BACK RIVER PROJECT

Water Licence 2AM-BRP1831

Part D, Item 3

Gander Culvert Crossing Detailed Report

December 2021

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1. Introduction

The development of the Back River Project (the Project) will require a total of four stream crossings along the proposed Goose Property haul road. Crossings with culvert installations have been designed to convey the design storm peak flows. The design of the crossings was first considered in the Project Feasibility Study, completed in 2015, and since then additional checks and modifications to improve constructability have been completed.

As part of the Detailed Engineering phase, the terrain and permafrost considerations at the water crossings, and various options for these water conveyance structures were re-examined. Trade-off between suitable water conveyance structures were completed to support future decision and design. The text below describes the Gander Crossing location specifically. Drawings for the Gander Culvert Crossing can be found in Appendix A. The construction of this crossing is planned to start in 2022.

2. Gander Culvert Crossing

The Gander Crossing Report has been laid out to address each of the requirements of Part D, Item 3 of Sabina's Back River Project Type A Water Licence (2AM-BRP1831). For ease of comparison, each subheading corresponds directly with the identically alphabetized subheading of Part D, Item 3 of Water Licence, 2AM-BRP1831.

A. DESIGN RATIONALE, REQUIREMENTS, CRITERIA, PARAMETERS, STANDARDS ANALYSIS, METHODS, ASSUMPTIONS AND LIMITATIONS

A summary of design criteria used for culvert sizing is presented in Table A-1.

Table A-1: Culvert Design Criteria

Item	Value	Unit	Source
Event Return Period	100	Years	Design criteria for all-weather service roads from the Back River Project Road Management Plan (Sabina 2018), based on (Best Management Practice (BMP)
Design Flow for Fish Passage	June Q10 (90th percentile June flow)	n/a	Arctic Grayling Passage Criteria – Back River Project (Golder 2021), included as Appendix B

Design flow rates for the culverts were prepared in the project Feasibility Study, which outlines the hydrologic methods and assumptions. Some additional checks on these values were completed in 2019.

A summary of design flow rates is presented in Table A-2, including the 100-year and June Q10 daily flows and include the diverted flows from Rascal Stream East due to the proposed airstrip extension.

Table A-2: Back River Culvert Design Flows

Culvert	Approximate Catchment Area [km^2]	100-year Daily Flow [m^3/s]	June Q10 Flow [m^3/s]
Gander Crossing	31.9[(a)]	5.14	2.00

a) Drainage area including the diverted flows from Rascal Stream East due to the proposed airstrip extension

The design of the culverts and velocity mitigation features (i.e., boulder clusters) were developed to permit fish passage. The design considered the distance Arctic Grayling could swim before fatigue under the fish passage design flows (June Q10 [90^{th} percentile June flows]) and resulting velocity of 1.33 m/s calculated using the DFO Swim Performance Online Tools (SPOT), described in more detail in Appendix B (Arctic Grayling Passage Criteria – Back River Project).

B. SITE SPECIFIC DATA AND ANALYSIS TO SUPPORT THE DESIGN AND MANAGEMENT DECISIONS

The Gander Crossing is located on Rascal Stream West between Gander Pond and Goose Lake, downstream of Rascal Lake. The area is characterised by low-relief tundra with exposed bedrock and localized fluvial sand and gravel deposits.

The crossing consists of two multiplate pipe arches located at the primary channel, and one round corrugated steel culvert at the secondary channel. The primary channel includes two culverts to keep flow velocities within acceptable levels for fish passage and to provide adequate conveyance capacity for the design event. Within the pipe arch culverts, existing stream bed substrate and boulder clusters will be placed to provide natural substrates to mimic the natural channel and resting zones for fish passage. Both the primary and secondary channel culverts are embedded.

Riprap armouring at the upstream and downstream end of culverts for both the primary and secondary channel designed to the 100-year event is included to protect against erosion and scouring.

Multiplate pipe arch structural drawings for the primary channel and design and installation drawings for the primary and secondary channel can be found in Appendix A.

The design event for the Gander Crossing has been set as the 100-year event (as outlined in Table A-1).

C. GEOCHEMICAL ANALYSIS OF WASTE ROCK AND FILL, DEMONSTRATING THEIR ACID ROCK DRAINAGE AND METAL LEACHING CHARACTERISTICS

Sabina is committed to using only non-potentially acid generating (NPAG) rock for the construction of the Gander Crossing. A summary of acid rock drainage (ARD) and metal leaching characteristics for potential quarry rock and waste rock sources is provided below, along with the associated geochemical segregation criteria and requisite confirmatory sampling. Additional information can be found in the Type A Water Licence (2AM-BRP1831) associated documentation: Borrow Pits and Quarry Management Plan (QMP), Mine Waste Rock Management Plan (WRMP), Environmental Management and Protection Plan (EMPP), and Geochemical Characterization Report (Main Application Document [MAD] Appendix E-3).

C.1 Quarry Rock at the Goose Property

Detailed geochemical characterization studies to assess the metal leaching (ML) and acid rock drainage (ARD) potential of quarry and waste rock sources at the Goose Property was carried out as part of the Final Environmental Impact Statement. Over 700 samples from the Goose Property were analyzed, including acid base accounting (ABA) and trace element analyses, during this characterisation study; details of this sampling program and the subsequent results can be found in the Geochemical Characterization Report (MAD Appendix E-3).

Sabina has identified multiple appropriate NPAG material sources at the Goose Property, including the Airstrip Quarry, Goose Plant Site, as well as others. For any potential quarry source, Sabina will adhere to the same geochemical criteria, sampling requirements, and reporting commitments outlined below.

Consistent with the waste rock classification criteria in the WRMP, the criteria that will be used to classify NPAG material to be used for construction from any quarry source will be an neutralization potential/acid generation potential (NP/AP) ratio of greater than 3, or a sulphur content of less than 0.15% (Table C-1). The classification criteria presented below is supported by the results of ABA, net acid generation (NAG) testing, and kinetic testing, and provides an appropriate level of conservatism; additional details on these testing programs and criteria rationale described in the Geochemical Characterization Report (MAD Appendix E-3).

Table C-1: Site-Specific Geochemical Classification Criteria

Acid Generation Potential	Criteria	Comments
Non-Potentially Acid Generating	NP/AP > 3 or total S < 0.15%	These samples are not expected to generate acidity
Potentially Acid Generating	NP/AP < 3	Potentially acid generating or uncertain acid generation potential owing to uncertainty in availability and reactivity of bulk NP

As stipulated in the Project Certificate Terms and Conditions, Sabina will develop site-specific quarry operation and management plans in advance of the development of any potential quarry site or borrow pit (PC No. 007, TC#16). This plan will be submitted to the Nunavut Impact Review Board (NIRB) and the Kitikmeot Inuit Association (KIA) at least 30 days prior to the use of borrow or quarry sites for review. Information regarding Sabina's fulfillment of this Term and Condition and the identification of any amendments to existing site-specific quarry operation and management plans will also be provided annually in Sabina's annual report to the NIRB. In addition, Sabina will continue to provide site-specific quarry operation and management plans to the NIRB and the KIA at least 30 days prior to the use of borrow or quarry sites for review. Any amendments to existing site-specific quarry operation and management plans shall be provided in Sabina's annual report to the NIRB.

C.2 Quarry Monitoring

The following quarry monitoring activities will be completed during construction to verify the effectiveness of the geochemical segregation criteria outlined in Table C-1:

- Quantities of the NPAG quarry rock produced during quarry operations, and the amounts placed in each of the infrastructure components will be recorded on a daily basis and a monthly summary will be provided in the Annual Report. Quantities of PAG excavated and deposited in the WRSAs will also be recorded.
- Geochemical monitoring will be completed to confirm that all of the quarry rock used for construction is NPAG. Confirmatory samples will be taken at a rate of one sample per 100,000 tonnes

of mined material from NPAG areas within the quarries. The collected samples will be sent to an accredited commercial laboratory for ABA tests (with NP determination using the Modified Sobek method) and NAG tests.

Quarry development and results of sampling will be provided in summary form will be reported to the Nunavut Water Board (NWB) through the Water Licence Annual Report (2AM-BRP1831, Schedule B). Additional details on quarry monitoring are outlined in the QMP, and details on other water monitoring related to the quarries are included in the EMPP.

D. CONSTRUCTION METHODS AND PROCEDURES REGARDING HOW INFRASTRUCTURE WILL BE PUT IN PLACE, INCLUDING QUALITY ASSURANCE AND QUALITY CONTROL MEASURES AND EQUIPMENT TO BE USED

Engineered Drawings (19-463-B_IFC and 20412211-2000-2670-Rev0) for the Back River Project Gander Crossing can be found in Appendix A; construction methods and procedures are outlined in the bulleted design consideration section of these drawings.

E. TECHNICAL SPECIFICATIONS FOR SEDIMENTATION, EROSION CONTROL AND BANK STABILIZATION MEASURES, INCLUDING PROPOSED MATERIALS, LOCATION AND EXTENT, PLACE METHODS AND QUANTITIES REQUIRED

The following management and mitigation measures will be adhered to during the construction of the Gander Crossing; refer to the Type A Water Licence Road Management Plan for additional details.

