Project Name
Robertson Shaft Cap – As Built Report

Project Location
Con Mine, Yellowknife, NWT

Prepared By
Williams Engineering Canada Inc.

Date Prepared
September 2, 2011

WE File No. 20948.00SF

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File No. 20948.00 SF

September 2, 2011

Miramar Northern Mining Ltd.
PO Box 2000
Yellowknife, NT, X1A 2M1

Attention: Mr. Ron Connell
Manager, Environment and Reclamation

Subject: Robertson Shaft Cap - As Built Report
Con Mine, Yellowknife, NWT

1. Introduction

Williams Engineering Canada Inc. (WECI) was retained by Miramar Northern Mining Ltd. (MNML) to design a concrete cap for closure of the Robertson Shaft at Con Mine in Yellowknife, NT. This report contains the information regarding the structural codes and standards, loadings, design criteria, structural systems and construction of the Robertson Shaft cap.

2. Codes and Standards

The design and construction of all structural elements for this mine shaft closure conform to the following codes and standards:

- Ontario Mining Act
- National Building Code of Canada 2005
- CSA Standard CSA A23.3-04 (R2010), Design of Concrete Structures
- CSA Standard CSA A23.1-09/CSA A23.2-09, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete
- CSA Standard CSA O86-01 (R2006), Engineering Design in Wood
- CSA Standard CSA S16-09, Design of Steel Structures

3. Design Criteria and Summary of Structural Loads

3.1 Geotechnical Information

The rock anchoring system for the Robertson Shaft cap was based on the following geotechnical report entitled "Robertson Shaft Cap Geotechnical Drilling Investigation Factual Report and Rock Quality, Con Mine, NT" prepared by Golder Associates, dated May 28, 2010.

The geotechnical investigation was required to assess the quality of the rock surrounding the Robertson shaft collar in order to design the rock anchoring system supporting the cap. The investigation involved drilling two diamond drill holes adjacent to the shaft, each approximately 15m long, from which information on overburden, bedrock geology, intact rock strength, discontinuities, and rock mass quality, could be acquired.

The Ontario Mining Act specifies that the rock anchors are to be embedded into sound rock with a minimum capacity of 600kPa. From the geotechnical investigation Golder Associates was able to provide the installation depth below grade and anchor lengths that allow for the proper anchoring into sound rock.

3.2 Other Considerations

Future Access

Maintaining access to the Robertson Shaft was a condition of this project in order to allow access to the mine water in the Robertson shaft. The cap was therefore designed with two openings: one hatch to allow for lowering a pump into the mine water, and the other to allow sampling.

The access hatches were installed at deck level with steel chutes connecting them to the concrete cap. A railing system was also designed and installed. The steel deck, railings, and hatch supports were designed for future removal, as there is the possibility that the head frame structure will be demolished. If this is the case, then the cap area would be clear of all head frame components, and a staircase design would be available for use.

Head Frame

The Robertson Shaft is currently enclosed by the Robertson Head Frame, a 250 foot tall steel frame tower. The tower has several platforms and guide support structures at varying elevations. Existing beams intersect the concrete collar at approximately 3 feet above the cap surface, and steel guides run vertically through the shaft. A number of structural beams and guides obstructed the constructability of the cap; in order to determine the feasibility of removing one or more of these structural elements, the head frame structure was required to be structurally assessed and analyzed. Copies of the original structural drawings for the head frame along with past structural assessment reports by J. S. Redpath Mining Consultants Limited, and Structure All Consulting Engineering Ltd., were provided by Mr. Phil Nolan of Structure All Consulting Engineers Limited. With this information an interpretation of the loads and load paths throughout the head frame structure was assessed. In addition, a site inspection by two WECI engineers took place to ensure all existing equipment and dead loads were accounted for in the load analysis. The results of the analysis showed that steel guides and specific beams could be removed.

3.3 Design Loads and Parameters

Climatic and Seismic Information

Climatic and Seismic information for the determination snow, wind, and earthquake loadings on the mine cap is found in Appendix C of the National Building Code of Canada.

The baseline design data referenced from NBCC is:

- Importance Category: Normal
- Ground Snow Load, S_s: 2.20 kPa
- Associated Rain Load, S_r: 0.10 kPa
- Snow Load Importance Factor, I_s: 1.00
- 1/10 Hourly Wind Pressure, q1/10: 0.36 kPa
- 1/50 Hourly Wind Pressure, q1/50: 0.47 kPa
- Wind Load Importance Factor, I_w: 1.00
- Seismic Data:
  - $S_a(0.2)$: 0.095
  - $S_a(0.5)$: 0.057
  - $S_a(1.0)$: 0.026
  - $S_a(2.0)$: 0.008
  - PGA: 0.036
- Seismic Importance Factor, I_E: 1.00
- Site Classification: A

Gravity Loads

The loads used to design the reinforced concrete cap and rock anchors were specified by the Ontario Mining Act (Ontario Regulation 240/00, Mine Development and Closure) and National Building Code of Canada 2005 (NBCC). Although the mine shaft is currently enclosed by a head frame, the closure cap was designed for the future possibility of being exposed to the elements and/or backfilled. The Building Code provided the climatic data used to design for potential snow loads. The minimum cap design live loads as per the Ontario Mining Act are as follows:

Live Loads considered for the cap design are as follows:

- Soil Surcharge (1.4m saturated soil with unit weight of 19kN/m^3): 26.60 kPa
- Snow Load: 2.30 kPa
- Additional Live Load – greater of:
  a) uniformly distributed load 18.00 kPa
  b) concentrated load anywhere on cap over an area of 300mm x 300mm 81.00 kN
- Construction Loads:
  a) Equipment load 3.60 kPa
  b) wet concrete 12.70 kPa

Dead Loads considered for the cap design are as follows:

- Concrete Cap (550mm thick): 12.95 kPa
- Form Work: 1.00 kPa
- Superimposed Dead Load: 0.50 kPa

4. Structural Systems

4.1 Timber Platform

A temporary timber platform was designed to span the existing concrete collar, providing a safe working platform and a base for the concrete cap formwork. The platform was designed to support loads from the construction crew and equipment, and the weight of the wet concrete. Over time it is expected that the wood will deteriorate and fall away. This will not affect the structural integrity of the concrete cap.

4.2 Reinforced Concrete Cap

The concrete specification on WECI drawings (Appendix C) for the Robertson shaft cap meets or exceeded Ontario Mining Act reinforced concrete specifications. A 550mm thick cap was specified with air flow in the shaft permitted by two 75mm diameter stainless steel pipes installed in the concrete cap.

The concrete cap was designed to be fully supported by the rock anchoring system, so in the case where the existing concrete collar deteriorates the capacity of the cap is not affected. In order to rely on the anchors for full support both the rock quality and concrete cap capacity had to be investigated. As advised by Golder Associates, the cap anchors were installed at a depth 3.2m below grade and were a minimum length of 2.5m, ensuring anchorage into sound bedrock.

4.3 Access Systems

The initial cap access system, a steel staircase permitting passage from grade to the concrete cap surface, was designed in full and is available for future use once the head frame is removed and there are no longer space confinements. Until that is the case, the at-grade steel deck and railing system will permit access to the sample and access hatches. The deck utilizes existing steel beams for support, so again it will need to be removed in the case of head frame demolition.

5. Construction

5.1 Forming/Working Platform

A Timber working platform (Photo 1) was formed in the shaft collar. The platform was constructed of timber beams laid side by side spanning the short dimension of the shaft collar, bearing onto a concrete ledge. Steel angle sections were placed at the timber beam ends and anchored into the concrete to hold the beams in place (Photo 2). The platform was constructed to serve a double duty, as a safe working platform and the bottom form for the concrete.

5.2 Anchors and Grouting

The anchor holes were drilled to the required depth. No breakthroughs were reported. Size 30M bars were grouted in place (Photo 3) as per the Rock Anchor Layout on structural drawing S-02 (Appendix C). Grouting took place on the 2010-12-11. Four standard cylinder samples were taken for uniaxial strength testing by EBA Engineering Consultants (a Tetra Tech Company). The 3, 5 and 7 day test result were at 34.5MPa, 38.1MPa, and 45.7MPa respectively. The 28 day tests were at 55.8MPa (Appendix B). The test results were acceptable and exceeded the specified uniaxial strength

5.3 Rebar and Concrete

The spacing of the top and bottom rebar layers was within design parameters (Photo 4). The required top and bottom layer bar spacing was 200mm in both directions. Chairs were provided to the bottom layer to ensure the 50mm cover was provided, and the top layer was positioned so as to achieve the 75mm cover. Diagonal bars were positioned around the pump hatch (Photo 5) and sample hatch (Photo 6). The vent pipes were positioned within the rebar (Photo 7). The slab was poured to a thickness of 550mm. Where the slab bears onto the concrete collar ledges the slab forms a beam approximately 580mm X 790mm. All specified ties and rebar were provided in the beams (Photo 8).

