Inventory Part	26	472.05
60210	LUMBER TREATED 8X20X28'	Inventory Part	18	990.65
60212	LUMBER TREATED 10X10X20'	Inventory Part	0	343.85
60214	LUMBER TREATED 10X16X16'	Inventory Part	0	0.00
60216	LUMBER TREATED 12X12X14'	Inventory Part	1	406.08
60220	LUMBER TREATED 12X12X16'	Inventory Part	17	464.10
60225	LUMBER TREATED 12X12X18'	Inventory Part	10	608.50
60235	LUMBER TREATED 12X12X24'	Inventory Part	16	811.31
60245	LUMBER TREATED 12X12X26'	Inventory Part	22	856.38
60250	LUMBER TREATED 12X12X28	Inventory Part	14	1,049.87
60255	LUMBER TREATED 12X12X30'	Inventory Part	37	1,135.93
60260	LUMBER TREATED 12X14X6'	Inventory Part	25	174.00

Lacombe County
Item Listing
March 1, 2017

Item	Description	Type	Quantity On Hand	Price
60266	LUMBER TREATED FRAMED 12X14X8.5'	Inventory Part	21	310.00
60280	LUMBER TREATED 12X14X12'	Inventory Part	12	476.72
60290	LUMBER TREATED 12X14X15'	Inventory Part	21	435.00
60291	LUMBER TREATED FRAMED 12X14X15'	Inventory Part	5	558.60
60300	LUMBER TREATED 12X14X18'	Inventory Part	14	715.07
60305	LUMBER TREATED 12X14X20'	Inventory Part	24	794.53
60310	LUMBER TREATED 12X14X22'	Inventory Part	0	681.07
60315	LUMBER TREATED 12X14X24'	Inventory Part	31	953.43
60320	LUMBRT TREATED 12X14X25'	Inventory Part	2	795.72
60325	LUMBER TREATED 12X14X26	Inventory Part	27	1,032.88
60330	LUMBER TREATED 12X14X27'	Inventory Part	3	859.38
60335	LUMBER TREATED 12X14X28'	Inventory Part	25	1,236.91
60340	LUMBER TREATED 12X14X30'	Inventory Part	0	1,135.00
60360	PILING UNTREATED 35'	Inventory Part	0	245.53
60365	PILING UNTREATED 40'	Inventory Part	0	292.80
60380	PILING TREATED 20'	Inventory Part	67	200.31
60385	PILING TREATED 25'	Inventory Part	0	251.26
60390	PILING TREATED 30'	Inventory Part	0	301.27
60395	PILING TREATED 35'	Inventory Part	37	355.86
60400	PILING TREATED 40'	Inventory Part	23	402.91
60405	PILING TREATED 45'	Inventory Part	76	449.57
60410	PILING TREATED 50'	Inventory Part	108	491.39
61845	LUMBER TREATED 6X8X8'	Inventory Part	0	42.70
74200	DECKING TREATED/CCA 2X12X20'	Inventory Part	0	53.07
74210	DECKING TREATED/CCA 3X10X16'	Inventory Part	0	53.07
74215	DECKING TREATED/CCA 3X10X18'	Inventory Part	0	79.96
74220	DECKING TREATED/CCA 3X10X20'	Inventory Part	0	66.34
74225	DECKING TREATED/CCA 3X12X14'	Inventory Part	0	62.22
74230	DECKING TREATED/CCA 3X12X16'	Inventory Part	410	82.07
74235	DECKING TREATED/CCA 3X12X18'	Inventory Part	0	95.94
74237	DECKING TREATED/CCA 3X12X20'	Inventory Part	298	98.01
74240	LUMBER TREATED/CCA6x6x20	Inventory Part	11	85.00
MISC		Inventory Part	0	0.00
neoprene ...		Inventory Part	3.32	34.00
neoprene ...		Inventory Part	0	68.00
NPN		Inventory Part	-2,906.75	0.00
P0042	6.1 M PRECAST G LHF	Inventory Part	0	200.00
P0043	6.1 M PRECAST G LHF	Inventory Part	1	200.00
P0044	6.1 M PRECAST G LHF	Inventory Part	1	200.00
P0045	6.1 M PRECAST G LHF	Inventory Part	1	200.00
P0046	6.1 M PRECAST G LHF	Inventory Part	1	200.00
P0049	6.1 M PRECAST G LHF	Inventory Part	1	200.00
P0090	7.6 M PRECAST VS	Inventory Part	0	200.00
P0091	7.6 M PRECAST VS	Inventory Part	0	200.00
P0166	11.6 M PRECAST "HC" CURB	Inventory Part	1	200.00
P0167	11.6 M PRECAST "HC" CURB	Inventory Part	1	200.00
P0169	11.6 M PRECAST HC	Inventory Part	0	200.00
P0170	11.6 M PRECAST HC	Inventory Part	1	200.00
P0171	11.6 M PRECAST HC	Inventory Part	1	200.00