Mitigation by Erosion and Sediment Control

- The area of landscape disturbance will be minimized, and restoration will occur as soon as possible in order to minimize erosion potential.
- Silt fences will be used in areas of cuts and excavations, downslope from exposed or erodible areas to prevent sedimentation of waterbodies.
- Effective erosion and sediment control measures will be installed before starting work to prevent sediment from entering the waterbody.
- Site isolation measures (e.g., silt boom or silt curtain) will be used to contain suspended sediment where in-water work is required.
- Regular inspection and maintenance of erosion and sediment control measures and structures will be conducted during the course of construction.

Mitigation by Shoreline/bank re-vegetation and stabilization

- Clearing of riparian vegetation will be kept to a minimum to avoid disturbance to the riparian vegetation and prevent soil compaction.
- If replacement rock reinforcement/armouring is required to stabilize eroding or exposed areas, appropriately-sized, clean rock will be installed at a similar slope to maintain a uniform bank/shoreline and natural stream/shoreline alignment.
- Exposed landscape surfaces will be protected, where possible, by the installation of covering material like riprap, aggregate, or rolled erosion control products.

- Decommissioning of the roads will involve restoring natural drainages, and stabilizing any slopes where there is potential for erosion; stabilization measures may require pulling back of side-cast fills on locally steep slopes or buttressing and/or re-contouring of steepened slopes using non acid generating material.

Mitigation by Operation of Machinery

- All heavy machinery used during construction will stay above the high-water mark to the greatest extent possible.
- Temporary crossings may be utilized if necessary to limit fording of watercourses.
- All machinery will arrive on site in a clean condition and maintained free of fluid leaks, invasive species and noxious weeds.
- All fueling will be done away from watercourses and water bodies, and a spill protocol will be in place.

Following the installation of the crossing structures, inspections and monitoring will be performed prior to, and during the spring freshet. Inspections will include daily visual assessments of ice blockages prior to the spring freshet, followed by visual assessments for erosion and sedimentation for the duration of the spring freshet. For fish-bearing crossings, turbidity levels will be monitored weekly during spring conditions or periods of high flow for the first year of operation of crossing structures.

F. TIMETABLE FOR SUBMISSION, INCLUDING DATE OF CONSTRUCTION AND PROPOSED DATE OF COMMISSIONING OF INFRASTRUCTURE; AND

Construction of the Gander Crossing is planned to occur in early Q1 of 2022, and the crossing will take approximately 3 weeks to complete.

Sabina will submit to the NWB for review, within ninety (90) days of completion of the Gander Crossing, a Construction Summary Report prepared by a qualified Engineer(s) in accordance with Schedule D, Item 1 of the Type A Water Licence (2AM-BRP1831).

G. WHERE REQUIRED, SIGNATURE AND SEAL BY THE APPROPRIATELY QUALIFIED ENGINEER.

Engineered Drawings (19-463-B_IFC and 20412211-2000-2670-Rev0)) for the Back River Project Gander Crossing can be found in Appendix A.

Appendix A Crossing Drawings

KEY PLAN
SCALE: NTS

ARMTEC CUSTOMER

SABINA GOLD & SILVER
1800, 555 BURRARD STREET
VANCOUVER, BC V7X 1E5
TEL: 604-818-6368

SABINA GOLD & SILVER
GANDER - PRIMARY CHANNEL PIPE ARCH

WESTERN KITIKMEOT REGION OF NUNAVUT
3890 SPAN x 2690 RISE SPCSP MULTIPLATE CULVERT
(152 x 51 CORRUGATION)
MP-PA-09 PIPE ARCH STRUCTURE
ARMTEC PROJECT #19-463-B

DRAWING INDEX

DRAWING #	DRAWING TITLE	REV. DATE	REV #
19-463-B-001	COVER PAGE	2021-08-13	1
19-463-B-002	ABBREVIATIONS AND SYMBOLS	2021-08-13	1
19-463-B-003	DESIGN NOTES	2021-08-13	1
19-463-B-004	SITE PLAN, LONGITUDINAL PROFILE	2021-08-13	1
19-463-B-005	GEOMETRY AND BACKFILL SECTION	2021-08-13	1
19-463-B-006	STRUCTURE LAYOUT	2021-08-13	1
19-463-B-007	PLATE LAPPING DETAILS	2021-08-13	1
19-463-B-008	RECOMMENDED PLATE ASSEMBLY AND BACKFILL OPERATION NOTES, CLOSED-SHAPE, PIPE ARCH OR ELLIPSE STRUCTURES	2021-08-13	1
19-463-B-009	BILL OF MATERIALS	2021-08-13	1

REGISTERED PROFESSIONAL ENGINEER
S. J. MACRAE
LICENSEE
NT/NU
Aug 17/21

PERMIT TO PRACTICE
ARMTEC INC.
Signature S MacRae
Date Aug 17/21
PERMIT NUMBER: P 1307
NT/NU Association of Professional Engineers and Geoscientists

CANADA'S BEST MANAGED COMPANIES

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SYMBOLS & NOTATIONS

- ⌒ TRUE LENGTH OF AN ARC
- ∠ ANGLE
- ≈ ALMOST EQUAL (APPROXIMATE)
- BREAK LINE
- ℄ CENTRE LINE
- ° DEGREES
- Δ DELTA (QUANTITY DIFFERENCE)
- Ø DIAMETER
- ± TOLERANCE
- γ UNIT WEIGHT OF SOIL
- WATER LEVEL
- DITCH/CREEK WITH FLOW DIRECTION
- BENCHMARK, ELEVATION LOCATION
- NORTH ARROW
- 1/002 SECTION SYMBOL
- 1/002 VIEW SYMBOL
- 1/002 DETAIL REFERENCE SYMBOL
- 0 REVISION INDICATOR
- COMPACTED BEDDING
- TRENCH REINFORCEMENT

COMMON ABBREVIATIONS

BCL	BOTTOM CENTRE LINE
C/C	CENTRE TO CENTRE
CLSM	CONTROLLED LOW-STRENGTH MATERIAL
CSP	CORRUGATED STEEL PIPE
C_u	COEFFICIENT OF UNIFORMITY – CHARACTERISTIC OF SOIL GRADATION CURVE
C_c	COEFFICIENT OF CURVATURE – CHARACTERISTIC OF SOIL GRADATION CURVE
EL	ELEVATION
I/S	INSIDE
INV	INVERT
LHF	LEFT HAND FORWARD
N	CIRCUMFERENTIAL BOLT HOLE SPACING (1N = 244 mm)
NA	NEUTRAL AXIS
NTS	NOT TO SCALE
OBV	OBVERT
O/O	OUTSIDE TO OUTSIDE
O/S	OUTSIDE
RHF	RIGHT HAND FORWARD
SPCSP	STRUCTURAL PLATE CORRUGATED STEEL PIPE
STA	STATION
TCL	TOP CENTRE LINE
TYP	TYPICAL
UON	UNLESS OTHERWISE NOTED
U/S	UNDERSIDE

DETAIL NUMBER

X

X

DETAIL SOURCE SHEET NUMBER, *OR* DETAIL LOCATION SHEET NUMBER

COMMON TERMS

BEDDING:
THE ENGINEERED SOIL ON WHICH THE CLOSED CONDUIT IS SUPPORTED.

CAMBER:
AN ADJUSTMENT REQUIRED IN THE LONGITUDINAL PROFILE OF BEDDING TO COMPENSATE FOR POST-CONSTRUCTION SETTLEMENT.

CONDUIT:
THE BRIDGED OPENING OF A BURIED STRUCTURE. NOTE: THROUGHOUT THESE DRAWINGS, 'CONDUIT' AND 'CULVERT' SHALL INDICATE THE SAME STRUCTURE.

COVER (COVER HEIGHT):
THE VERTICAL DISTANCE BETWEEN THE ROADWAY SURFACE (OR BOTTOM OF TIE FOR RAILWAYS) AND THE OUTSIDE CREST OF THE CONDUIT WALL.

CROWN:
THE HIGHEST POINT OF THE TRANSVERSE SECTION OF THE CONDUIT WALL.

ENGINEERED BACKFILL:
SOIL SELECTED AND PLACED TO ACHIEVE DESIRED GEOTECHNICAL PROPERTIES.

ENGINEERED BACKFILL ENVELOPE:
DEFINED ZONE OF ENGINEERING BACKFILL SURROUNDING THE CONDUIT.

HEADWALL:
A TRANSVERSE WALL AT THE END OF A CULVERT.

HAUNCH / CORNER:
THE PORTION OF THE CONDUIT WALL BETWEEN THE SPRING LINE AND THE TOP OF THE BEDDING.

INSIDE VIEW:
FLAT PLAN VIEW OF A CONDUIT PLATE LAYOUT VIEWING THE INSIDE OF THE STRUCTURE, WHERE PLATES ARE SHOWN WITH VISIBLE INSIDE FACES.

INVERT:
THE LOWEST POINT OF THE INSIDE TRANSVERSE SECTION OF THE CONDUIT WALL.

LONGITUDINAL DIRECTION:
THE DIRECTION ALONG THE CULVERT LENGTH.

MASTER CORNER HOLE:
CORNER HOLE IN THE OUTSIDE VALLEYS CLOSEST TO THE VISIBLE EDGE.

OBVERT:
THE HIGHEST POINT OF THE INSIDE TRANSVERSE SECTION OF THE CONDUIT WALL.

OUTSIDE VIEW:
FLAT PLAN VIEW OF A CONDUIT PLATE LAYOUT VIEWING THE OUTSIDE OF THE STRUCTURE, WHERE PLATES ARE SHOWN WITH VISIBLE OUTSIDE FACES.