The concrete was delivered to site on the 26/01/2011 by Capital Concrete Ltd. Winter concrete methods were used (Photo 12). The concrete was tested for slump and air entrainment by EBA Engineering Consultants (a Tetra Tech Company).

- slump was 85mm, within the 50mm-100mm range (Photo 9), and
- air entrainment was 7%, within the 5% to 8% range.

Two sets of four standard cylinder samples (Photo 10) were taken for uniaxial strength testing by EBA Engineering Consultants:

- 7 day test result was at 22.7MPa and 23.9MPa
- 28 day tests were at 37.2MPa, 36.5MPa, 36.2MPa and 36.5MPa.
- 56 day tests were at 37.3MPa and 36.2MPa

The test results exceeded the design specification for a 56 day minimum strength of 32MPa (Appendix B).

5.4 Access systems

A steel deck and railing system was installed (Photo 14) with access to the pump and sample hatches (Photo 15) at grade level. The deck was constructed supported of the existing steel head frame

structural members. On final inspection all framing and grating was in place as per structural site instructions except two discrepancies; deck around hatch was not supported, and grating over a new support channel was incorrect. The client agreed that they were adequate for the intended purpose.

6. Conclusion

A concrete shaft closure cap was successfully installed at the Robertson Shaft at Con Mine (Photo 16). The dimensions and clearances of the installation met or exceeded the design specification and were in general quite consistent. Specifically, the anchors and reinforcing bars were within the design specification.

The concrete testing for slump and air entrainment were within acceptable design limits. Both of the 56 day compressive strength tests were above the design specification of 32MPa. The as-built drawing is in Appendix C.

Closure

This report has been prepared based upon the information referenced herein. It has been prepared in a manner consistent with good engineering judgement. Should new information come to light, Williams Engineering Canada Inc. requests the opportunity to review this information and our conclusions contained in this report. This report has been prepared for the exclusive use of Miramar Northern Mining Ltd., and there are no representations made by Williams Engineering Canada Inc. to any other party. Any use that a third party makes of this report, or any reliance on or decisions made based on it, are the responsibility of such third parties.

Yours truly,

Williams Engineering Canada Inc.

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Structural

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Williams Engineering Canada Inc.

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/JF

Document1

Appendix A

Photos

Photo 1 – Timber working platform.

Photo 2 – Steel angle fixed to collar

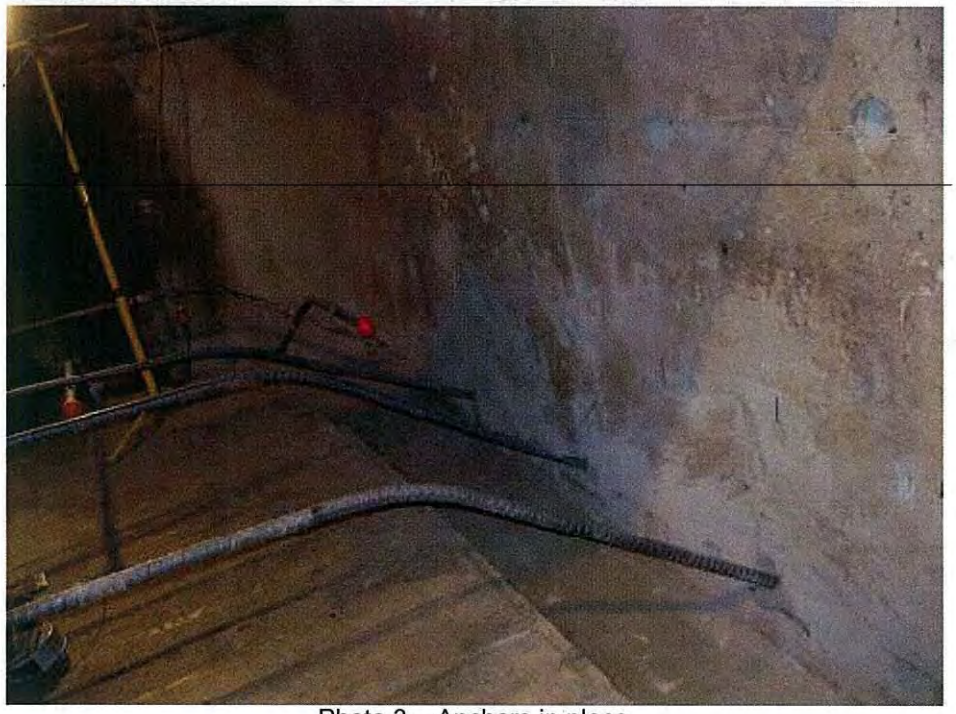


Photo 3 – Anchors in place

Photo 4 – Top and Bottom rebar in place

Photo 5 – Pump hatch

Photo 6 – Sample Hatch

Photo 7 – Vent pipes

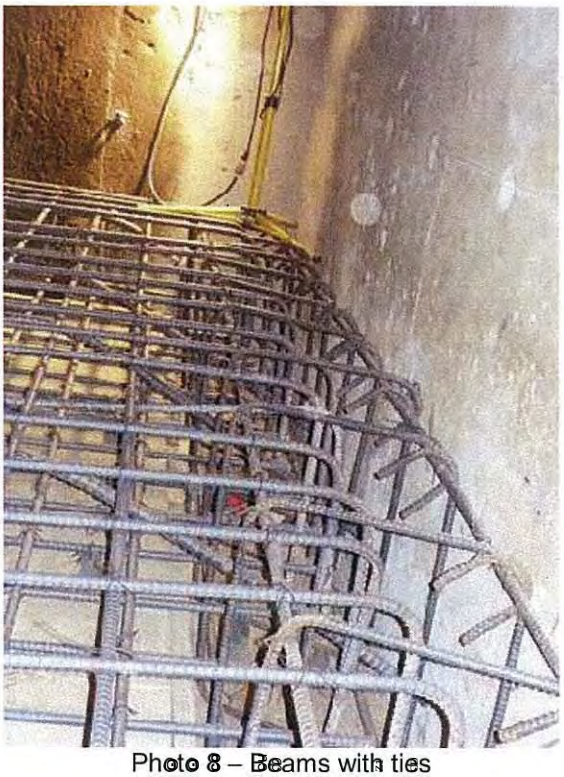


Photo 8 – Beams with ties

Photo 9 – Slump test

Photo 10 – Cylinders being cast

Photo 11 – Concrete Pour

Photo 12 – Warm air provided during pour and curing

Photo 13 – Concrete curing under burlap and polythene

Photo 14 – Deck and railing

Photo 15 – Pump and Sample hatches

Photo 16 – Rob Shaft Concrete Cap

Appendix B

Concrete and Grout Results

GROUT STRENGTH TEST RESULTS

CSA Specification A23.2

Yellowknife, NT Laboratory

Project No: Y14101343
Project: Con Mine Miscellaneous Testing
Client: Nahanni Construction Ltd.
Attention: Alain Gagnon

Element Cast & Location Tested :
Con Mine
In coffee room; cast at location 18 of the 25
Placing Method:
Test No: 6617

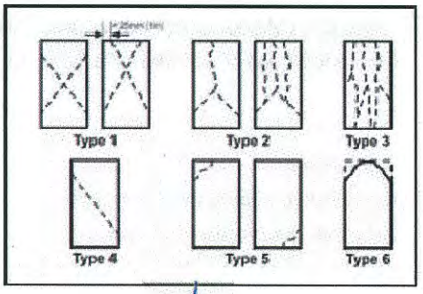
INFORMATION FROM DELIVERY SLIP

Supplier:
Truck No: n/a Plant Dep: n/a
Ticket No: n/a Mix No.: Sika 212 Grout
Load Amount: m^3 Cumulative: m^3
Admixture: Air CaCl2 Other
Spec. Strength: MPa Spec Air: %
Cement Type: Spec Slump/flow: mm
Max Aggregate Size: mm