Lacombe County
Item Listing
March 1, 2017

Item	Description	Type	Quantity On Hand	Price
P0172	11.6 M PRECAST HC	Inventory Part	1	200.00
P0173	11.6 M PRECAST HC	Inventory Part	1	200.00
P0174	11.6 M PRECAST HC	Inventory Part	1	200.00
P0175	11.6 M PRECAST HC	Inventory Part	1	200.00
P0176	11.6 M PRECAST HC	Inventory Part	1	200.00
P0248	6.1M PRECAST G	Inventory Part	0	200.00
P0350	6.1 M PRECAST G LHF	Inventory Part	1	200.00
P0351	6.1 M PRECAST G LHF	Inventory Part	1	200.00
P0353	6.1 M PRECAST G LHF	Inventory Part	1	200.00
P0356	6.1 M PRECAST G LHF	Inventory Part	1	200.00
P0357	6.1 M PRECAST G LHF	Inventory Part	1	200.00
P0358	6.1 M PRECAST G LHF	Inventory Part	1	200.00
P0359	6.1 M PRECAST G LHF	Inventory Part	1	200.00
P0360	6.1 M PRECAST G LHF	Inventory Part	1	200.00
P0361	6.1 M PRECAST G LHF	Inventory Part	1	200.00
P0362	6.1 M PRECAST G LHF	Inventory Part	1	200.00
P0363	6.1 M PRECAST G LHF	Inventory Part	1	200.00
P0364	6.1 M PRECAST HH LHF	Inventory Part	1	200.00
P0365	6.1 M PRECAST HH LHF	Inventory Part	1	200.00
P0366	6.1 M PRECAST HH LHF	Inventory Part	1	200.00
P0367	6.1 M PRECAST HH LHF	Inventory Part	1	200.00
P0508	6.1 M PRECAST HH RHF	Inventory Part	1	200.00
P0509	6.1 M PRECAST HH RHF	Inventory Part	1	200.00
P0510	6.1 M PRECAST G RHF	Inventory Part	1	200.00
P0511	6.1 M PRECAST HH RHF	Inventory Part	1	200.00
P0512	6.1 M PRECAST HH RHF	Inventory Part	1	200.00
P0513	6.1 M PRECAST HH RHF	Inventory Part	1	200.00
P0514	6.1 M PRECAST HH RHF	Inventory Part	1	200.00
P0550	6.1 M PRECAST HH LHF	Inventory Part	1	200.00
P0551	6.1 M PRECAST HH LHF	Inventory Part	1	200.00
P0552	6.1 M PRECAST HH LHF	Inventory Part	1	200.00
P0553	6.1 M PRECAST HH LHF	Inventory Part	1	200.00
P0554	6.1 M PRECAST HH LHF	Inventory Part	1	200.00
P0555	6.1 M PRECAST HH LHF	Inventory Part	1	200.00
P0556	6.1 M PRECAST HH LHF	Inventory Part	1	200.00
P0557	6.1 M PRECAST HH LHF	Inventory Part	1	200.00
P0558	6.1 M PRECAST HH LHF	Inventory Part	1	200.00
P0559	6.1 M PRECAST HH LHF	Inventory Part	1	200.00
P0560	6.1 M PRECAST HH LHF	Inventory Part	1	200.00
P0561	6.1 M PRECAST HH LHF	Inventory Part	1	200.00
P0562	6.1 M PRECAST HH LHF	Inventory Part	1	200.00
P0563	6.1 M PRECAST HH LHF	Inventory Part	1	200.00
P0564	6.1 M PRECAST HH LHF	Inventory Part	1	200.00
P0565	6.1 M PRECAST HH LHF	Inventory Part	1	200.00
P0566	6.1 M PRECAST HH LHF	Inventory Part	1	200.00
P0567	6.1 M PRECAST HH LHF	Inventory Part	1	200.00
P0568	6.1 M PRECAST HH LHF	Inventory Part	1	200.00
P0569	6.1 M PRECAST HH LHF	Inventory Part	1	200.00
P0570	6.1 M PRECAST HH LHF	Inventory Part	1	200.00

Lacombe County
Item Listing
March 1, 2017

Item	Description	Type	Quantity On Hand	Price
P0573	6.1 M PRECAST HH LHF	Inventory Part	1	200.00
P0614	8.5 M PRECAST LHF	Inventory Part	1	200.00
P0615	8.5 M PRECAST HC LHF	Inventory Part	1	200.00
P0626	8.5 M PRECAST VS	Inventory Part	1	200.00
P0627	7.6 M PRECAST VS	Inventory Part	1	200.00
P0633	7.6 M PRECAST VS	Inventory Part	1	200.00
P0634	7.6 M PRECAST VS	Inventory Part	1	200.00
P0636	7.6 M PRECAST VS	Inventory Part	1	200.00
P0660	10.1 M PRECAST "HC"	Inventory Part	0	200.00
P0661	10.1 M PRECAST "HC"	Inventory Part	1	200.00
P0673	10.1 M PRECAST "HC"	Inventory Part	1	200.00
P3038	6.1 M PRECAST "HC"	Inventory Part	0	200.00
P3056	12.2 M PRECAST "HC"	Inventory Part	1	200.00
P3057	12.2 M PRECAST "HC"	Inventory Part	1	200.00
P3058	12.2 M PRECAST "HC"	Inventory Part	1	200.00
P3061	12.2 M PRECAST "HC"	Inventory Part	1	200.00
P3062	12.2 M PRECAST "HC"	Inventory Part	1	200.00
P3063	12.2 M PRECAST "HC"	Inventory Part	1	200.00
P3064	12.2 M PRECAST "HC"	Inventory Part	1	200.00
P3072	6.1 PRECAST "G"	Inventory Part	0	200.00
P3073	6.1 M PRECAST "G" Curb	Inventory Part	0	200.00
P3076	6.1 M PRECAST "G" LHF	Inventory Part	0	200.00
P3077	6.1 M PRECAST "G" LHF	Inventory Part	1	200.00
P3088	6.1 M PRECAST G LHF	Inventory Part	1	200.00
P3089	6.1 M PRECAST "G" LHF	Inventory Part	1	200.00
P3100	6.1 M PRECAST "A" LHF	Inventory Part	1	200.00
P3137	8.5 M PRECAST	Inventory Part	1	200.00
P3138	8.5 M PRECAST	Inventory Part	1	200.00
P3194	8.5 M PRECAST	Inventory Part	1	200.00
P3201	8.5 M PRECAST	Inventory Part	1	200.00
P3202	8.5 M PRECAST	Inventory Part	1	200.00
P4220	10.1 M PRECAST "HC" CURB	Inventory Part	1	200.00
P4249	10.1 M PRECAST "HC" CURB	Inventory Part	1	200.00
P4274	10.1 M PRECAST "HC" CURB	Inventory Part	1	200.00
P4334	10.1 M PRECAST HC CURB	Inventory Part	1	200.00
P4336	10.1 M PRECAST HC CURB	Inventory Part	1	200.00
P5267	8.5 M PRECAST HC LHF	Inventory Part	1	200.00
P5305	8.5 M PRECAST "HC" 15 LHF	Inventory Part	1	200.00

5% Vertically Ellipse Pipes		
Diameter	Span	Rise
1500	1429	1575
1810	1724	1901
2120	2019	2226
2430	2314	2552
2740	2610	2877
3050	2905	3203
3360	3200	3528
3670	3495	3854
3990	3800	4190
4300	4095	4515
4610	4390	4841
4920	4686	5165
5230	4981	5492
5540	5276	5817
5850	5571	6142
6160	5866	6468

Arch Culverts		
Equivalent Diameter	Span	Rise
CSP		
1524	1829	1118
1676	1854	1397
1829	2057	1499
1981	2210	1600
2134	2413	1702
2286	2616	1803
2438	2845	1905
SPCSP		
1676	1854	1397
1753	1930	1448
1829	2057	1499
1905	2134	1549
1981	2210	1600
2057	2337	1651
2134	2413	1702
2210	2489	1753
2286	2616	1803
2362	2464	1854
2438	2845	1905
2515	2896	1956
2591	2972	2007
2667	3124	2057
2743	3251	2108
2819	3327	2159
2896	3480	2210
2972	3531	2261
3048	3607	2311
3124	3759	2362
3200	3810	2413
3277	3861	2464
3353	3912	2540
3429	4089	2565
3505	4242	2616
3581	4293	2667
3658	4343	2718
3734	4521	2769
3810	4674	2819
3886	4724	2870
3962	4775	2921
4039	4826	2997
4115	5004	3023
4191	5055	3073

BIM INSPECTION MANUAL UPDATE

INSPECTION AND RATING OF CULVERTS WITH STRUTS

EFFECTS OF STRUTS ON ELEMENT AND GENERAL RATINGS

There are many culverts on the Provincial road system that are strutted with either steel or timber struts. While the intent is not to arbitrarily increase the barrel general rating due to the presence of the struts, there are situations where a 1 or 2 rating point increase to the **barrel general rating** may be justified.