PERIPHERY:
PERIMETER OF A STRUCTURE OPENING ALONG THE CIRCUMFERENTIAL SEAM, EXPRESSED IN MULTIPLES OF 'N'.

PLATE:
AN INDIVIDUAL SEGMENT USED IN THE FORMATION OF THE CONDUIT, CONSISTING OF A CORRUGATED METAL SHEET.

RING:
COMBINATION OF PLATES FORMING AN ANNULAR CONFIGURATION OF THE CONDUIT.

RISE:
THE MAXIMUM VERTICAL CLEARANCE INSIDE A CONDUIT AT A TRANSVERSE SECTION, MEASURED AT THE INSIDE CREST OF THE CORRUGATIONS OF METAL STRUCTURES.

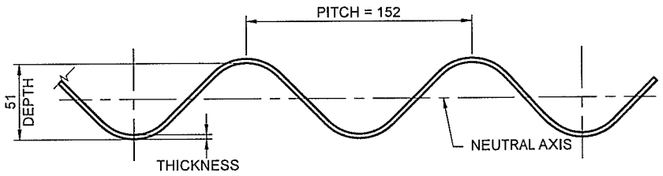
SEAM:
JOINT BETWEEN STRUCTURAL STEEL PLATES FORMED BY OVERLAPPING AND BOLTING PLATES TOGETHER.
A) CIRCUMFERENTIAL SEAM: SEAM RUNNING PERPENDICULAR TO THE LENGTH OF THE CULVERT.
B) LONGITUDINAL SEAM: SEAM RUNNING PARALLEL TO THE LENGTH OF THE CULVERT.

SKEW ANGLE:
THE ANGLE BETWEEN THE LONGITUDINAL AXIS OF A CULVERT AND A LINE PERPENDICULAR TO THE CENTRELINE OF THE ROAD.

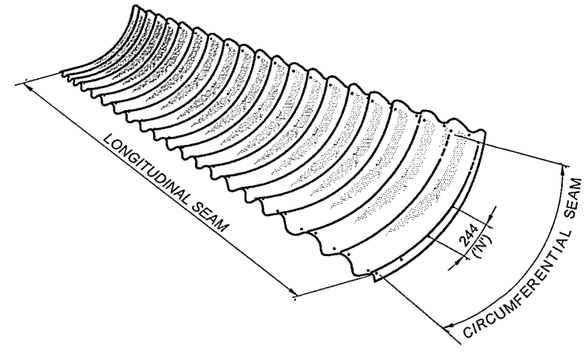
SPAN:
THE HORIZONTAL WIDTH BETWEEN THE SIDE WALLS OF THE CONDUIT, MEASURED AT THE INSIDE CRESTS OF THE CORRUGATIONS.

SPRING LINE:
THE HORIZONTAL LINE CONNECTING THE OUTER MOST POINTS OF THE CONDUIT.

VISIBLE EDGE OF PLATE:
EXPOSED EDGE OF STEEL, LOCATED AT THE LONGITUDINAL SEAM.



152 X 51 mm MULTIPLATE CORRUGATION
SCALE 1:4



DETAIL OF CURVED MULTIPLATE

PERMIT TO PRACTICE
ARMTEC INC.
Signature S Macrae
Date AUG 17/21
PERMIT NUMBER: P 1307
NT/NU Association of Professional Engineers and Geoscientists

REGISTERED PROFESSIONAL ENGINEER
S. J. MACRAE
LICENSEE
NT/NU
AUG 17/21

REV.	REVISION NOTE	BY	CK'D	REV'D	DATE
1	ISSUED FOR CONSTRUCTION	JK	SM	SM	2021-08-13
0	ISSUED FOR CONSTRUCTION	JK	SM	SM	2021-06-30
A	ISSUED FOR APPROVAL	CG	TCB	MA	2021-06-25

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APPROVALS		DATE
DESIGN BY	M.A.	2021-06-18
DESIGN CHECK	A.R.	2021-06-18
DRAFT BY	CG	2021-06-23
DRAFT CHECK	TCB	2021-06-24

CUSTOMER: SABINA GOLD & SILVER
PROJECT NAME: GANDER - PRIMARY CHANNEL PIPE ARCH
WESTERN KITIKMEOT REGION OF NUNAVUT
DRAWING TITLE: ABBREVIATIONS AND SYMBOLS

SALES ORDER NO.	SHEET NO.	SCALE	PROJECT NO.	DRAWING NO.	REV.
231548	2 OF 9	AS NOTED	19-463-B	002	1

GENERAL DESIGN NOTES

1. DIMENSIONS

1.1. THE FOLLOWING DIMENSIONAL CONVENTIONS ARE FOLLOWED, UNLESS OTHERWISE NOTED:
1.2. ALL DIMENSIONS ARE IN MILLIMETERS (mm)
1.3. ALL ELEVATIONS ARE IN METERS (m)
1.4. ALL DIMENSIONS ARE SUBJECT TO MANUFACTURING TOLERANCES.
1.5. ALL DIMENSIONS ARE TO THE INSIDE CREST OF STEEL.
1.6. ALL DIMENSIONS ARE TO THE CENTRE OF BOLT HOLE.
1.7. 1N = 244 mm.
1.8. ARMTEC RESERVES THE RIGHT TO MODIFY THE PLATE ARRANGEMENT WITHOUT NOTICE BASED ON PLATE AVAILABILITY AT TIME OF FABRICATION.

2. DESIGN STANDARDS

2.1. CANADIAN HIGHWAY BRIDGE DESIGN CODE CAN/CSA-S6-19.
2.2. CANADIAN STANDARDS ASSOCIATION (CSA).
2.3. ASTM INTERNATIONAL (ASTM).

3. DESIGN PARAMETERS

3.1. SERVICE LOADS
3.1.1. LIVE LOAD: CAT 775G (G.V.W. = 111812 KG)
3.1.2. DEAD LOAD: SOIL COVER AS NOTED ON LONGITUDINAL PROFILE SECTION.
3.2. CONSTRUCTION LOADS (ASSUMED CONFIGURATION).
3.2.1. 1500 lbs WACKER COMPACTOR 200 mm MINIMUM COVER (FOR COMPACTING BACKFILL MATERIAL).
3.2.2. CATERPILLAR D-4 DOZER 600 mm MINIMUM COVER (FOR SPREADING BACKFILL MATERIAL)
3.2.3. 3000 lbs DOUBLE DRUM VIBRATORY COMPACTOR 600 mm MINIMUM COVER (FOR COMPACTING BACKFILL MATERIAL).
3.2.4. MINIMUM COVER REQUIREMENT FOR THE CONSTRUCTION LOADS HEAVIER THAN THE ABOVE SHALL BE APPROVED BY DESIGN ENGINEER.
3.3. UNIT WEIGHT OF ENGINEERED SOIL 22 kN/m³.
3.4. UNIT WEIGHT OF RANDOM FILL SOIL 22 kN/m³.
3.5. DESIGN SERVICE LIFE 25 YEARS.
3.6. SITE ENVIRONMENTAL LIMITS (WATER):

pH = 6 - 9	SULPHATES: ≤ 240 ppm
RESISTIVITY: ≥ 2000 ohm-cm	HARDNESS: > 80 ppm
CHLORIDES: ≤ 50 ppm	MAXIMUM ABRASION LEVEL 2: FLOW VELOCITY: ≤ 1.5 m/s WITH MINOR BEDLOADS OF SAND AND GRAVEL

4. MATERIAL SPECIFICATIONS

4.1. MULTIPLATE STEEL SHALL CONFORM TO CAN/CSA G401-14.
4.2. DESIGN YIELD STRENGTH OF PLATE 230 MPa.
4.3. Ø 3/4" BOLTS SHALL CONFORM TO CAN/CSA G401-14 AND ASTM A 449, TYPE 1.
4.4. Ø 3/4" NUTS SHALL CONFORM TO CAN/CSA G401-14 AND ASTM A 563, GRADE C.
4.5. PROTECTIVE COATING
4.5.1. PLATES: HOT-DIP GALVANIZED, 915 g/m² (Z915) ZINC COATING MASS (TOTAL ON BOTH SIDES) CONFORMING TO CAN/CSA G401-14 AND ASTM A123.
4.5.2. BOLTS: HOT-DIP GALVANIZED ACCORDING TO ASTM A153, CLASS C, OR MECHANICALLY GALVANIZED ACCORDING TO ASTM B 695, CLASS 55.
4.5.3. NUTS: HOT-DIP GALVANIZED ACCORDING TO ASTM A153, CLASS C, OR MECHANICALLY GALVANIZED ACCORDING TO ASTM B 695, CLASS 55.
4.5.4. BOLTS AND NUTS, OR ANCHOR BOLTS AND NUTS, SHALL BE COATED USING THE SAME ZINC COATING PROCESS.
4.5.5. REPAIR OF DAMAGED GALVANIZED COATING SHALL BE DONE IN ACCORDANCE WITH CSA G401-14, CLAUSE 6.2 WITH A ZINC-RICH COATING COMPLYING WITH ASTM A780.