Test Time: n/a Unit Weight: kg/m^3
Temperature: Air n/a °C Grout n/a °C
Grout Setting Temperature Within Specification
Limits: (15 - 25C) Yes [ ] No [X] If No see remarks
Slump/Flow: n/a mm Air Content: n/a %
Date Cast: 10 12 11 By: RM
Date Received: 10 12 13 By: DY

Cylinder Number	Age Days	Test Date	Test By	Compressive Strength MPa	Type of Fracture	Comments
6617-1	3	10 12 14	DY	34.5	1	Cylinder Mass = 1410 g
6617-2	5	10 12 16	DY	38.1	2	Cylinder Mass = 1465 g
6617-3	7	10 12 18	NR	45.7	3	Cylinder Mass = 1470 g
6617-4	28	11 01 08	NR	55.8	2	Cylinder Mass = 1500 g

Type of Fracture



Remarks: 4-75mm x 150mm cylinders cast in plastic molds
Initial curing temperatures: Min. 14° C Max. 30° C

Distribution:
Gord Beckford: Gord@nahanninc.com
Alain Gagnon: Alain.Gagnon@Newmont.com
Scott Stringer: Scott.Stringer@Newmont.com
Ron Connell: Ron.Connell@Newmont.com

Reviewed By:

GROUT STRENGTH TEST RESULTS

CSA Specification A23.2

Yellowknife, NT Laboratory

Project No: Y14101343
Project: Con Mine Miscellaneous Testing

Client: Nahanni Construction Ltd.

Attention: Gord Beckford

Element Cast & Location Tested :
Con Mine
Shaft Plug

Placing Method: Chute

Test No: 6624

INFORMATION FROM DELIVERY SLIP

Supplier:	Capital				
Truck No:	17031	Plant Dep:			
Ticket No:		Mix No.:			
Load Amount:	6 m^3	Cumulative:	m^3		
Admixture: Air	X	CaCl2	Other		
Spec. Strength:	32 MPa	Spec Air:	5 - 8 %		
Cement Type:	HS	Spec Slump/flow:	75 ± 25 mm		
Max Aggregate Size:	20 mm				

Test Time: 9:55 Unit Weight: kg/m^3

Temperature: Air -21 °C Grout 20 °C

Grout Setting Temperature Within Specification
Limits: (15 - 25C) Yes [X] No [ ] If No see remarks

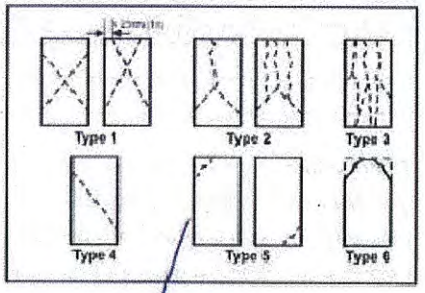
Slump/Flow: 85 mm Air Content: 7 %

Date Cast: 11 01 26 By: KL

Date Received: 11 01 29 By: NR

Cylinder Number	Age Days	Test Date	Test By	Compressive Strength MPa	Type of Fracture	Comments
6624-1	7	11 02 02	NR	22.7	4	Cylinder Mass = 4054 g
6624-2	28	11 02 23	NR	37.2	4	Cylinder Mass = 4003 g
6624-3	28	11 02 23	NR	36.5	1	Cylinder Mass = 4026 g
6624-4	57	11 03 24	IF	37.3	4	Cylinder Mass = 4048 g

Type of Fracture



Remarks: 4-100mm x 200mm cylinders cast in plastic molds
2 sets of 4 cylinders cast from same load as requested by client
See second set of cylinders on Test No. 6625

Distribution:
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Reviewed By:

GROUT STRENGTH TEST RESULTS

CSA Specification A23.2

Yellowknife, NT Laboratory

Project No: Y14101343
Project: Con Mine Miscellaneous Testing

Client: Nahanni Construction Ltd.

Attention: Gord Beckford

Element Cast & Location Tested :
Con Mine
Shaft Plug

Placing Method: Chute

Test No: 6625

INFORMATION FROM DELIVERY SLIP

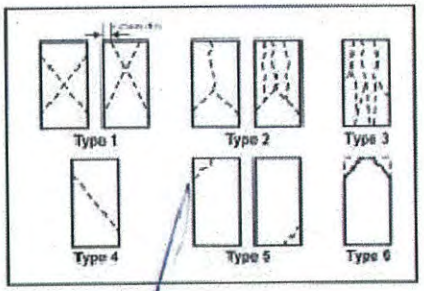
Supplier: Capital
Truck No: 17031 Plant Dep:
Ticket No: Mix No.:
Load Amount: 6 m^3 Cumulative: m^3
Admixture: Air X CaCl2 Other
Spec. Strength: 32 MPa Spec Air: 5 - 8 %
Cement Type: HS Spec Slump/flow: 75 ± 25 mm
Max Aggregate Size: 20 mm

Test Time: 9:55 Unit Weight: kg/m^3
Temperature: Air -21 °C Grout 20 °C
Grout Setting Temperature Within Specification
Limits: (15 - 25C) Yes X No If No see remarks
Slump/Flow: 85 mm Air Content: 7 %
Date Cast: 11 01 26 By: KL
Date Received: 11 01 29 By: NR

Cylinder Number	Age Days	Test Date	Test By	Compressive Strength MPa	Type of Fracture	Comments
6625-1	7	11 02 02	NR	23.9	1	Cylinder Mass = 4009 g
6625-2	28	11 02 23	NR	36.2	4	Cylinder Mass = 3971 g
6625-3	28	11 02 23	NR	36.5	4	Cylinder Mass = 3996 g
6625-4	57	11 03 24	IF	36.2	1	Cylinder Mass = 4003 g

Type of Fracture

Remarks: 4-100mm x 200mm cylinders cast in plastic molds



Distribution:
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Reviewed By:

Appendix C

As-Built Drawing

GENERAL STRUCTURAL

GENERAL REQUIREMENTS

1. EXECUTION: PERFORM WORK IN ACCORDANCE WITH NATIONAL BUILDING CODE, 2005; AND LOCAL CODES, BY-LAWS, ORDINANCES, AND SAFETY REGULATIONS. THE COMPLETE WORK UNDER THESE TRADES SHALL BE GOVERNED BY THE DICTATES OF GOOD PRACTICE IN ALL DETAILS OF MATERIALS AND METHODS, EVEN IF NOT MINUTELY SPECIFIED. PROPERLY COORDINATE THE WORK WITH THE REQUIREMENTS OF OTHER UNITS OF WORK SPECIFIED IN OTHER SECTIONS. THE DRAWINGS DESCRIBE THE COMPLETED PROJECT, AND DO NOT INDICATE COMPONENTS THAT MAY BE NECESSARY FOR CONSTRUCTION SAFETY. THE CONTRACTOR IS RESPONSIBLE FOR SAFETY IN-AND-ABOUT THE JOB SITE DURING CONSTRUCTION, AND THE DESIGN AND ERECTION OF ALL TEMPORARY STRUCTURES, FORMWORK, FALSEWORK, SHORING, ETC., REQUIRED TO COMPLETE THE PROJECT. MAINTAIN THE WORK, INCLUDING ROOF AND BUILDING SYSTEMS, AT LEAST ON A DAILY BASIS, FREE FROM ACCUMULATIONS OF WASTE MATERIAL AND DEBRIS. IN PREPARATION FOR FINAL ACCEPTANCE OF THE PROJECT ON AN INTERIM, OR FINAL CERTIFICATE OF COMPLETION, PERFORM FINAL CLEANING.