If the following guidelines are met, then the inspector has the flexibility to increase the barrel general rating by a maximum of 2 rating points (not to exceed a barrel general rating of 4) without increasing the element rating.

RATING GUIDELINES

- The inspector must verify the struts have been in place for 2 years or more. This is to ensure that the struts and culvert are stable.
- The struts must be in good condition (i.e. rated as a "special feature" at 5 or more).
- The culvert must have at least 1 permanent reference point for measuring and future monitoring.
- The culvert struts must be inspected on a minimum ½ cycle, or after any significant flood event. Ideally, struts should be inspected every spring to ensure they are tight and have not been damaged by ice or run-off.
- Consideration should be given to the size of the culvert and to the depth of cover over the culvert. (Complete failure of a large diameter culvert under high fills may not be as threatening to public safety as the failure of the same culvert under shallow fill).
- The rating increase would not apply to any culvert with deflections greater than 30%, or with cracked seams with less than 25 mm or remaining steel.
- The rating increase is applied to the "general rating" only. The "element rating" (i.e. seams, barrel, roof, etc) would not change.

SECTION III

Mass of Materials

Timber:

Untreated	3000 lbs/fbm	1360 kg/fbm
Treated	4000 lbs/fbm	1800 kg/fbm
Untreated Piling	25 lbs/ft	37 kg/m
Treated Piling	30 lbs/ft	45 kg/m

Steel Pipe:

356 mm x 7 mm	41.3 lbs/ft	61.3 kg/m
406 mm x 6 mm	42.2 lbs/ft	62.6 kg/m
406 mm x 7 mm	47.4 lbs/ft	70.3 kg/m
508 mm x 7 mm	59.4 lbs/ft	88.1 kg/m
610 mm x 10 mm	94.9 lbs/ft	140.8 kg/m
762 mm x 10 mm	119.1 lbs/ft	176.6 kg/m

Steel Piling:

HP 250 x 62	42 lbs/ft	62 kg/m
HP 310 x 79	53 lbs/ft	79 kg/m
HP 310 x 94	63 lbs/ft	94 kg/m
HP 360 x 132	89 lbs/ft	132 kg/m

Miscellaneous:

3.81 m Flexbeam	90 lbs	40.7 kg
6" x 8" x 5' T.T. Post	75 lbs	33.9 kg
6" x 8" x 7' T.T. Post	100 lbs	45.2 kg

Reinforcing Steel:

Bar Designation		10 M	15 M	20 M	25 M	30 M	35 M
Mass	kg/m	.785	1.570	2.335	3.925	5.495	7.850
	lbs/ft	.53	1.05	1.57	2.63	3.69	5.27

Steel Plate:

Thickness in mm (inches)	kg per square metre	Pounds per square foot
9.5 (3/8)	74.80	15.3
12.7 (1/2)	99.76	20.4
16.0 (5/8)	124.70	25.5
19 (3/4)	149.60	30.6
22 (7/8)	174.57	35.7
25.4 (1)	195.10	40.8
29 (1 1/8)	224.45	45.9
32 (1 1/4)	249.39	51.0
35 (1 3/8)	274.33	56.1
38.1 (1 1/2)	292.27	61.2
44.5 (1 3/4)	349.15	71.4
50.8 (2)	399.02	81.6

Material:

	kg per cubic metre	lbs per cubic foot
Crushed Rock	2000	125
Sand	1925	120
Dry Earth	1550	95
ACP	2325	145
Concrete	2400	150
Water	1000	62.4

Weight of Bridge Materials — Treated Timber

Type	F.B.M.	LBS.	KG.
3" x 8" x 10'	20	80	36
3" x 8" x 12'	24	96	44
3" x 8" x 14'	28	112	51
3" x 8" x 16'	32	128	58
3" x 8" x 18'	36	144	65
3" x 8" x 20'	40	160	73
3" x 8" x 22'	44	176	80
3" x 10" x 10'	25	100	45
3" x 10" x 12'	30	120	54
3" x 10" x 14'	35	140	64
3" x 10" x 16'	40	160	73
3" x 10" x 18'	45	180	82
3" x 10" x 20'	50	200	91
3" x 10" x 22'	55	220	100
3" x 10" x 24'	60	240	109
3" x 10" x 26'	65	260	118
3" x 12" x 10'	30	120	54
3" x 12" x 12'	36	144	65
3" x 12" x 14'	42	168	76
3" x 12" x 16'	48	192	87
3" x 12" x 18'	54	216	98
3" x 12" x 20'	60	240	109
3" x 12" x 22'	66	254	115
3" x 12" x 24'	72	288	131
3" x 12" x 26'	78	312	142
4" x 10" x 8'	27	107	49
4" x 10" x 10'	34	134	60
4" x 10" x 12'	40	160	73
4" x 10" x 14'	47	187	85
4" x 10" x 16'	54	213	97
4" x 10" x 18'	60	240	109
4" x 10" x 20'	67	268	122
4" x 10" x 22'	74	293	133
4" x 10" x 24'	80	320	145
4" x 10" x 26'	87	347	157

Weight of Bridge Materials — Treated Timber

Type	F.B.M.	LBS.	KG.
4" x 12" x 8'	32	128	58
4" x 12" x 10'	40	160	73
4" x 12" x 12'	48	192	87
4" x 12" x 14'	56	224	102
4" x 12" x 16'	64	256	116
4" x 12" x 18'	72	288	130
4" x 12" x 20'	80	320	145
4" x 12" x 22'	88	352	160
4" x 12" x 24'	96	384	174
4" x 12" x 26'	104	416	189
12" x 12" x 8'	96	384	174
12" x 12" x 10'	120	480	217
12" x 12" x 12'	144	576	261
12" x 12" x 14'	168	672	304
12" x 12" x 16'	192	768	348
12" x 12" x 18'	216	864	391
12" x 12" x 20'	240	960	435
12" x 12" x 22'	264	1056	479
12" x 12" x 24'	288	1152	522
12" x 12" x 26'	312	1248	566
12" x 12" x 28'	336	1344	610
12" x 12" x 30'	360	1440	653
12" x 14" x 8'	112	448	203
12" x 14" x 10'	140	560	254
12" x 14" x 12'	168	672	304
12" x 14" x 14'	196	784	355
12" x 14" x 16'	224	896	406
12" x 14" x 18'	252	1008	457
12" x 14" x 20'	280	1120	508
12" x 14" x 22'	308	1232	559
12" x 14" x 24'	336	1344	609
12" x 14" x 26'	364	1456	660
12" x 14" x 28'	392	1568	711
12" x 14" x 30'	420	1680	762