5. FOUNDATION

5.1. MAXIMUM UNFACTORED INVERT / CORNER PRESSURE = 260 kPa. CONFIRMATION OF ADEQUATE SOIL BEARING CAPACITY IS THE RESPONSIBILITY OF THE CONTRACTOR'S / OWNER'S GEOTECHNICAL ENGINEER.
5.2. ALL UNSUITABLE MATERIAL WITHIN THE FOUNDATION ZONE SHALL BE REMOVED AND REPLACED WITH SUITABLE MATERIAL AS DETERMINED AND APPROVED BY THE CONTRACTOR'S / OWNER'S GEOTECHNICAL ENGINEER.

6. ASSEMBLY

6.1. LONGITUDINAL SEAMS SHALL BE OVERLAPPED TO ENSURE THE HOLE IN THE VALLEY IS CLOSEST TO THE VISIBLE EDGE WHEN VIEWED FROM THE INSIDE OR OUTSIDE.
6.2. BOLT HEADS CAN BE PLACED ON THE INSIDE OR OUTSIDE OF THE CONDUIT WALL, WHICHEVER FACILITATES THE BEST INSTALLATION.
6.3. CURVED SURFACE OF NUT TO BEAR AGAINST THE MULTIPLATE.
6.4. BOLTS SHALL HAVE A MINIMUM OF TWO (2) THREAD PITCHES PROTRUDING BEYOND THE NUT FACE AND BE TORQUED WITHIN THE FOLLOWING RANGE:
MINIMUM 200 Nm (150 ft lbs)
MAXIMUM 340 Nm (250 ft lbs)
6.5. CARE SHALL BE TAKEN TO AVOID OVERTORQUING OF BOLTS.
6.6. ONE EDGE OF EACH MULTIPLATE SHALL BE PAINTED ORANGE FOR A DISTANCE OF 300-600mm. THE PAINTED EDGE MUST BE ON THE OUTSIDE OF THE STRUCTURE.

7. ENGINEERED BACKFILL AND BEDDING MATERIAL

7.1. BURIED CORRUGATED STEEL PLATE STRUCTURE IS A COMPOSITE SYSTEM MADE UP OF THE STEEL RING AND THE SOIL ENVELOPE, AND BOTH ELEMENTS PLAY A VITAL PART IN THE STRUCTURAL INTEGRITY OF THE COMPOSITE SYSTEM THROUGHOUT THE SERVICE LIFE. IT IS THEREFORE IMPORTANT TO ENSURE THAT ENGINEERING BACKFILL IS MADE UP OF ACCEPTABLE MATERIAL AND WELL-CONSTRUCTED.
7.2. ENGINEERING BACKFILL MATERIAL SHALL BE CLEAN, GRANULAR, AND POSSESS TIME-INDEPENDENT PROPERTIES.
7.3. BACKFILL MATERIAL SHALL CONSISTS OF A WELL GRADED GRANULAR MATERIAL WITH ANGULAR GRAINS AND MEET FOLLOWING REQUIREMENTS:
7.3.1. MAXIMUM PARTICLE SIZE SHALL NOT EXCEED 75 mm.
7.3.2. MAXIMUM PARTICLE SIZE FOR BEDDING SHALL NOT EXCEED 25 mm.
7.3.3. COEFFICIENT OF CURVATURE: $1 \le Cc \le 3$ WHERE, $Cc = D_{30}^2 / (D_{10} \times D_{60})$
7.3.4. COEFFICIENT OF UNIFORMITY: $Cu \ge 7$, WHERE, $Cu = D_{60} / D_{10}$
7.3.5. MINIMUM GRAVEL CONTENT (PARTICLE SIZE > 4.75 mm): 30%
7.3.6. MAXIMUM FINES CONTENT (PASSING THROUGH #200 SIEVE): 10%.
7.4. PARTICLE ANGULARITY: PERCENTAGE OF FRACTURED GRAVEL PARTICLE (2 FACES) SHALL BE MORE THAN 50 (ASTM D5821).
7.5. PARTICLE DURABILITY: L.A. ABRASION COARSE AGGREGATE LOSS SHALL NOT EXCEED BY 35% AS DETERMINED BY L.A. ABRASION TEST (AASHTO T96).
7.6. DELETERIOUS DURABILITY:
7.6.1. BACKFILL MATERIAL SHALL BE FREE FROM FOREIGN MATTER.
7.6.2. FROZEN MATERIAL SHALL NOT BE ALLOWED IN THE BACKFILL ZONE.
7.7. PLASTICITY INDEX (PI) OF FINE GRAINED PORTION OF THE SOIL SHALL BE LESS THAN 10 (ASTM D4318). PLASTICITY INDEX CAN BE WAIVED IF FINES CONTENT IS LESS THAN OR EQUAL TO 5%.
7.8. ELECTROCHEMICAL LIMITS FOR GALVANIZED PLATES:

pH: 5 – 10	(AASHTO T289-91 OR EQUIVALENT)
RESISTIVITY: ≥ 3000 ohm-cm	(AASHTO T288-91 OR EQUIVALENT)
CHLORIDES: ≤ 100 ppm	(AASHTO T291-91 OR EQUIVALENT)
SULPHATES: ≤ 200 ppm	(AASHTO T290-91 OR EQUIVALENT)
ORGANIC CONTENT: ≤ 1%	(AASHTO T267-86 OR EQUIVALENT)

7.9. COMPACTION
7.9.1. MAXIMUM UNCOMPACTED LIFT HEIGHT SHALL BE 200 mm.
7.9.2. EACH LAYER SHALL BE COMPACTED TO MINIMUM OF 95% STANDARD PROCTOR DENSITY ASTM D 698.
7.9.3. OPTIMUM MOISTURE CONTENT SHALL BE MAINTAINED DURING COMPACTION ASTM D 698.
7.10. BALANCED BACKFILLING: ROADWAY SKEW ANGLE SHALL BE LESS THAN 40 DEGREES. FOR SKEW ANGLE GREATER THAN 20 DEGREES EARTH PRESSURE IMBALANCE SHALL BE ACCOMMODATED BY CONTOUR GRADING OF EMBANKMENT SLOPE.

8. QUALITY ASSURANCE & INSPECTION

8.1. QUALITY ASSURANCE OF THE COMPLETE PROJECT INCLUDING FOUNDATION AND BACKFILL MATERIAL AND PLACEMENT SHALL BE COMPLETED IN ACCORDANCE WITH THE CONTRACT REQUIREMENTS AND NOT BE THE RESPONSIBILITY OF ARMTEC.
8.2. THE CONTRACTOR'S / OWNER'S REPRESENTATIVE SHALL ALSO BE RESPONSIBLE FOR ENSURING THAT THE FOLLOWING ITEMS HAVE BEEN ACHIEVED WITHIN THE REQUIRED TOLERANCES:
8.2.1. SATISFACTORY BEDDING AND/OR FOUNDATION
8.2.2. TORQUE ON THE BOLT ASSEMBLIES
8.2.3. ENGINEERED BACKFILL ELECTRO-CHEMICAL PARAMETERS
8.2.4. ENGINEERED BACKFILL REQUIREMENTS
8.2.5. ENGINEERED BACKFILL LIFT HEIGHT AND COMPACTION
8.2.6. CONFIRMATION OF DIMENSIONAL CHECKS OF THE CONDUIT PRIOR TO AND AFTER BACKFILLING
8.2.7. CONFIRMATION OF THE MINIMUM AND MAXIMUM COVER

9. HYDRAULIC CAPACITY & SCOUR PROTECTION

9.1. HYDRAULIC CAPACITY OF THE CONDUIT AND STABILITY OF THE INLET AND OUTLET IS THE RESPONSIBILITY OF THE CONTRACTOR'S / OWNER'S HYDROTECHNICAL ENGINEER.
9.2. TYPE AND EXTENT OF SCOUR PROTECTION TO PREVENT EROSION AND LOSS OF ENGINEERING BACKFILL FOR THE CONDUIT, BEDDING, AND FOUNDATION IS THE RESPONSIBILITY OF THE CONTRACTOR'S / OWNER'S HYDROTECHNICAL ENGINEER.

PERMIT TO PRACTICE
ARMTEC INC.
Signature S Macrae
Date AUG 17/21
PERMIT NUMBER: P 1307
NT/NU Association of Professional Engineers and Geoscientists

REGISTERED PROFESSIONAL ENGINEER
S. J. MACRAE
LICENSEE
NT/NU
AUG 17/21

REV.	REVISION NOTE	BY	CK'D	REV'D	DATE
1	ISSUED FOR CONSTRUCTION	JK	SM	SM	2021-08-13
0	ISSUED FOR CONSTRUCTION	JK	SM	SM	2021-06-30
A	ISSUED FOR APPROVAL	CG	TCB	MA	2021-06-25