2. STANDARDS:

.1 NATIONAL BUILDING CODE: NBCC 2005.
.2 CONCRETE MATERIALS AND METHODS OF CONCRETE CONSTRUCTION: CSA A23.1-04.
.3 METHODS OF TEST FOR CONCRETE: CSA A23.2-04.
.4 DESIGN OF CONCRETE STRUCTURES (LIMIT STATES DESIGN): CSA A23.3-04.
.5 ENGINEERING DESIGN IN WOOD (LIMIT STATES DESIGN): CSA 086-01

3. DESIGN LOADS

3.1 LIVE LOADS:

.1 GROUND SNOW LOAD (Ss) - 2.2 KPA
.2 RAIN LOAD (Sr) - 0.1 KPA
.3 IMPORTANCE FACTOR FOR SNOW LOAD - 1.0
.4 SOIL SURCHARGE LOAD - 25.6 KPA
.5 ADDITIONAL LIVE LOAD (MAINTENANCE CREW) - GREATER OF
A) 1.8 KPA
B) 81 KN POINT LOAD ANYWHERE ON CAP OVER AN AREA 300MMx300MM

CONSTRUCTION LIVE LOADS:
.1 EQUIPMENT LOAD - 3.6KPA (TOTAL LOAD NOT TO EXCEED 60 KN)
.2 WET CONCRETE - 12.7 KPA (0.55M DP SLAB)

3.2 DEAD LOADS:

.1 CONCRETE CAP:
DEAD LOAD - 12.95 KPA
.2 FORM WORK - 1 KPA
.3 SUPERIMPOSED DEAD LOAD - 0.50 KPA

NOTE: SUPERIMPOSED DEAD LOADS ARE NON-STRUCTURAL DEAD LOADS DUE TO MECHANICAL, ELECTRICAL, TOPPINGS, AND MISCELLANEOUS LOADINGS.

3.3 SEISMIC DATA:

Sa (0.2)	0.12
Sa (0.5)	0.056
Sa (1.0)	0.023
Sa (2.0)	0.006
PGA	0.059

4. SHOP DRAWINGS

SUBMIT ONE SET OF REPRODUCIBLE DRAWINGS WITH THREE SETS OF PRINTS. SHOP DRAWINGS NOT STAMPED, SIGNED, AND DATED BY THE CONTRACTOR WILL BE RETURNED WITHOUT BEING REVIEWED, AND SHALL BE CONSIDERED REJECTED. SHOP DRAWINGS FOR WORK DESIGNED BY FABRICATOR SHALL BEAR THE STAMP AND SIGNATURE OF A PROFESSIONAL ENGINEER REGISTERED IN THE NORTHWEST TERRITORIES

5. TIMBER - ROUGH CARPENTRY

5.1 EXECUTION: PERFORM TIMBER CONSTRUCTION WORK IN ACCORDANCE WITH THE FOLLOWING STANDARDS:

.1 ENGINEERING DESIGN IN WOOD (LIMIT STATES DESIGN): CSA 086.1-01 (R2006).
.2 PRESERVATIVE TREATMENT OF WOOD: CSA 080 SERIES-08.

5.2 MATERIALS:

.1 ROUGH SAWN LUMBER: SPRUCE, N2
.2 GLUED END-JOINTED OR FINGER-JOINTED LUMBER IS NOT ACCEPTABLE.
.3 WIRE NAILS, SPIKES AND STAPLES: TO CSA B111-1974.

6. CAST-IN-PLACE CONCRETE

6.1 EXECUTION: PERFORM CAST-IN-PLACE CONCRETE WORK IN ACCORDANCE WITH THE FOLLOWING STANDARDS:

.1 CONCRETE MATERIALS AND METHODS OF CONSTRUCTION - CSA A23.1-04.
.2 METHODS OF TEST FOR CONCRETE - CSA A23.2-04.
.3 DESIGN OF CONCRETE STRUCTURES FOR BUILDINGS (LIMIT STATES DESIGN) - CSA A23.3-94.
.4 AMERICAN SOCIETY FOR TESTING AND MATERIALS - ASTM.
.5 AMERICAN CONCRETE INSTITUTE DETAILING MANUAL - ACI 318-05.

6.2 FORMWORK MATERIALS: FORMWORK TO CSA A23.1; FORM OIL TO BE NON-STAINING AND NON-VOLATILE TYPE.

6.3 ERECTION OF CONCRETE FORMWORK: DETERMINE THE REQUIREMENTS OF THE OTHER TRADES, INFORM ALL CONCERNED TRADES, AND ASSUME RESPONSIBILITY FOR LOCATION, INSTALLATION AND QUALITY OF ALL ITEMS WHICH AFFECT THE WORK OF THIS SECTION. CHECK LOCATIONS AND SIZES OF SLEEVES, OPENINGS, ETC., SHOWN ON STRUCTURAL DRAWINGS WITH ARCHITECTURAL, MECHANICAL, AND ELECTRICAL DRAWINGS. OBTAIN ENGINEER'S PERMISSION BEFORE FORMING OPENINGS, NOT INDICATED ON THE DRAWINGS, IN CONCRETE BEAMS OR COLUMNS.

6.4 CONCRETE: SUPPLY "CONTROLLED CONCRETE" AS DEFINED BY CSA A23.1 IN ACCORDANCE WITH THE FOLLOWING:

.1 EXTERIOR SLABS ON GRADE
CONCRETE STRENGTH (MINIMUM) - 32 MPA
CEMENT TYPE - HS
EXPOSURE CLASS - S-2
AIR CONTENT - 5-7%
AGGREGATE SIZE (MAXIMUM) - 20 MM
SLUMP 75 +/- 25 MM
WATER/CEMENT RATIO - 0.45

.2 NOTES
STRENGTH: 56 DAY COMPRESSIVE STRENGTH PER CSA A23.2.
TYPE: CEMENT TYPE AS DEFINED IN CSA A23.1.
EXPOSURE: CLASS OF EXPOSURE PER CSA A23.1 FOR DETERMINATION OF WATER CEMENT RATIO.
AIR: AIR CONTENT % BY VOLUME; N=NATURAL AIR - NO AIR ENTRAINING AGENT.
SLUMP: HIGH RANGE WATER REDUCING AGENTS MAY BE ADDED TO INCREASE WORKABILITY AND AID IN THE PLACEMENT OF CONCRETE WHERE THE SPECIFIED SLUMP IS LESS THAN 80 MM.
FLYASH: FLYASH NOT PERMITTED IN FLOOR SLAB CONCRETE MIXES.

6.5 CONCRETE ACCESSORIES

.1 LIQUID MEMBRANE CURING COMPOUND: CHLORINATED RUBBER TYPE COMPOUND TO CSA A23.1.
.2 BITUMINOUS DAMPPROOFING: WATERPROOF EMULSION COMPOSED OF ASPHALT DISPERSED IN A MINERAL COLLOID EMULSIFIER TO CGSB 37-GP-19M.
.3 NON-SHRINK GROUT FOR ROCK ANCHORS: SIKA GROUT 212 SR + SIKACEM ACCELERATOR.
.4 BONDING AGENT FOR BOLTS TO CONCRETE: SIKA ANCHORFIX-2.

6.6 REINFORCING: PROVIDE SHOP DRAWINGS INCLUDING PLACING DRAWINGS FOR ALL REINFORCEMENT. REINFORCING STEEL TO CSA G30.18-92; NEW BILLET STEEL, GRADE 400R DEFORMED BARS FOR 10M AND LARGER. WELDABLE REINFORCING STEEL TO CSA G30.18-92, NEW BILLET STEEL, GRADE 400R DEFORMED BARS. WELDED WIRE MESH TO CSA G30.5-83 (PROVIDE IN FLAT SHEETS ONLY). DEFORMED WELDED WIRE MESH TO CSA G30.15-83 (PROVIDE IN FLAT SHEETS ONLY). CHAIRS, BOLSTERS, BAR SUPPORTS, AND SPACERS TO BE ADEQUATE FOR STRENGTH AND SUPPORT OF REINFORCING, AND MUST NOT CAUSE STAINING OF EXPOSED CONCRETE. ALL SUPPORTS USED TO SUPPORT EPOXY COATED REINFORCING SHALL BE PLASTIC COATED. EPOXY COATINGS TO ASTM A775.

6.7 FABRICATION OF CONCRETE REINFORCEMENT: HOOKS, BENDS, LAPS AND SIMILAR DETAILS TO ACI 318-99. UNLESS OTHERWISE NOTED, SPLICE ALL BEAM TOP REINFORCEMENT AT MID-SPAN AND ALL BOTTOM REINFORCEMENT AT SUPPORT LOCATIONS. PROVIDE CORNER BARS AT ALL BEAM INTERSECTIONS AND CORNERS. USE SPLICES ONLY WHERE SHOWN ON THE DRAWINGS, OR AS APPROVED BY THE ENGINEER. FOR SPLICES NOT SHOWN ON THE DRAWINGS, USE CLASS "B" SPLICES FOR REINFORCEMENT BARS. ALL HORIZONTAL BARS IN WALLS SHALL BE CONSIDERED AS TOP REINFORCEMENT.