Weight of Bridge Materials — Treated Timber

Type	F.B.M.	LBS.	KG.
6" x 12" x 8'	48	192	87
6" x 12" x 10'	60	240	108
6" x 12" x 12'	72	288	130
6" x 12" x 14'	84	336	152
6" x 12" x 16'	96	384	174
6" x 12" x 18'	108	432	196
6" x 12" x 20'	120	480	218
6" x 12" x 22'	132	528	240
6" x 12" x 24'	144	576	261
6" x 12" x 26'	156	624	283
6" x 14" x 8'	56	224	102
6" x 14" x 10'	70	280	127
6" x 14" x 12'	84	336	152
6" x 14" x 14'	98	392	178
6" x 14" x 16'	112	448	203
6" x 14" x 18'	126	504	229
6" x 14" x 20'	140	560	254
6" x 14" x 22'	154	616	279
6" x 14" x 24'	168	672	304
6" x 14" x 26'	182	728	330
6" x 16" x 8'	64	256	116
6" x 16" x 10'	80	320	145
6" x 16" x 12'	96	384	174
6" x 16" x 14'	112	448	203
6" x 16" x 16'	128	512	232
6" x 16" x 18'	144	576	261
6" x 16" x 20'	160	640	290
6" x 16" x 22'	176	704	319
6" x 16" x 24'	192	768	348
6" x 16" x 26'	208	832	377

Weight of Bridge Materials — Treated Timber

Type	F.B.M.	LBS.	KG.
8" x 20" x 8'	107	426	193
8" x 20" x 10'	134	533	242
8" x 20" x 12'	160	640	290
8" x 20" x 14'	187	747	339
8" x 20" x 16'	213	853	387

Weight of Bridge Materials — Treated Timber

Type	F.B.M.	LBS.	KG.
8" x 20" x 18'	240	960	435
8" x 20" x 20'	267	1066	483
8" x 20" x 22'	294	1173	532
8" x 20" x 24'	320	1280	580
8" x 20" x 26'	346	1384	627
8" x 20" x 28'	373	1492	676
8" x 20" x 30'	400	1600	725

Weight of Bridge Materials — Untreated Timber

Type	F.B.M.	LBS.	KG.
3" x 8" x 10'	20	60	27
3" x 8" x 12'	24	72	32
3" x 8" x 14'	28	84	38
3" x 8" x 16'	32	96	43
3" x 8" x 18'	36	108	49
3" x 8" x 20'	40	120	54
3" x 8" x 22'	44	132	60
3" x 8" x 24'	48	144	65
3" x 10" x 10'	25	75	34
3" x 10" x 12'	30	90	41
3" x 10" x 14'	35	105	48
3" x 10" x 16'	40	120	54
3" x 10" x 18'	45	135	61
3" x 10" x 20'	50	150	68
3" x 10" x 22'	55	165	75
3" x 10" x 24'	60	180	82
3" x 12" x 10'	30	90	41
3" x 12" x 12'	36	108	49
3" x 12" x 14'	42	126	57
3" x 12" x 16'	48	144	65
3" x 12" x 18'	54	162	74
3" x 12" x 20'	60	180	82
3" x 12" x 22'	66	198	90
3" x 12" x 24'	72	216	98
12" x 12" x 10'	120	360	164
12" x 12" x 12'	144	432	196
12" x 12" x 14'	168	504	229

Weight of Bridge Materials — Untreated Timber

Type	F.B.M.	LBS.	KG.
12" x 12" x 16'	192	576	262
12" x 12" x 18'	216	648	294
12" x 12" x 20'	240	720	326
12" x 12" x 22'	264	792	360
12" x 12" x 24'	288	864	392
12" x 12" x 26'	312	936	425
12" x 12" x 28'	336	1008	457
12" x 12" x 30'	360	1080	490
12" x 12" x 32'	384	1152	523

Bailey Bridge Components and Their Weights

	LBS.	KG.
Standard Panel	603	274.00
Panel Pin	6	2.72
End Posts	130	59.00
Transom (floorbeams)	470	213.63
Interior Stringers	183	83.20
Edge Stringers	190	86.40
Sway Brace	65	29.50
Chord Reinforcing	210	95.45
Chord Bolts	8	3.65
Bracing Frame	40	18.20
Raker	18	8.20
Transom Clamp	6	2.72
Bearing	70	31.80
Base Plate	400	181.80
Mark I Link	12	5.45
Mark II Link	28	12.72
Rocking Roller	202	91.80
Plain Roller	105	47.70

SECTION IV

Weights of Precast Units

Calculated Weights of Standard VS Units With Semi-Light Weight Aggregate

Weights in Tonnes

Length	Interior	Curb	Posts
20'	4.763	6.264	4
25'	5.955	7.791	5
30'	7.145	9.359	6
35'	8.336	10.905	6

SM Units Semi-Light Weight Aggregates

Length	Interior	Curb	Posts
6 m	4.73	6.33	3
8 m	6.30	8.45	4
10 m	7.88	10.56	5
11 m	8.67	11.61	5

Calculated Weights of Precast Units in Tonnes. Standard Weight Aggregate

"HC Units"

Length	Interior	Curbs
20'	3.435	4.959
28'	4.728	6.897
33'	5.517	8.067
38'	6.352	9.265

"G Units"

Length	Interior	Curbs
20'	3.475	4.383
28'	4.740	6.260

"VH Units"

Length	Interior	Curbs
20'	3.816	5.336
28'	4.147	5.309
33'	6.765	9.342
38'	7.813	10.690

Calculated Weights of Precast Units in Tonnes.
Standard Weight Aggregate - Con't.

"E Units"

Length	Interior	Curbs
30'	7.963	10.694
35'	9.229	12.464
40'	10.499	14.188
42'	10.998	14.868

"M Units"

Length	Interior	Curbs
40'	11.379	15.839
42'	12.234	16.636
45'	13.117	17.836
50'	14.170	19.782
55'	15.622	21.733
58'	17.377	23.730
58'	Parapet 28.358	