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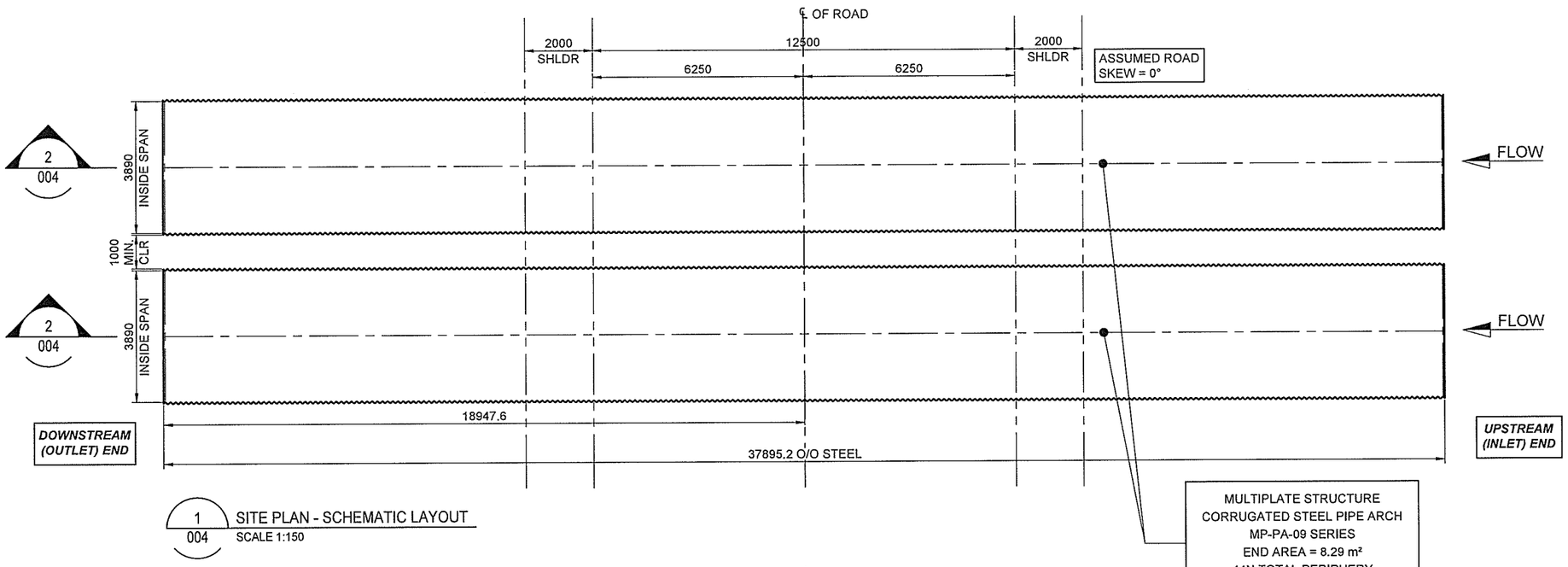
APPROVALS		DATE
DESIGN BY	M.A.	2021-06-18
DESIGN CHECK	A.R.	2021-06-18
DRAFT BY	CG	2021-06-23
DRAFT CHECK	TCB	2021-06-24

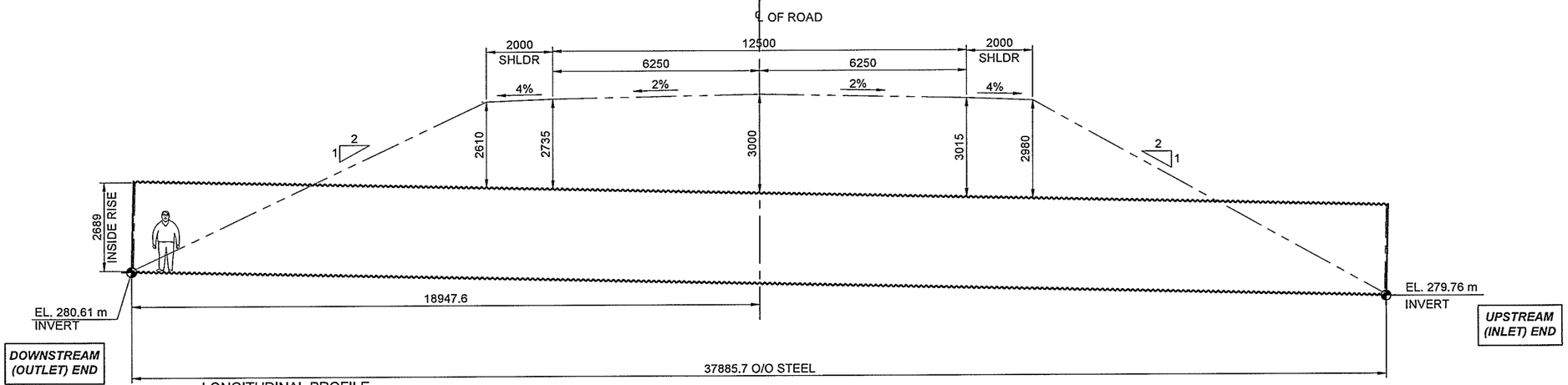
CUSTOMER: SABINA GOLD & SILVER
PROJECT NAME: GANDER - PRIMARY CHANNEL PIPE ARCH
WESTERN KITIKMEOT REGION OF NUNAVUT
DRAWING TITLE: DESIGN NOTES

SALES ORDER NO.	SHEET NO.	SCALE	PROJECT NO.	DRAWING NO.	REV.
231548	3 OF 9	AS NOTED	19-463-B	003	1



1 004 SITE PLAN - SCHEMATIC LAYOUT
SCALE 1:150

3 005



2 004 LONGITUDINAL PROFILE THROUGH ℄ OF STRUCTURE
SCALE 1:150

PERMIT TO PRACTICE
ARMTEC INC.
Signature
Date AUG 17/21
PERMIT NUMBER: P 1307
NT/NU Association of Professional Engineers and Geoscientists

REGISTERED PROFESSIONAL ENGINEER
S. J. MACRAE
LICENSEE
NT/NU
AUG 17/21

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A	ISSUED FOR APPROVAL	CG	TCB	MA	2021-06-25

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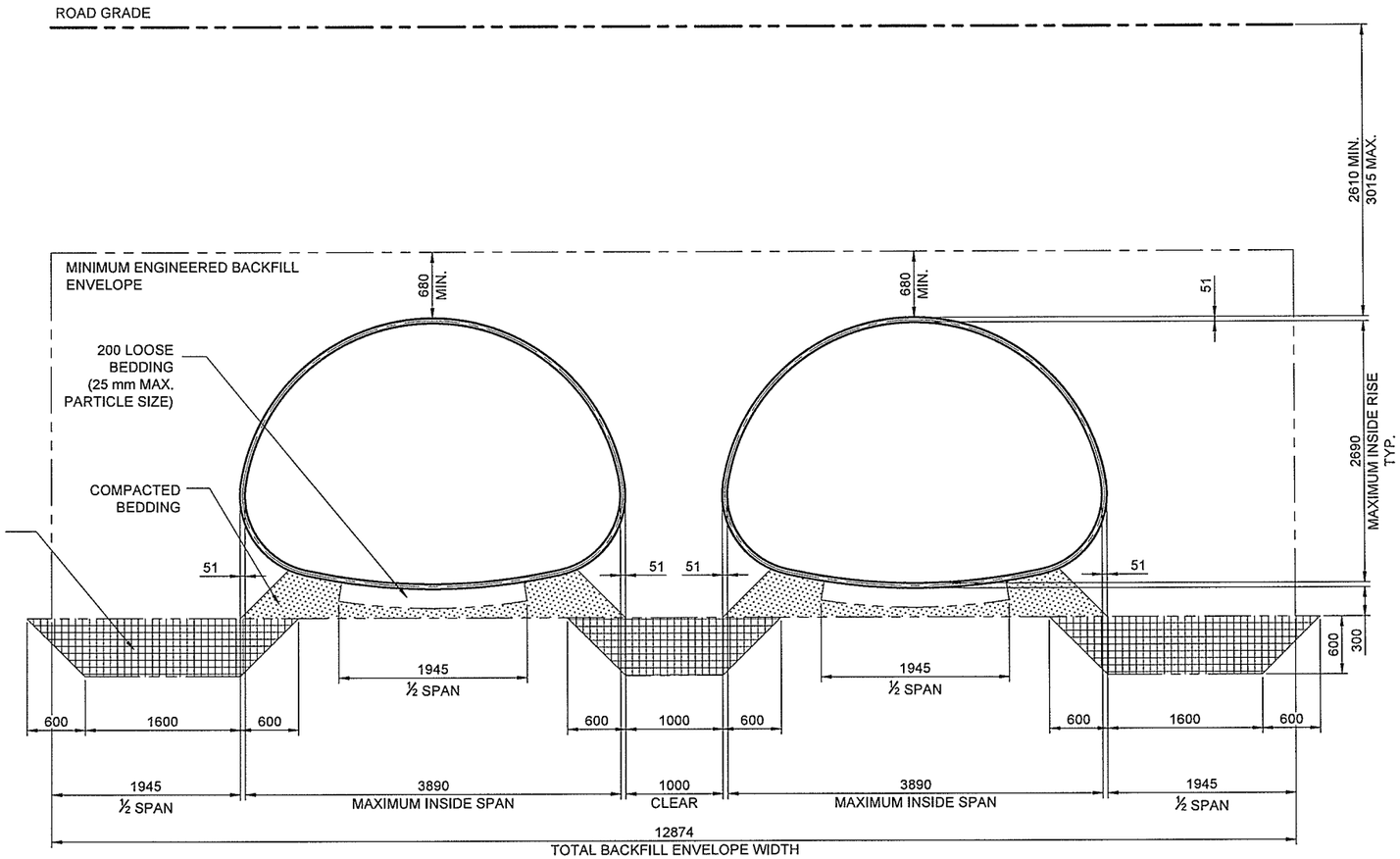
APPROVALS	DATE
DESIGN BY M.A.	2021-06-18
DESIGN CHECK A.R.	2021-06-18
DRAFT BY CG	2021-06-23
DRAFT CHECK TCB	2021-06-24

CUSTOMER: SABINA GOLD & SILVER
PROJECT NAME: GANDER - PRIMARY CHANNEL PIPE ARCH
WESTERN KITIKMEOT REGION OF NUNAVUT
DRAWING TITLE: SITE PLAN, LONGITUDINAL PROFILE

SALES ORDER NO.	SHEET NO.	SCALE	PROJECT NO.	DRAWING NO.	REV.
231548	4 OF 9	AS NOTED	19-463-B	004	1

MULTIPLATE STRUCTURE
CORRUGATED STEEL PIPE ARCH
MP-PA-09 SERIES
END AREA = 8.29 m²
44N TOTAL PERIPHERY
CORRUGATION PROFILE = 152 x 51



NOTE:
- TRENCH REINFORCEMENT DETAIL SHOWN IN ACCORDANCE WITH CHBDC CLAUSE 7.6.4.2.
- ON SITE GEOTECHNICAL ENGINEERING TO DETERMINE IF TRENCH IS REQUIRED BASED ON SITE FOUNDATION SOIL CONDITIONS.