6.8 PLACING REINFORCING STEEL: PLACE TO TOLERANCES IN ACCORDANCE WITH CSA A23.1. REINFORCING IS TO BE PLACED ON PURPOSE-MADE SUPPORTS. A REINFORCEMENT TECHNICIAN IS TO BE ON SITE DURING THE PLACEMENT OF CONCRETE FLOOR SLABS, AND IS TO RECHAIR AND/OR ADJUST SUPPORTS FOR REINFORCEMENT AS REQUIRED DURING THE PLACEMENT OF CONCRETE. WELDING OF REINFORCEMENT IS NOT PERMITTED, UNLESS OTHERWISE NOTED.

6.9 UNLESS OTHERWISE NOTED, PROVIDE 2-15M BARS PARALLEL TO ALL EDGES AND EXTENDING 600MM BEYOND CORNERS AT OPENINGS IN WALL AND SLABS.

6.10 CLEAR COVER TO REINFORCEMENT:

.1 TOP REBAR - 75 MM.
.2 BOTTOM REBAR - 50 MM
.3 STIRRUPS - 40MM

6.11 PLACING CONCRETE: CONCRETE MUST BE PLACED WITHIN 60 MINUTES OF BEING MIXED AT THE PLANT. CLEAN PREVIOUSLY PLACED CONCRETE TO ENSURE BOND. MIX AND BRUSH ON BONDING AGENT, WHERE SPECIFIED, IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS. PLACE CONCRETE AS A CONTINUOUS OPERATION, STOPPING ONLY AT CONSTRUCTION JOINTS INDICATED ON THE DRAWINGS, OR AS FOLLOWS: AT CENTRE OF SPAN OF SUSPENDED SLABS AND BEAMS; IN WALLS AND COLUMNS IMMEDIATELY ABOVE OR BELOW FLOOR CONSTRUCTION; AT CENTRE OF STEEL BEAM THAT SUPPORTS CONCRETE SLAB. USE WINTER CONCRETING METHODS IN ACCORDANCE WITH CSA A23.1 WHEN THE MEAN DAILY TEMPERATURE FALLS BELOW 5°C. USE HOT WEATHER CONCRETE METHODS IN ACCORDANCE WITH CSA A23.1 WHEN THE AIR TEMPERATURE IS AT OR ABOVE 25°C DURING THE PLACING OF THE CONCRETE.

6.12 FINISHING FORMED SURFACES AND FLATWORK:

.1 USE OF CALCIUM CHLORIDE IS NOT PERMITTED.
.2 ROUGH FINISH CONCRETE SURFACES NOT EXPOSED TO VIEW. CUT OFF FORM TIES A MINIMUM OF 10 MM BELOW CONCRETE SURFACE. PATCH TIE HOLES AND DEFECTS.
.3 GROUT CLEANED FINISH, EXTERIOR SURFACES, AND VERTICAL INTERIOR SURFACES EXPOSED TO VIEW: PLACE CONCRETE AGAINST PLYWOOD, STEEL, OR TEMPERED HARDBOARD. PATCH TIE HOLES AND DEFECTS. REMOVE FINS. RUB DOWN WITH CEMENT SAND SLURRY.
.4 LIGHT BROOM FINISH ALL EXTERIOR CONCRETE SLABS. APPLY HARDENERS AND SEALERS TO LOCATIONS WHERE INDICATED.

6.13 CURING METHODS: PONDING OR CONTINUOUS SPRINKLING; ABSORPTIVE MAT OR FABRIC KEPT CONTINUOUSLY WET; CURING COMPOUNDS SHALL BE CLEAR LIQUID CONFORMING TO CANADIAN GENERAL STANDARDS BOARD STANDARD 90-GP-16, TYPE 1. POLYETHYLENE SHEET IS NOT AN ACCEPTABLE CURING METHOD FOR SLABS WHICH ARE TO BE EXPOSED. CURING COMPOUNDS SHALL NOT BE USED ON CONCRETE SURFACES TO RECEIVE TOPPING OR OTHER TYPE OF BONDED FINISH UNLESS APPROVED BY THE ENGINEER.

6.14 TESTING CONCRETE:
NOTIFY THE ENGINEER 24 HOURS IN ADVANCE OF A POUR FOR REVIEW BEFORE PLACING CONCRETE. TESTING FIRM WILL TAKE FOUR TEST CYLINDERS FROM EACH 50 CU.M OF CONCRETE, OR FRACTION THEREOF, OF EACH TYPE OF CONCRETE PLACED IN ANY ONE DAY.
TESTING FIRM WILL MAKE AT LEAST ONE SLUMP TEST AND ONE ENTRAINED AIR TEST FOR EACH SET OF TEST CYLINDERS TAKEN.
RESULTS OF FIELD TESTS WILL BE REPORTED IMMEDIATELY TO THE CONTRACTOR BY THE FIELD REPRESENTATIVE OF THE TESTING FIRM. THESE RESULTS DO NOT IMPLY APPROVAL OR DISAPPROVAL OF THE WORK, BUT ARE FOR THE CONTRACTOR'S INFORMATION.
A QUALIFIED PROFESSIONAL ENGINEER SHALL CERTIFY ALL TEST RESULTS OBTAINED AS PER THESE SPECIFICATIONS, AND THE CERTIFIED RESULTS SHALL BE SUBMITTED TO THE DIRECTOR NO LATER THAN 90 DAYS AFTER TESTING.
CONCRETE THAT DOES NOT MEET THE SPECIFIED REQUIREMENTS SHALL BE REJECTED. .

STRUCTURAL STEEL

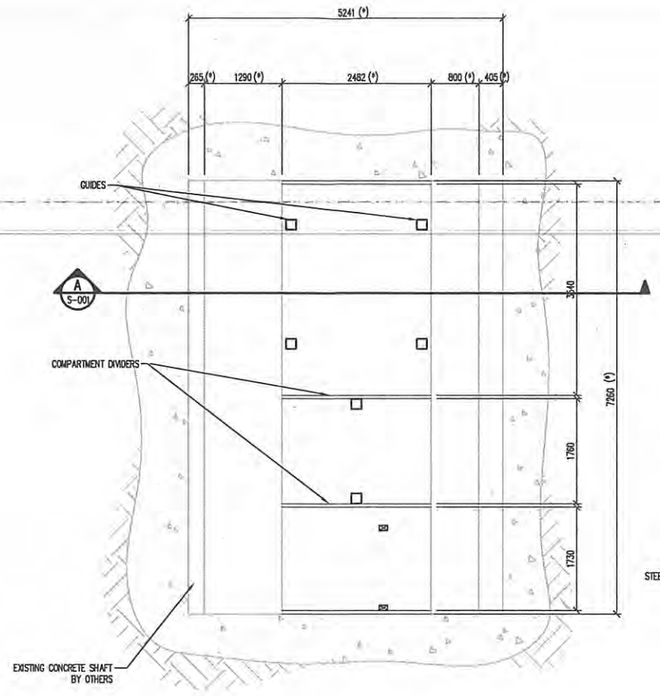
7.1 MATERIALS:

.1 STRUCTURAL STEEL: TO CSA G40.20-04/G40.21-04 GRADE 350W
STRUCTURAL SHAPES - GRADE 350 W
MISCELLANEOUS PLATES, BARS AND RODS - GRADE 300W
.2 ANCHOR BOLTS: TO CSA G40.20-04/G40.21-04, GRADE 300,
.3 BOLTS AND NUTS: TO ASTM A 325-02. PROVIDE A MINIMUM OF 2-M20 BOLTS UNLESS OTHERWISE NOTED.
.4 WELDING MATERIALS: STEEL TO CSA W59-03
.5 PRIMER: STEEL SHALL BE PAINTED WITH SHOP PRIMER MEETING THE REQUIREMENTS OF CGSB 1-GP-40M (MODIFIED) CISC/CPMA STANDARD 2.75.