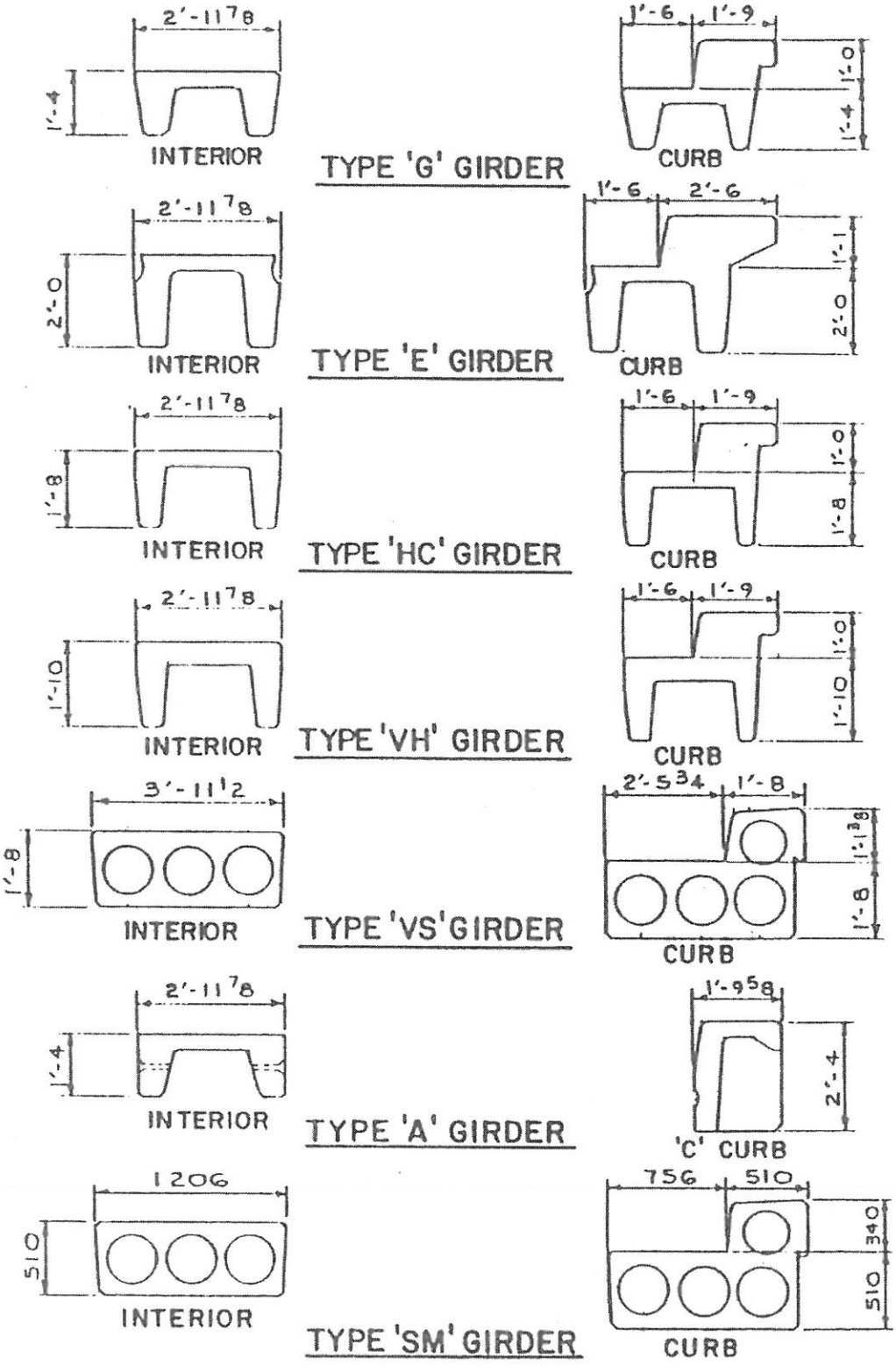
"FC" Units - Standard Weights

Length	Tonnes	Length	Tonnes
40'	16.924	80'	32.668
45'	18.874	85'	34.619
50'	20.917	90'	35.345
55'	22.868	95'	38.612
60'	24.773	100'	47.913
65'	26.724	105'	50.363
70'	28.766	110'	52.722
75'	30.717	115'	55.127

"FC" Units - Semi-Light Weight

Length	Tonnes	Length	Tonnes
85'	26.679	110'	42.123
90'	28.448	115'	44.038
95'	30.036	120'	45.917
100'	38.294	125'	47.866
105'	40.209		

Sketch of Precast Units



Rope Specification Table

All Weights, Footage and Tensile Strength Figures shown on this list are approximate and are subject to the **STANDARD 5% TOLERANCE**.

Size		Tensile Strength			Weight lbs/100 ft		
Dia.	Circ.	Manila	Nylon	Poly-propylene	Manila	Nylon	Poly-propylene
3/16"	9/16"	450	960	725	1.5	1.2	.75
1/4"	3/4"	600	1500	1250	2	1.8	1.1
5/16"	1"	1000	2400	1925	2.9	2.9	1.8
3/8"	1-1/8"	1350	3400	2550	4.1	4.1	2.5
1/2"	1-1/2"	2650	6200	4150	7.5	6.7	4.9
5/8"	2"	4400	10,000	6500	13.1	11.3	8.1
3/4"	2-1/4"	5400	14,000	8700	16.7	14.7	12
7/8"	2-3/4"	7700	19,000	11,000	22.5	23.5	15
1"	3"	9000	24,000	14,400	27	27	17.6
1-1/8"	3-1/2"	12,000	31,500	18,750	36	37	27.6
1-1/4"	3-3/4"	13,500	36,000	21,000	41.8	42	31
1-5/16"	4"	15,000	42,000	24,000	48	48	36
1-1/2"	4-1/2"	18,500	51,000	30,250	60	57	43
1-5/8"	5"	22,500	62,000	36,400	75	72	52
1-3/4"	5-1/2"	26,500	75,000	43,600	90	85	56
2"	6"	31,000	89,500	52,000	108	103	63

Note — Weights and strengths vary with different constructions.

The following tables of loads are included to provide an indication of what can be expected from a hook based on its throat opening. Refer to the manufacturers' ratings for specific values of specific hooks.

Eye Hooks, Shank Hooks, Swivel Hooks

Forged Alloy Steel
(Safety Factor = 5)

Eye Hook

Swivel Hook

Shank Hook

Throat Opening (Inches)	Maximum Safe Working Load (Pounds)
5/8	600
11/16	800
1	1,500
1 1/16	2,000
1 1/8	2,500
1 1/4	4,000
1 3/8	4,500
1 13/32	5,000
1 1/2	5,500
1 17/32	6,000
1 11/16	6,800
1 25/32	8,000
1 7/8	8,400
1 15/16	10,000
2 1/16	10,400
2 1/8	11,000
2 1/4	12,500
2 5/16	13,000
2 1/2	16,000
2 9/16	18,000
3	19,200
3 1/16	20,000
3 3/8	24,000
3 7/16	26,000
4	33,400

Clevis Type

Chain Slip Hooks

(Clevis Type and Eye Type)
Forged Alloy Steel
(Safety Factor = 4)

Eye Type

Throat Opening (Inches)	For Size of Chain (Inches)	Maximum Safe Working Load (Pounds)
15/16	1/4	2,750
1 1/16	5/16	4,300
1 5/16	3/8	5,250
1 9/16	7/16	7,000
1 11/16	1/2	9,000
2	5/8	13,500
2 1/8	3/4	19,250
2 3/4	7/8	26,000
3	1	34,000