3 / 004 TYPICAL BACKFILL - SECTION
SCALE 1:60

PERMIT TO PRACTICE
ARMTEC INC.
Signature E Macrae
Date Aug 17/21
PERMIT NUMBER: P 1307
NT/NU Association of Professional Engineers and Geoscientists

REGISTERED PROFESSIONAL ENGINEER
S. J. MACRAE
LICENSEE
NT/NU
Aug 17/21

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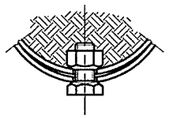
DESIGN CHECK	A.R.	2021-06-18
DRAFT BY	CG	2021-06-23
DRAFT CHECK	TCB	2021-06-24

CUSTOMER: SABINA GOLD & SILVER
PROJECT NAME: GANDER - PRIMARY CHANNEL PIPE ARCH
WESTERN KITIKMEOT REGION OF NUNAVUT
DRAWING TITLE: GEOMETRY AND BACKFILL SECTION

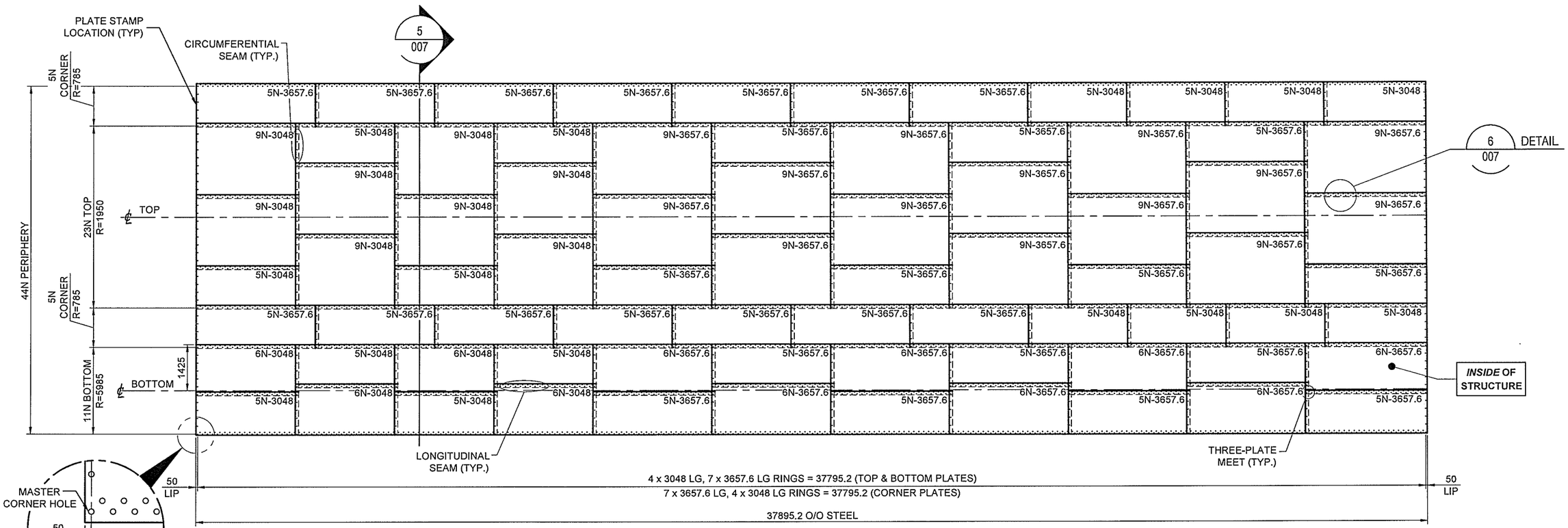
SALES ORDER NO.	SHEET NO.	SCALE	PROJECT NO.	DRAWING NO.	REV.
231548	5 OF 9	AS NOTED	19-463-B	005	1



2 PLATE LAPS
4.0 & 5.0 mm THK PLATES
USE Ø3/4" x 1 1/2" LG
MULTIPLATE BOLTS
(COLOUR CODE: GREEN)

3 PLATE LAPS
4.0 & 5.0 mm THK PLATES
USE Ø3/4" x 1 3/4" LG
MULTIPLATE BOLTS
(COLOUR CODE: RED)

BOLT LENGTH CHART		
MULTIPLATE PLATE THICKNESS (mm)	BOLT LENGTHS TO BE USED (INCHES)	COMMENTS
5N & 6N PLATES = 4.0 9N PLATES = 5.0	1 1/2", 1 3/4"	IF NEEDED, USE 3" LONG BOLTS TEMPORARILY @ THREE PLATE MEETS, TO BRING PLATES TOGETHER.



4 / 006 STRUCTURE LAYOUT
INSIDE FLAT VIEW
SCALE 1:125

PERMIT TO PRACTICE
ARMTEC INC.
Signature S Macrae
Date AUG 17/21
PERMIT NUMBER: P 1307
NT/NU Association of Professional Engineers and Geoscientists

2 COMPLETE STRUCTURES REQUIRED

REGISTERED PROFESSIONAL ENGINEER
S. J. MACRAE
LICENSEE
NT/NU
AUG 17/21

REV.	REVISION NOTE	BY	CK'D	REV'D	DATE
1	ISSUED FOR CONSTRUCTION	JK	SM	SM	2021-08-13
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APPROVALS		DATE
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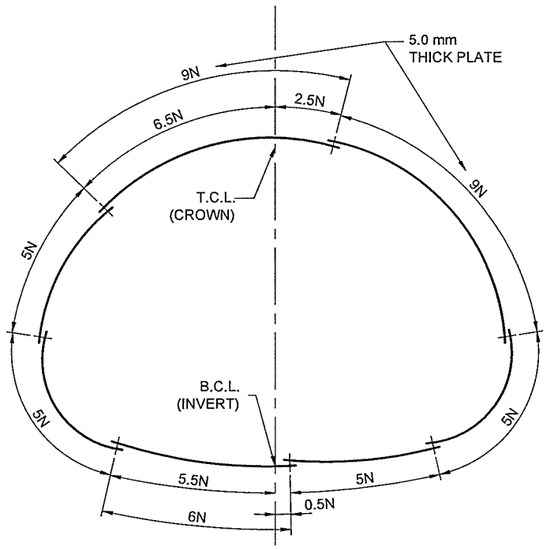
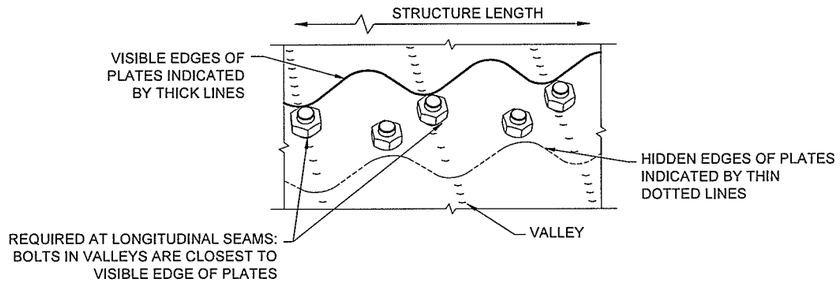
DESIGN CHECK	A.R.	2021-06-18
DRAFT BY	CG	2021-06-23
DRAFT CHECK	TCB	2021-06-24

CUSTOMER: SABINA GOLD & SILVER
PROJECT NAME: GANDER - PRIMARY CHANNEL PIPE ARCH
WESTERN KITIKMEOT REGION OF NUNAVUT
DRAWING TITLE: STRUCTURE LAYOUT

SALES ORDER NO.	SHEET NO.	SCALE	PROJECT NO.	DRAWING NO.	REV.
231548	6 OF 9	AS NOTED	19-463-B	006	1



5 006 SECTION DETAIL
PLATE LAYOUT & LAPPING
SCALE: NTS



NOTE: PROPER LAPPING OF PLATE IS IMPORTANT FOR PERFORMANCE OF STRUCTURE.