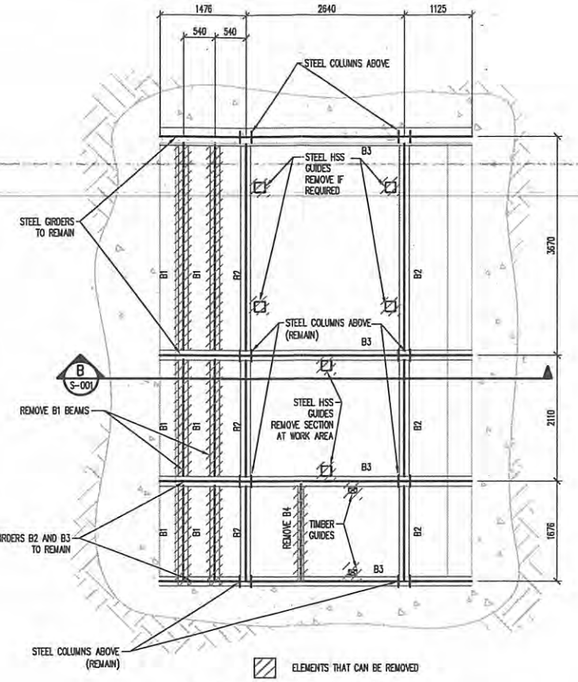
7.2 DESIGN: CONTRACTOR SHALL BE RESPONSIBLE FOR DESIGN OF CONNECTIONS TO RESIST THE FORCES SHOWN ON THE DRAWINGS. WHERE FORCES ARE NOT SHOWN, CONNECTIONS ARE TO BE DESIGNED FOR NOT LESS THAN 50% OF THE SHEAR RESISTANCE OF THE MEMBER. MINIMUM CONNECTION TO BE 2-M16-A325N BOLTS DESIGN BRACING, BRIDGING AND CONNECTORS TO SAFELY SUPPORT LOADS AS INDICATED, EQUIPMENT LOADS, WET SERVICE CONDITIONS, SNOW AND SNOW ACCUMULATION AND LOADS DURING ERECTION. PROVIDE 10 MM THICK BEARING STIFFENERS EACH SIDE OF BEAM WEB (CENTERED OVER SUPPORT) WHERE BEAM OR CHANNEL PASSES OVER SUPPORT.

7.3 SHOP DRAWINGS: SUBMIT SHOP DRAWINGS FOR STRUCTURAL STEEL. SHOP DRAWINGS FOR WORK DESIGNED BY FABRICATOR SHALL BEAR THE STAMP AND SIGNATURE OF A PROFESSIONAL ENGINEER REGISTERED IN THE NORTHWEST TERRITORIES

7.4 QUALITY: THE FABRICATOR SHALL HAVE A QUALITY ASSURANCE PROGRAM THAT CONFORMS TO THE REQUIREMENTS OF THE C.I.S.C. ALBERTA REGION "GUIDELINE FOR QUALITY FOR STRUCTURAL STEEL FABRICATION", OR AN EQUIVALENT DOCUMENT.

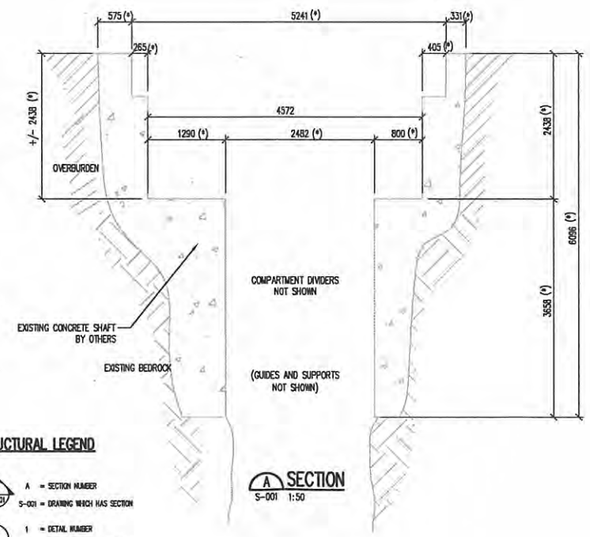


1 PLAN VIEW
S-001 1:50



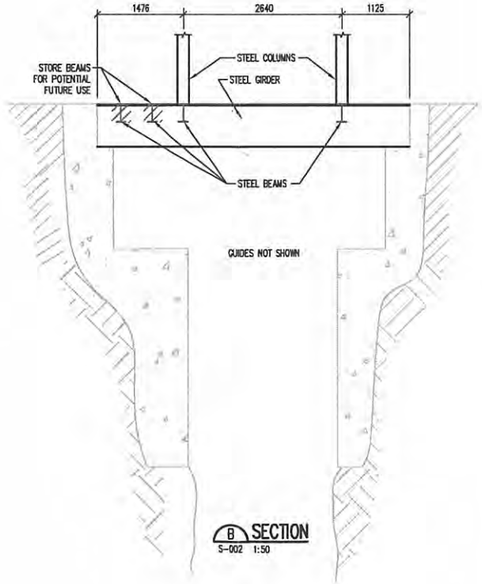
ELEMENTS THAT CAN BE REMOVED

2 PLAN VIEW AT GRADE LEVEL
S-001 1:50



A SECTION
S-001 1:50

EXISTING SHAFT
(*) DIMENSIONS TO BE SITE CONFIRMED



B SECTION
S-002 1:50

DEMOLITION PLAN

STRUCTURAL LEGEND

A S-001 = SECTION NUMBER
S-001 = DRAWING WHICH HAS SECTION
1 S-001 = DETAIL NUMBER
S-001 = DRAWING WHICH HAS DETAIL
= ELEVATION MARK
= PROPERTY LINE
= SPAN SYMBOL
= EXTENT SYMBOL
T.O.S. TOP OF STEEL
E/W EACH WAY
MID MIDDLE

REVISIONS

NO.	DESCRIPTION	YYYY.MM.DD	BY	APP.
0	ISSUED FOR CONSTRUCTION	2010.11.10	AL	JC
1	REVISED STAIR LOCATION/CLARIFICATIONS	2010.11.25	AL	JC
2	RECORD DRAWINGS	2011.09.02	PC	JC

RECORD DRAWING

DRAWINGS WERE BASED UPON INFORMATION SUBMITTED FROM OTHER PARTIES AND THE ENGINEER DOES NOT WARRANT OR CERTIFY THAT THE INFORMATION FROM THESE OTHER PARTIES IS ACCURATE.

DATE (YYYY MM DD): 2011.09.02

REFERENCE DRAWINGS

DRAWING NO.	DESCRIPTION

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LEGEND

A A-001 SECTION # SOURCE / REFERENCE DWG.
1 E-001 DETAIL # SOURCE / REFERENCE DWG.

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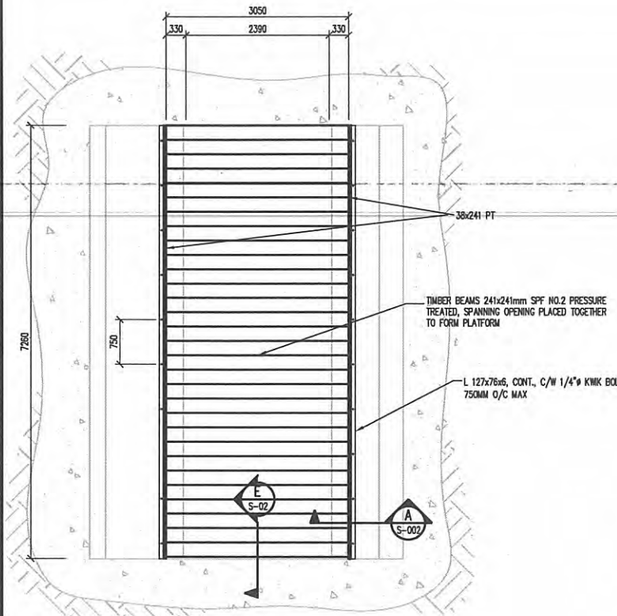
WILLIAMS ENGINEERING CANADA