Typical Sorting Hook

Forged Alloy Steel

I.D. of Eye	1 1/4"
Opening at Top of Hook	2 13/16"
Safe Working Load 2 1/2" From Tip	2 Tons
Safe Working Load at Bottom of Hook	7 1/2 Tons

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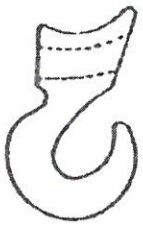
Chain Grab Hooks
(Clevis Type and Eye Type)
Forged Alloy Steel


Clevis Type


Eye Type

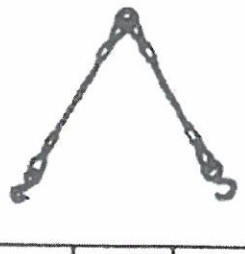
Throat Opening (Inches)	For Size of Chain (Inches)	Maximum Safe Working Load (Pounds)
11/32	1/4	2,750
7/16	5/16	4,300
1/2	3/8	5,250
9/16	7/16	7,000
21/32	1/2	9,000
25/32	5/8	13,500
15/16	3/4	19,250
1 1/16	7/8	26,000
1 3/16	1	34,000

Sliding Choker Hooks
Forged Alloy Steel
(Safety Factor = 5)



Throat Opening (Inches)	For Rope Size (Inches)	Maximum Safe Working Load (Pounds)
1/2	1/4 - 5/16	1,500
5/8	3/8	2,600
7/8	1/2	3,400
1 1/8	5/8	5,100
1 1/8	3/4	8,000
1 7/16	7/8 - 1	15,000
1 3/4	1 1/8 - 1 1/4	23,000
2 3/16	1 3/8 - 1 1/2	30,000

SAFE WORKING LOADS FOR WIRE ROPE

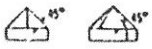
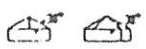
 FLEMISH EYE LOOP	 VERTICAL LIFT	 CHOKER HITCH	 BASKET HITCH			
				 60°	 90°	 120°
				W.L.L. 2 LEGS	W.L.L. 2 LEGS	W.L.L. 2 LEGS
ROPE SIZE (Inches)	TONS (2000 lbs)	TONS (2000 lbs)	TONS (2000 lbs)	TONS (2000 lbs)	TONS (2000 lbs)	TONS (2000 lbs)
1/4	.60	.45	1.20	1.00	.84	.60
3/8	1.34	1.00	2.65	2.30	1.85	1.34
1/2	2.40	1.80	4.80	4.10	3.35	2.40
5/8	3.50	2.60	7.00	6.20	5.00	3.50
3/4	5.40	4.00	10.80	9.20	7.50	5.40
7/8	7.00	5.20	14.00	12.00	9.80	7.00
1	9.10	6.80	18.20	16.00	13.00	9.10
1 1/8	11.30	8.40	22.60	19.40	15.80	11.30
1 1/4	13.50	10.10	27.00	23.20	18.90	13.50
1 3/8	16.40	12.30	32.80	28.20	22.90	16.40
1 1/2	19.40	15.00	38.80	34.00	27.10	19.40
1 5/8	23.50	17.60	47.00	40.40	32.90	23.50
1 3/4	27.00	20.20	54.00	46.40	37.80	27.00
1 7/8	30.50	22.80	61.00	52.40	47.70	30.50
2	35.00	26.00	70.00	60.00	49.00	35.00

CALCULATED ON THE BASIS OF
5 - 1 WORKING LOAD FACTOR

Using Wire Rope Industries Ltd. 6 x 19 or 6 x 37 classification. The regular lay is preformed improved plow steel with independent wire rope centre.

Safe Working Loads for Chain Slings

Nominal Chain Size	Single Chain 90°	Double Chain Slings		
				
mm	kg	kg	kg	kg
7	1500	2500	2100	1500
10	3200	5500	4500	3200
13	5400	9300	7600	5400
16	8000	13,800	11,300	8000
19/20	11,500	19,900	16,200	11,500
inch	lbs	lbs	lbs	lbs
1/4	3300	5500	4620	3300
3/8	7040	12,100	9900	7040
1/2	11,880	20,460	16,720	11,880
5/8	17,600	30,360	24,860	17,600
3/4	25,300	43,780	35,640	25,300

Nominal Chain Size	Triple and Quad Chain Slings		
			
mm	kg	kg	kg
7	3800	3100	2250
10	3800	6700	4800
13	14,000	11,400	8100
16	20,700	16,900	12,000
19/20	29,800	24,300	17,200
inch	lbs	lbs	lbs
1/4	8360	6820	4950
3/8	18,260	14,740	10,560
1/2	30,800	25,080	17,820
5/8	45,540	37,180	26,400
3/4	65,560	53,460	37,840

Calculated on the basis of a 4 – 1 working load factor.

SECTION VII

Miscellaneous

Bolted Connection

Bolt tension

Bolt Size (A325 Bolts)	Minimum Bolt Tension (kilonewtons)
M16 x 2	94.2
M20 x 2.5	147
M24 x 3	212
M30 x 3.5	337
M36 x 4	490