6 006 TYPICAL PLATE LAPPING
SCALE: NTS

PERMIT TO PRACTICE
ARMTEC INC.
Signature S MacRae
Date Aug 17/21
PERMIT NUMBER: P 1307
NT/NU Association of Professional Engineers and Geoscientists

REGISTERED PROFESSIONAL ENGINEER
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0	ISSUED FOR CONSTRUCTION	JK	SM	SM	2021-06-30
A	ISSUED FOR APPROVAL	CG	TCB	MA	2021-06-25

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APPROVALS		DATE
DESIGN BY	M.A.	2021-06-18
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DRAFT BY	CG	2021-06-23
DRAFT CHECK	TCB	2021-06-24

CUSTOMER
SABINA GOLD & SILVER

PROJECT NAME
GANDER - PRIMARY CHANNEL PIPE ARCH
WESTERN KITIKMEOT REGION OF NUNAVUT

DRAWING TITLE
PLATE LAPPING DETAILS

SALES ORDER NO.	SHEET NO.	SCALE	PROJECT NO.	DRAWING NO.	REV.
231548	7 OF 9	AS NOTED	19-463-B	007	1

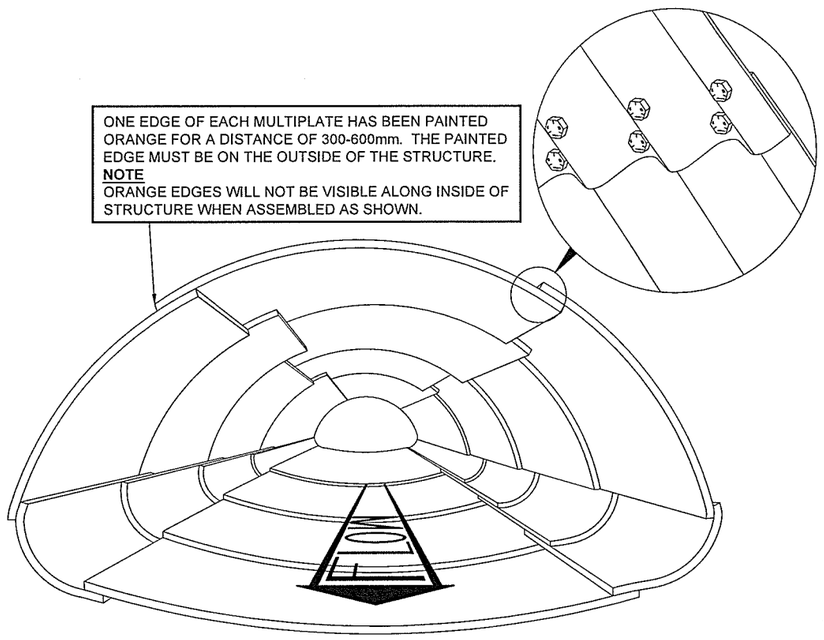
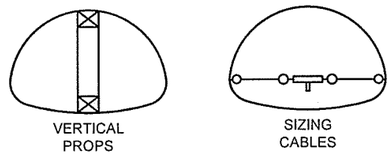
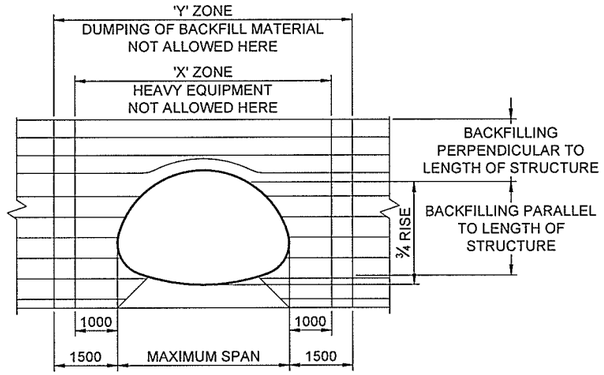


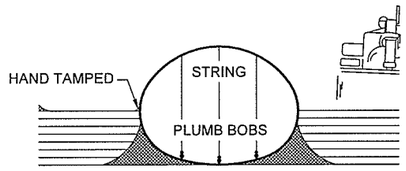
PLATE LAP DETAIL



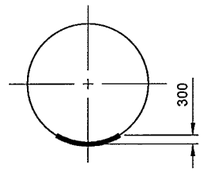
METHODS OF SHAPE CONTROL



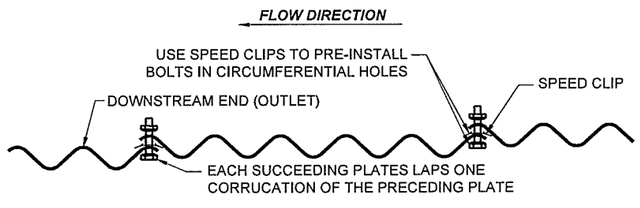
CLOSED-SHAPE GEOMETRY (PIPE ARCH OR ELLIPSE)
RECOMMENDED BACKFILL



PLUMB-BOB METHOD OF MONITORING



SPEED (SPRING) CLIP PLACEMENT - OPTIONAL
PLACE ALONG CIRCUMFERENTIAL SEAMS ONLY, FOR THE FULL LENGTH OF STRUCTURE.
CLIPS SUPPLIED TO COVER, AT LEAST 300 mm UP FROM THE STRUCTURES OBVERT.



DETAIL OF BOTTOM PLATE LAP

IMPORTANT: THE FOLLOWING NOTES ARE RECOMMENDATIONS ONLY. CONTRACTOR SHALL APPLY OWN KNOWLEDGE AND STANDARDS FOR APPROPRIATE INSTALLATION PROCEDURE BASED ON SITE CONDITIONS.

1. RECOMMENDED PLATE ASSEMBLY

1.1. INSTALL BOTTOM PLATES FROM DOWNSTREAM TO UPSTREAM END.
1.2. INSTALL SIDE / TOP PLATES FROM UPSTREAM TO DOWNSTREAM END.
1.3. INSTALL BOLTS HAND-TIGHT, STARTING NEAR THE MIDDLE OF THE PLATES.
1.4. TIGHTENING OF BOLTS CAN BEGIN ONCE 3 TO 4 FULL RINGS ARE ASSEMBLED.
1.5. KEEP 2 OR 3 RINGS WITH HAND-TIGHT BOLTS TO AID WITH INSTALLATION OF REMAINING PLATES.
1.6. USE OF PRY BAR AND DRIFT PIN WILL AID ASSEMBLY WHEN BOLTS ARE LOOSE.
1.7. USE TEMPORARY BRACING AS REQUIRED TO SUPPORT PLATES AND MAINTAIN GEOMETRY DURING ASSEMBLY. TEMPORARY BRACING SHALL NOT HINDER MOVEMENT OF STRUCTURE DURING BACKFILL OPERATION AND CAN BE REMOVED WHEN BACKFILLING IS NEAR THE SPRINGLINE.

2. RECOMMENDED BACKFILL OPERATION

2.1. BEDDING SHALL BE PLACED ON STABLE NATIVE GROUND AND PRESHAPED IN THE TRANSVERSE DIRECTION TO ACCOMMODATE CURVED INVERT.
2.2. BACKFILL MATERIAL SHALL BE PLACED IN 200 mm THICK LOOSE LIFTS (LAYERS) AT CONSTANT GRADE.
2.3. BACKFILL MATERIAL SHALL BE PLACED UNIFORMLY ON BOTH SIDES OF THE STRUCTURE.
2.4. LIFTS MUST NOT EXCEED 400 mm DIFFERENTIAL BETWEEN SIDES OF STRUCTURE, MEASURED AT ANY TRANSVERSE SECTION THROUGH THE STRUCTURE.
2.5. COMPACTION EQUIPMENT TO TRAVEL PARALLEL TO THE LENGTH OF THE STRUCTURE. MAXIMUM OPERATING WEIGHT FOR COMPACTION EQUIPMENT SHALL MEET THE REQUIREMENT IN THE DESIGN PARAMETERS.
2.6. WHEN BACKFILL REACHES 3/4 OF THE STRUCTURE HEIGHT (OR WHEREVER CONVENIENT) ONLY LIGHT COMPACTION EQUIPMENT SHALL COMPACT BACKFILL OVER THE STRUCTURE CROWN UNTIL MINIMUM COVER IS ATTAINED AND IN A DIRECTION PERPENDICULAR TO THE LENGTH OF THE STRUCTURE.
2.7. HEAVY EQUIPMENT SHALL NOT BE ALLOWED WITHIN THE 'X' ZONE (1000 mm MIN. FROM THE STRUCTURE, MEASURED AT THE MAXIMUM SPAN), UNTIL THE MINIMUM COVER OVER THE STRUCTURE IS IN PLACE. HAND TAMPING OR HAND-HELD COMPACTOR SHALL BE USED WITHIN 500 mm FROM THE STRUCTURE.
2.8. HEAVY EQUIPMENT SHALL VEER AWAY FROM THE ENDS OF THE STRUCTURE.
2.9. DUMPED BACKFILL MATERIAL WILL NOT BE ALLOWED WITHIN THE 'Y' ZONE (1500 mm MIN. FROM THE STRUCTURE, MEASURED AT THE MAXIMUM SPAN).
2.10. BACKFILL MATERIAL SHALL BE COMPACTED TO THE REQUIREMENTS AS DESCRIBED ON NOTE 7, SHEET 003.
2.11. CAUTION SHALL BE EXERCISED IN COMPACTING MATERIAL NEAR THE CORNERS/HAUNCHES.
2.12. IF THE BACKFILL IS NOT TO BE PLACED IMMEDIATELY TO THE FINISHED ROAD ELEVATION, A WEARING AND TRAVELLING SURFACE IS TO BE BUILT OVER THE CRITICAL BACKFILL ZONE IN ORDER TO KEEP THE LATTER OPERATIVE AND ADEQUATE TO PERFORM ITS FUNCTION AS A SAFE STRUCTURE (OR AS A SOIL ARCH) AT ALL TIMES.