JOB TITLE:
CON MINE
ROBERTSON SHAFT
CAP DESIGN

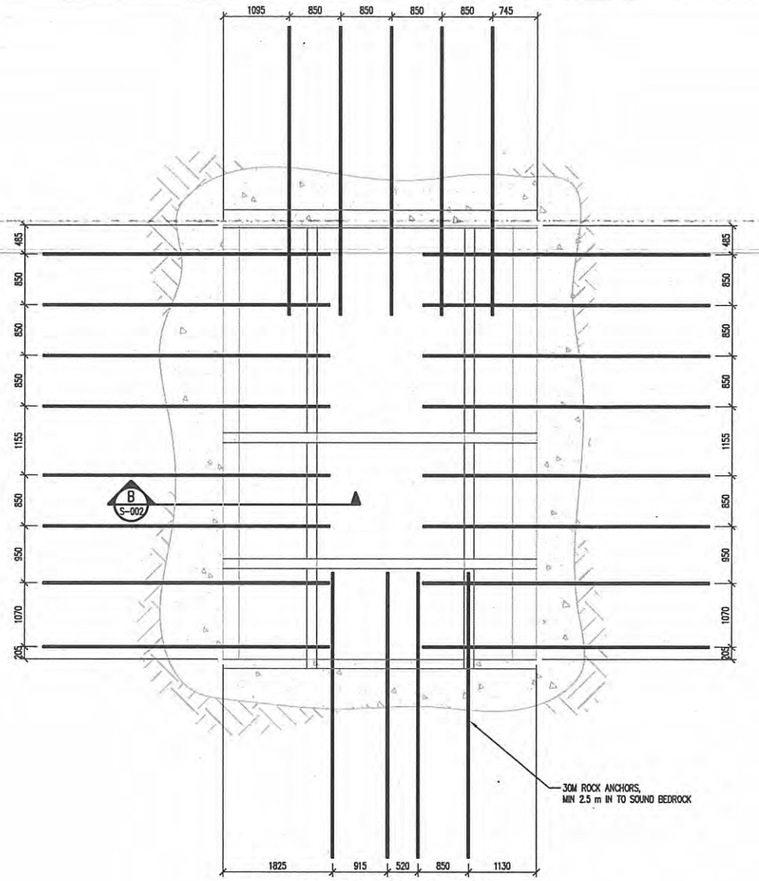
DWG. TITLE:
GENERAL STRUCTURAL
EXISTING SHAFT

DWN. BY:	DES. BY:	PROJ. MGR.:
JB	JB	JC
PEER REVIEW:	DATE: (YY-MM-DD)	SCALE:
AL	2010.11.25	AS NOTED
CLIENT PROJ. #		WE PROJ. #
		20948.00

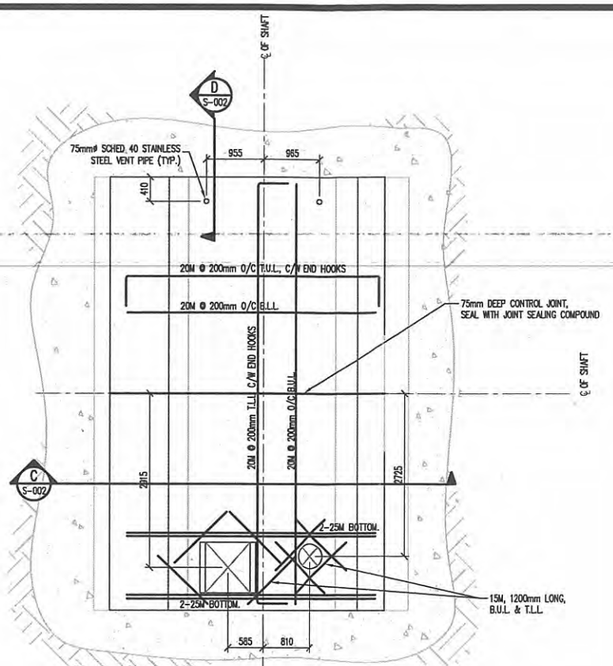
DWG # S-001 SHT 4 REV 2



1 FORMWORK PLAN VIEW
S-002 1:50

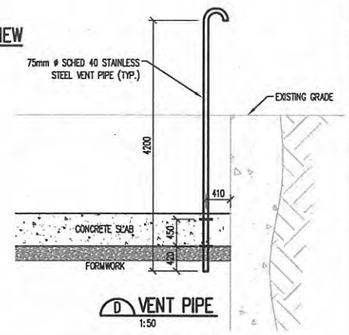


2 ROCK ANCHOR LAYOUT
S-002 1:50

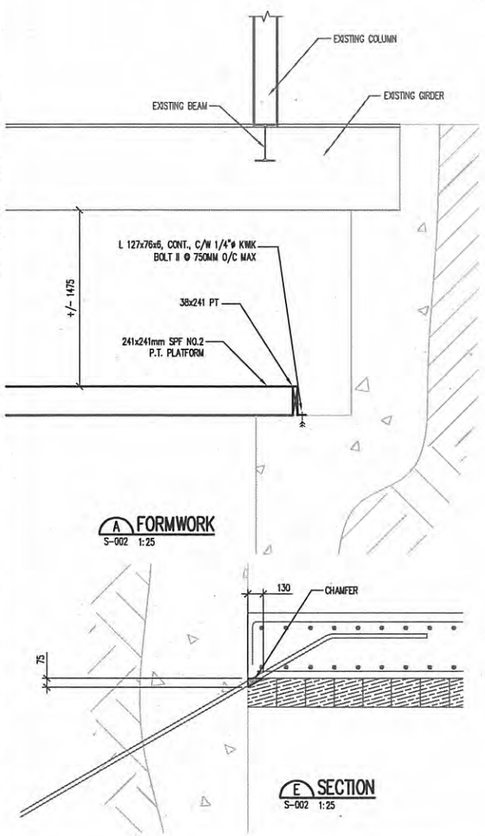


B.L.L.: BOTTOM LOWER LAYER
B.U.L.: BOTTOM UPPER LAYER
T.L.L.: TOP LOWER LAYER
T.U.L.: TOP UPPER LAYER

3 CONCRETE CAP PLAN VIEW
S-002 1:50

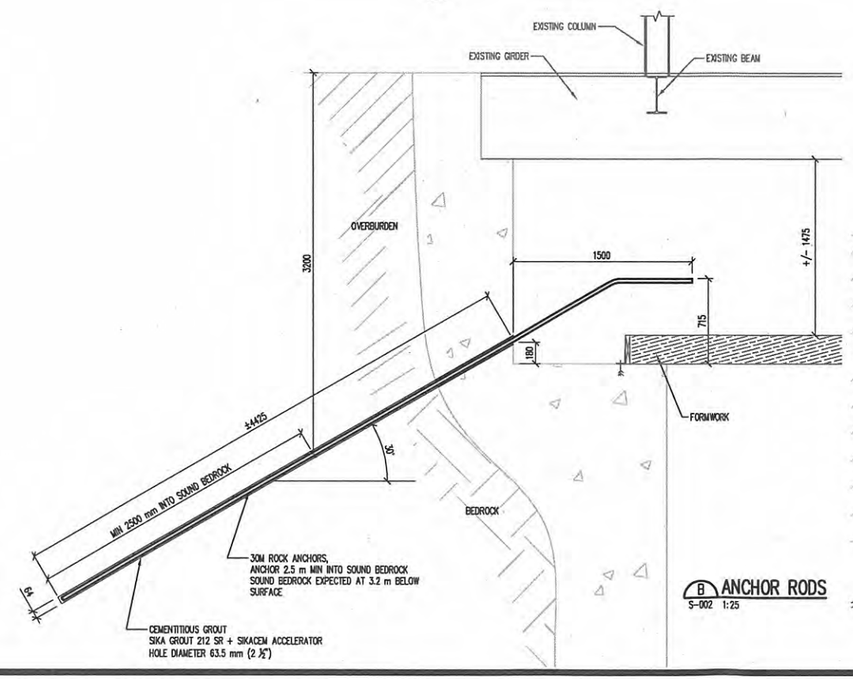


D VENT PIPE
1:50

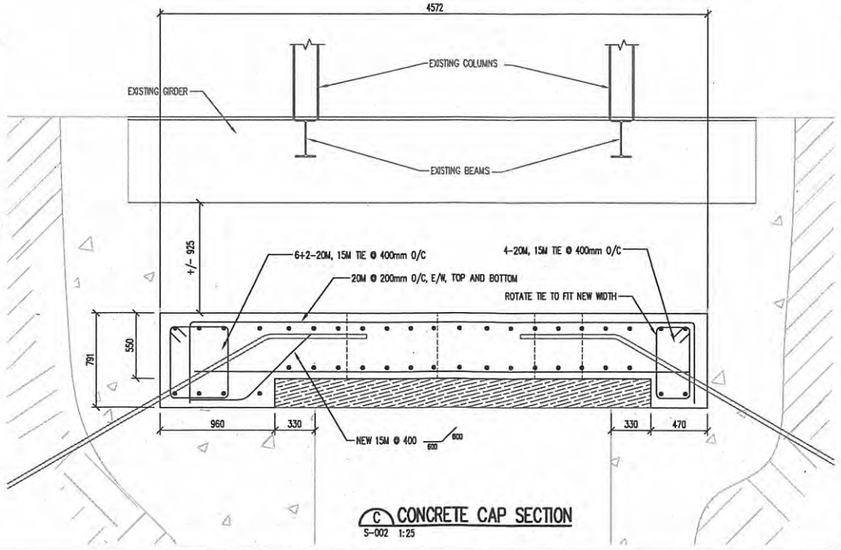


A FORMWORK
S-002 1:25

E SECTION
S-002 1:25



B ANCHOR RODS
S-002 1:25



C CONCRETE CAP SECTION
S-002 1:25

REVISIONS

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DATE (YYYY MM DD): 2011.09.02