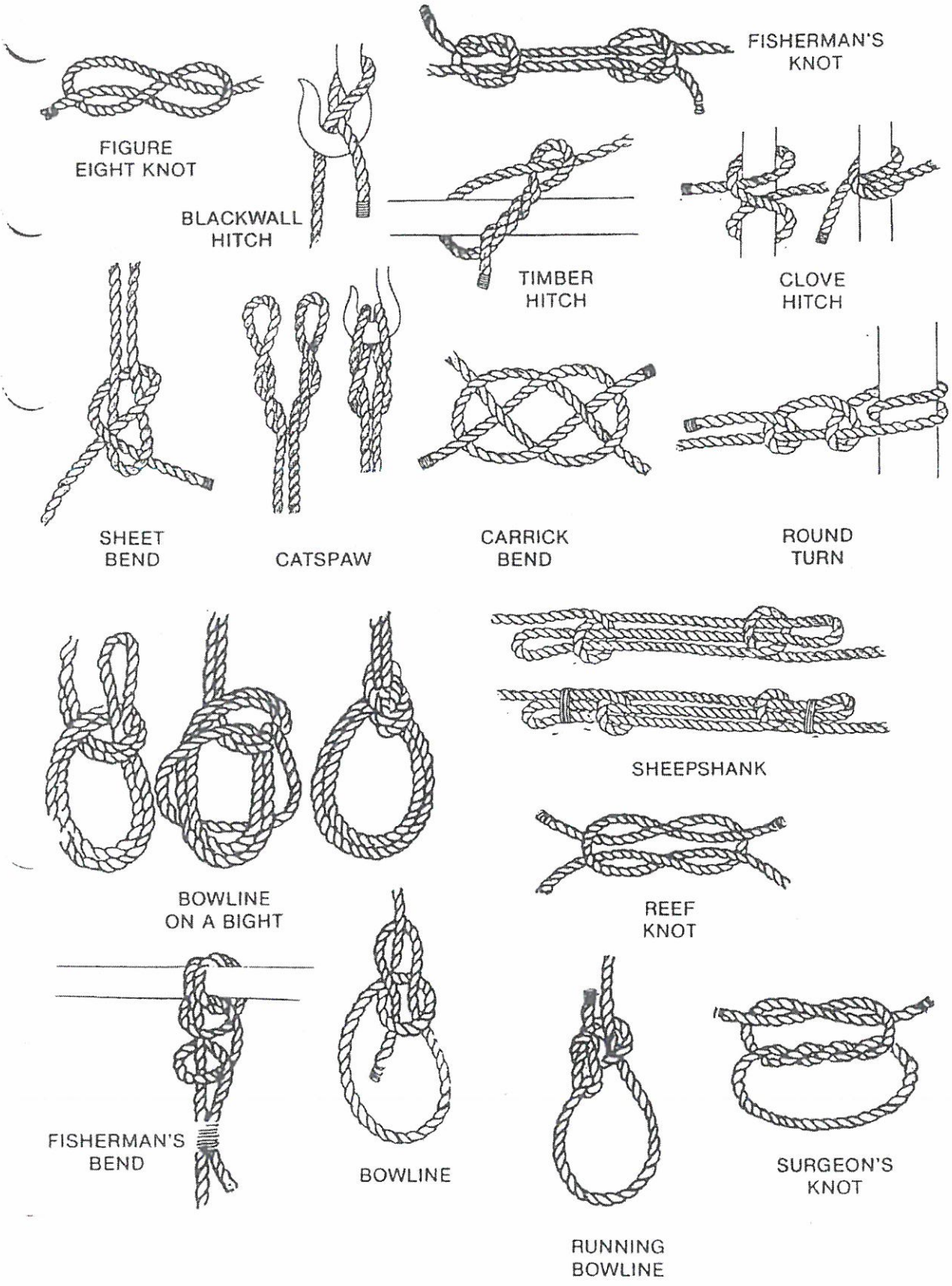
Refer to Construction Specifications Section 6 "Structural Steel Erection" for details and methods of checking bolt tension.

Minimum Edge Distance For Drilled Holes in Members

Bolt Size	Minimum distance center of hole to edge of material
19 mm	32 mm
22 mm	40 mm

Minimum bolt spacing center to center
3 times bolt dia. preferred minimum spacing 76 mm

Rope Knots


FISHERMAN'S KNOT
FIGURE EIGHT KNOT
BLACKWALL HITCH
TIMBER HITCH
CLOVE HITCH
SHEET BEND
CATSPAW
CARRICK BEND
ROUND TURN
SHEEPSHANK
BOWLINE ON A BIGHT
REEF KNOT
FISHERMAN'S BEND
BOWLINE
SURGEON'S KNOT
RUNNING BOWLINE

Metric Conversion Table

In an effort to familiarize readers with the metric system, at least two project features in this issue have measurements entirely in metric. This conversion table is provided as an aid to those who have difficulty in coping with the new system.

When you know	Multiply by	To find
Length		
centimetres (cm)	0.3937	inches
decimetres (dm)	0.3281	feet
	3.281	feet
metres (m)	1.094	yards
kilometres (km)	0.6214	miles
Area		
square centimetres (cm^2)	0.155	square inches
	10.76	square feet
square metres (m^2)	1.196	square yards
square kilometres (km^2)	0.386	square miles
hectares (ha)	2.471	acres
Mass		
grams (g)	0.035	ounces
kilograms (kg)	2.205	pounds
tonnes (t)	1.102	tons
Volume		
litres (L)	0.220	gallons
	35.315	cubic feet
cubic metres (m^3)	1.308	cubic yards
Pressure		
kilopascals (kPa)	0.1450	pounds/square inch
Power		
kilowatts (kW)	1.34	horsepower
Energy		
joules (J)	0.7375	foot-pounds
Newton	9.80665	kilogram FORCE
1KIP =	1000 lbs	
1KIP =	4.448 KN	

Crane & Hoist Signals

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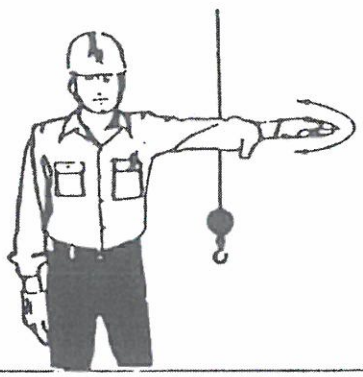
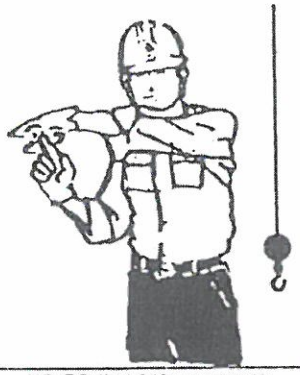
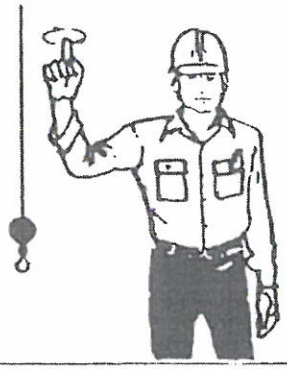


STOP Arm extended, palm down, move hand and forearm in a chopping motion

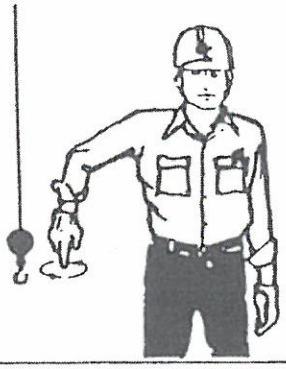
DOG EVERYTHING. Clasp hands in front of body



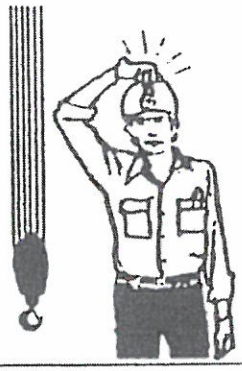
MOVE SLOWLY Use one hand to give any motion signal and place other hand motionless in front of hand giving the motion signal (HOIST SLOWLY SHOWN AS EXAMPLE)



HOIST With forearm vertical, forefinger pointing up, move hand in small horizontal circles

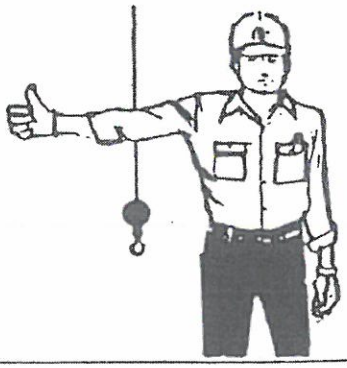


LOWER With arm extended downward, forefinger pointing down, move hand in small horizontal circles.