3. SHAPE MONITORING AND TOLERANCES

3.1. IT IS IMPORTANT THAT THE DESIGN SHAPE OF THE STRUCTURE BE MAINTAINED AT ALL STAGES OF CONSTRUCTION.
3.2. BEFORE STARTING BACKFILLING OPERATION, CHECKS SHALL BE MADE TO ENSURE THAT RISE AND SPAN DIMENSIONS ARE WITHIN THE ALLOWABLE ASSEMBLY TOLERANCE LIMITS.
3.3. STRUCTURE SHAPE SHALL BE MONITORED REGULARLY.
3.4. DIMENSIONS AND TOLERANCES (RISE AND SPAN)
3.4.1. DIMENSIONS OF ASSEMBLED SHAPE AFTER TORQUING AND PRIOR TO BACKFILLING SHALL BE WITHIN ±1% OF THE DESIGN DIMENSIONS.
3.4.2. LENGTH OF ASSEMBLED STRUCTURE SHALL BE WITHIN ±1% OF THE SPECIFIED LENGTH.
3.4.3. FINAL SHAPE AFTER BACKFILLING SHALL BE WITHIN ±1% OF ASSEMBLED SHAPE AND WITHIN ±2% OF DESIGN SHAPE.

4. MONITORING THE SHAPE DURING BACKFILLING

4.1. PLUMB-BOBS SUSPENDED FROM THE STRUCTURE WILL SHOW LATERAL MOVEMENT OF THE CROWN (ROLLING) AND VERTICAL MOVEMENT (PEAKING). THESE MOVEMENTS CAN RESULT FROM THE COMPACTION EFFORTS NEAR THE STRUCTURE SIDES, UNBALANCED FILL HEIGHTS OR HEAVY EQUIPMENT WORKING TOO CLOSE TO THE STRUCTURE. SPAN AND RISE DIMENSIONS SHOULD BE CHECKED AND RECORDED AFTER EVERY SIGNIFICANT OPERATION. OTHER ACCEPTABLE MONITORING METHODS MAY ALSO BE USED AS DETERMINED BY CONTRACTOR.

PERMIT TO PRACTICE
ARMTEC INC.
Signature S MacRae
Date AUG, 17/21
PERMIT NUMBER: P 1307
NT/NU Association of Professional Engineers and Geoscientists

REGISTERED PROFESSIONAL ENGINEER
S. J. MACRAE
LICENSEE
NT/NU

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0	ISSUED FOR CONSTRUCTION	JK	SM	SM	2021-06-30
A	ISSUED FOR APPROVAL	CG	TCB	MA	2021-06-25

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APPROVALS	DATE
DESIGN BY M.A.	2021-06-18
DESIGN CHECK A.R.	2021-06-18
DRAFT BY CG	2021-06-23
DRAFT CHECK TCB	2021-06-24

CUSTOMER
SABINA GOLD & SILVER

PROJECT NAME
GANDER - PRIMARY CHANNEL PIPE ARCH
WESTERN KITIKMEOT REGION OF NUNAVUT

DRAWING TITLE
RECOMMENDED PLATE ASSEMBLY AND BACKFILL OPERATION
NOTES, CLOSED-SHAPE, PIPE ARCH OR ELLIPSE STRUCTURES

SALES ORDER NO.	SHEET NO.	SCALE	PROJECT NO.	DRAWING NO.	REV.
231548	8 OF 9	AS NOTED	19-463-B	008	1

Plot Date & Time: 2021-08-17, 1:33:37 PM

BILL OF MATERIALS - MULTIPLATE 152 x 51 CORRUGATION PROFILE - TOTAL No. STRUCTURES = 2

PART ID	TOTAL QTY.	QTY PER STRUCTURE	DESCRIPTION	CORRUGATION (mm)	LENGTH (mm) U.N.O.	DIAMETER (INCHES)	INSIDE RADIUS (mm)	THICKNESS (mm)	MATERIAL SPECIFICATION	COATING SPECIFICATION	LABEL / COLOUR	COMMENT
M436460-915	14	7	6N CORRUGATED STEEL PLATE	152 x 51	3657.6	-	5985	4.00	CSA G401-14	915 g/m² ZINC COATING PER CSA G401-14 AND ASTM A123	-	BOTTOM PLATES
M430460-915	8	4	6N CORRUGATED STEEL PLATE	152 x 51	3048	-	5985	4.00	CSA G401-14	915 g/m² ZINC COATING PER CSA G401-14 AND ASTM A123	-	BOTTOM PLATES
M436380-915	14	7	5N CORRUGATED STEEL PLATE	152 x 51	3657.6	-	5985	4.00	CSA G401-14	915 g/m² ZINC COATING PER CSA G401-14 AND ASTM A123	-	BOTTOM PLATES
M430380-915	8	4	5N CORRUGATED STEEL PLATE	152 x 51	3048	-	5985	4.00	CSA G401-14	915 g/m² ZINC COATING PER CSA G401-14 AND ASTM A123	-	BOTTOM PLATES
M536690-915	28	14	9N CORRUGATED STEEL PLATE	152 x 51	3657.6	-	1950	5.00	CSA G401-14	915 g/m² ZINC COATING PER CSA G401-14 AND ASTM A123	-	TOP PLATES
M530690-915	16	8	9N CORRUGATED STEEL PLATE	152 x 51	3048	-	1950	5.00	CSA G401-14	915 g/m² ZINC COATING PER CSA G401-14 AND ASTM A123	-	TOP PLATES
M436380-915	14	7	5N CORRUGATED STEEL PLATE	152 x 51	3657.6	-	1950	4.00	CSA G401-14	915 g/m² ZINC COATING PER CSA G401-14 AND ASTM A123	-	TOP PLATES
M430380-915	8	4	5N CORRUGATED STEEL PLATE	152 x 51	3048	-	1950	4.00	CSA G401-14	915 g/m² ZINC COATING PER CSA G401-14 AND ASTM A123	-	TOP PLATES
M436380-915	28	14	5N CORRUGATED STEEL PLATE	152 x 51	3657.6	-	785	4.00	CSA G401-14	915 g/m² ZINC COATING PER CSA G401-14 AND ASTM A123	-	CORNER PLATES
M430380-915	16	8	5N CORRUGATED STEEL PLATE	152 x 51	3048	-	785	4.00	CSA G401-14	915 g/m² ZINC COATING PER CSA G401-14 AND ASTM A123	-	CORNER PLATES
M341140	7286	3643	GALV. STEEL BOLT Ø3/4" x 1 1/2"	-	1 1/2"	Ø3/4"	-	-	CSA G401-14/ASTM A449, TYPE 1	ASTM A153, CLASS C OR ASTM B695, CLASS 55	GREEN	-
M341120	628	314	GALV. STEEL BOLT Ø3/4" x 1 3/4"	-	1 3/4"	Ø3/4"	-	-	CSA G401-14/ASTM A449, TYPE 1	ASTM A153, CLASS C OR ASTM B695, CLASS 55	RED	-
M343000	6	3	GALV. STEEL BOLT Ø3/4" x 3"	-	3"	Ø3/4"	-	-	CSA G401-14/ASTM A449, TYPE 1	ASTM A153, CLASS C OR ASTM B695, CLASS 55	-	-
M340000	7914	3957	GALV. STEEL NUT Ø3/4"	-	-	Ø3/4"	-	-	CSA G401-14/ASTM A563, GRADE C	ASTM A153, CLASS C OR ASTM B695, CLASS 55	-	-
M340001	300	150	SPRING CLIP	-	-	Ø3/4"	-	-	-	-	-	-
BPB154	2	-	PRY BAR	-	4'-6"	Ø1"	-	-	-	-	-	-
BDP1316	1	-	DRIFT PIN	-	-	Ø13/16"	-	-	-	-	-	-
MPP1000	1	-	CAN ZINC RICH PRIMER PAINT	-	-	-	-	-	-	-	-	-
-	1	-	SHIPPING ENVELOPE	-	-	-	-	-	-	-	-	-

PERMIT TO PRACTICE
ARMTEC INC.
Signature S MacRae
Date AUG 17/21
PERMIT NUMBER: P 1307
NT/NU Association of Professional Engineers and Geoscientists

REGISTERED PROFESSIONAL ENGINEER
S. J. MACRAE
LICENSEE
NT/NU
AUG 17/21

REV.	REVISION NOTE	BY	CK'D	REV'D	DATE
1	ISSUED FOR CONSTRUCTION	JK	SM	SM	2021-08-13
0	ISSUED FOR CONSTRUCTION	JK	SM	SM	2021-06-30
A	ISSUED FOR APPROVAL	CG	TCB	MA	2021-06-25

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APPROVALS		DATE
DESIGN BY	M.A.	2021-06-18
DESIGN CHECK	A.R.	2021-06-18
DRAFT BY	CG	2021-06-23
DRAFT CHECK	TCB	2021-06-24

CUSTOMER: SABINA GOLD & SILVER
PROJECT NAME: GANDER - PRIMARY CHANNEL PIPE ARCH
WESTERN KITIKMEOT REGION OF NUNAVUT
DRAWING TITLE: BILL OF MATERIALS

SALES ORDER NO.	SHEET NO.	SCALE	PROJECT NO.	DRAWING NO.	REV.
231548	9 OF 9	AS NOTED	19-463-B	009	1

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Appendix B Arctic Grayling Passage Criteria