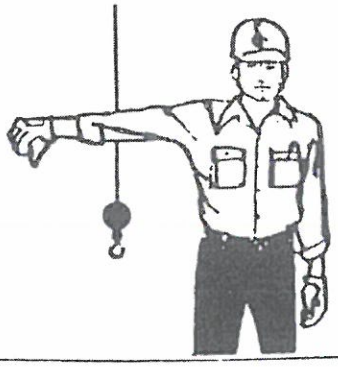


USE MAIN HOIST. Tap fist on head, then use regular signals.

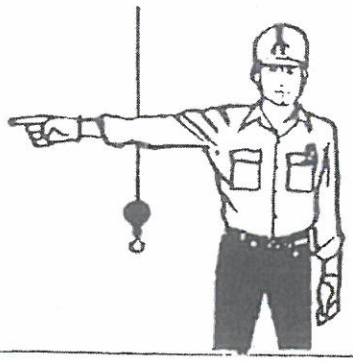
USE WHIPLINE (Auxiliary hoist) Tap elbow with one hand, then use regular signals



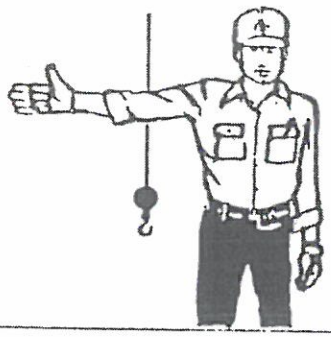
RAISE BOOM Arm extended, fingers closed, thumb pointing upward.



LOWER BOOM Arm extended, fingers closed, thumb pointing downward

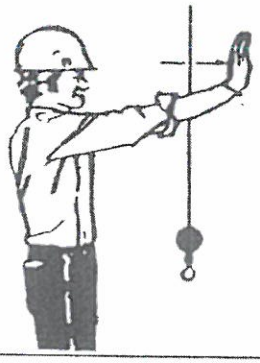


SWING. Arm extended, point with finger in direction of swing of boom



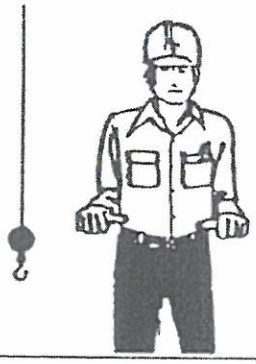
RAISE THE BOOM AND LOWER THE LOAD. With arm extended, thumb pointing up, flex fingers in and out as long as load movement is desired.

LOWER THE BOOM AND RAISE THE LOAD. With arm extended, thumb pointing down, flex fingers in and out as long as load movement is desired

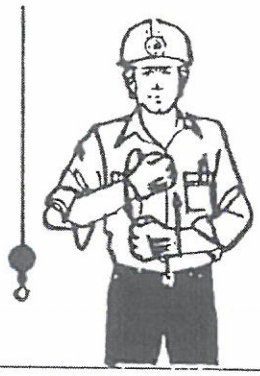


TRAVEL. Arm extended forward, hand open and slightly raised, making pushing motion in direction of travel.

EXTEND BOOM (Telescoping booms) Both fists in front of body with thumbs pointing outward.



RETRACT BOOM (Telescoping booms) Both fists in front of body with thumbs pointing toward each other.



TRAVEL (Crawler Crane, Both Tracks) Arm extended forward, hand open and slightly raised, making pushing motion in direction of travel

TRAVEL (Crawler Crane, One Track) Lock the track on side indicated by raised fist. Travel opposite track in direction indicated by circular motion of other fist rotated vertically in front of body (for crawler cranes only)

SECTION VIII

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Working Limits from Power Lines

Safe Limits of Approach in Metres from Power Lines for Persons and Equipment

Voltages (Line to Ground) kv	Distance m
0 - 5	2.0
5 - 50	3.0
50 - 250	4.5
over 250	6.0

SECTION IX

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Table 1.

Ice Strength For Continuous Travel

These tables are for clear, blue ice on lakes and on rivers. This table does not apply for parked loads, or where ice faults are evident.

Permissible load (clear, blue ice)	Effective Ice Thickness In Millimetres	
	Lake	River
One person on foot	50	60
Group, in single file	80	90
Passenger car 2000 kg	180	210
Light truck 2500 kg	200	230
Medium truck 3500 kg	260	300
Heavy truck 7000 to 8000 kg	350	405
10,000 kg	380	435
25,000 kg	630	725
45,000 kg	800	920
70,000 kg	1000	1150
110,000 kg	1250	1440

Table 2.

Ice Strength for Stationary Loads and Working on Ice

This table applies to loads to be stationary on ice for more than two hours.

Permissible load (clear, blue ice)	Effective Ice Thickness In Millimetres	
	Lake	River
1,000 kg	200	230
2,000 kg	300	350
4,000 kg	450	520
8,000 kg	600	1270
25,000 kg	1100	1730
45,000 kg	1500	1725
70,000 kg	1800	2070
110,000 kg	2300	2650

How to Calculate Effective Thickness

The effective thickness of a base of clear blue ice plus white ice or snow ice is a thickness of clear blue ice of equivalent load bearing strength. The formula to calculate total effective ice thickness is:

Clear + ½ T White = T Effective

Example: 400 mm of clear ice plus 200 mm of snow ice = 400 mm clear + ½ of 200 mm snow ice = 500 mm effective.

Where water lies between layers, use only the depth of the top layer of ice.

Temperature Variations

Daily air temperatures must be constant over a given period so that ice thickness will withstand the permissible loads at outlined in the tables.

When ice is

- Less than 500 mm thick, temperature must be constant for three (3) days.
- Between 500 and 1000 mm thick, temperature must be constant for four (4) days.
- Over 1000 mm thick, temperature must be constant for five days.

During a sudden drop in temperature and for three to five days following such a decline, the minimum ice thickness should be adjusted. If the temperature drop is excessive, severe thermal stressing or cracking of the ice will require caution and temporary load restrictions.

If drop is

5° or less - multiply 1.4 X minimum ice thickness
5° to 10° - multiply 2.0 X minimum ice thickness
10° + - multiply 2.4 X minimum ice thickness

Under thawing temperatures where the average air temperature exceeds 0°C, increase the required ice thickness given in the tables by 20 per cent or, reduce the allowable weight by one-third.

Additional Necessary Precautions

Continuous Use Areas

Construction of flooded areas for ice crossings, parking areas or bridge erection requires daily measurement for ice thickness, air temperature and ice cracks. Currents can create wear to the underside of the ice and reduce its thickness.