DRAWING NO. | DESCRIPTION

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LEGEND

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WILLIAMS ENGINEERING CANADA

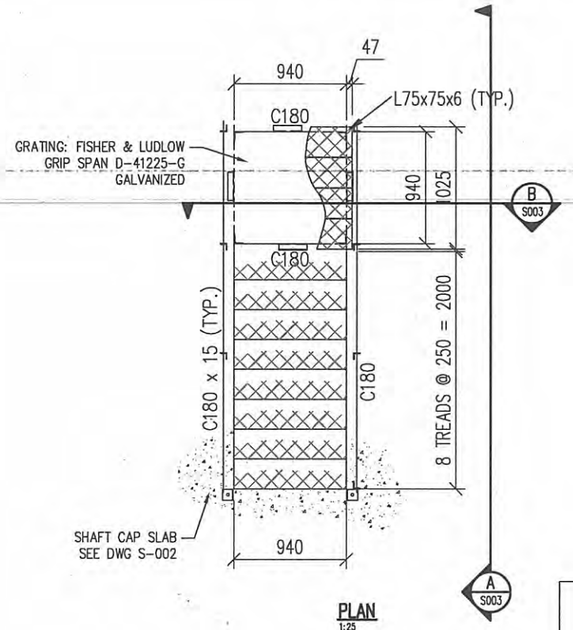
NEWMONT The Gold Company

JOB TITLE:
CON MINE
ROBERTSON SHAFT
CAP DESIGN

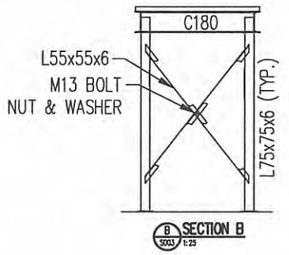
DWG. TITLE:
FORMWORK
ROCK ANCHORS
CONCRETE CAP
LAYOUTS AND SECTIONS

DRN. BY:	DES. BY:	PROJ. MGR:
JB	JB	JC
PEER REVIEW:	DATE: (YY-MM-DD)	SCALE:
AL	2010.11.25	AS NOTED
CLIENT PROJ. #		WE PROJ. #
		20948.00

DWG # S-002 SHT 4 REV 2



PLAN
1:25



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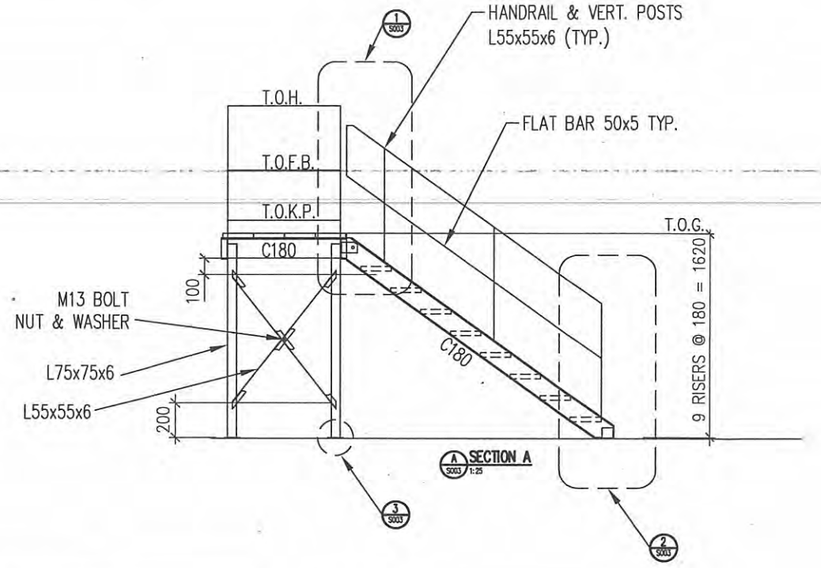

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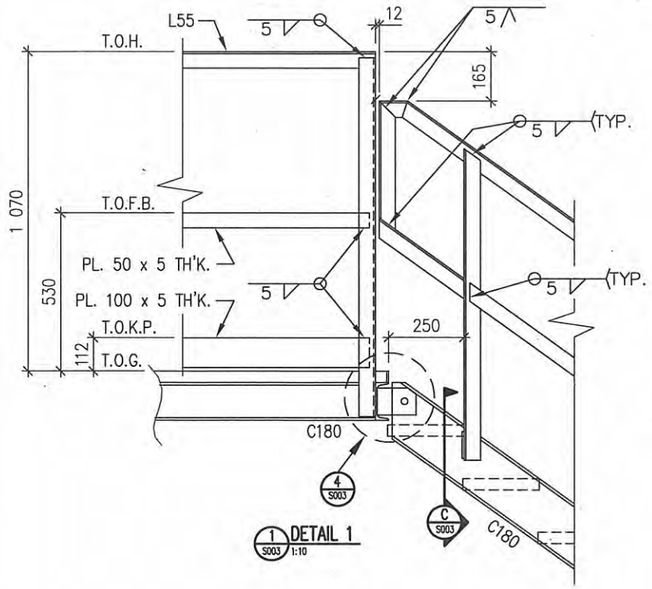

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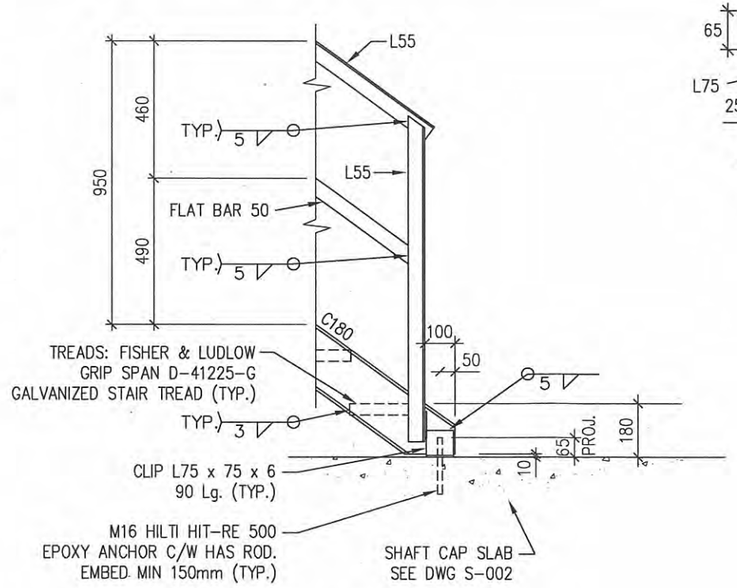

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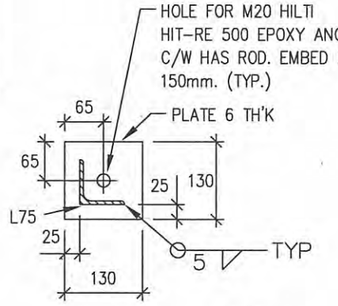
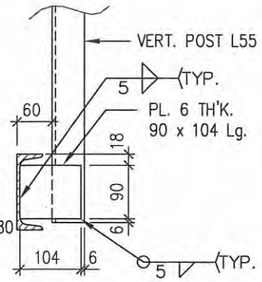


3 S003 DETAIL - PLAN VIEW (TYP. 4) 1:5



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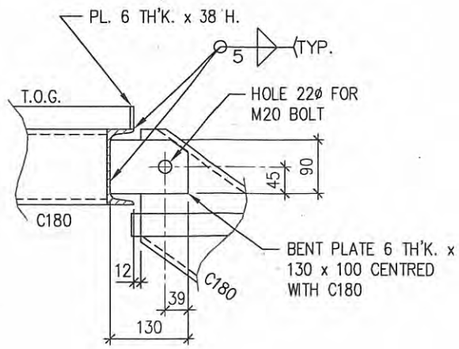

4 S003 DETAIL 4 1:5

REVISIONS

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A A-001 SECTION # SOURCE / REFERENCE DWG.

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WILLIAMS ENGINEERING CANADA

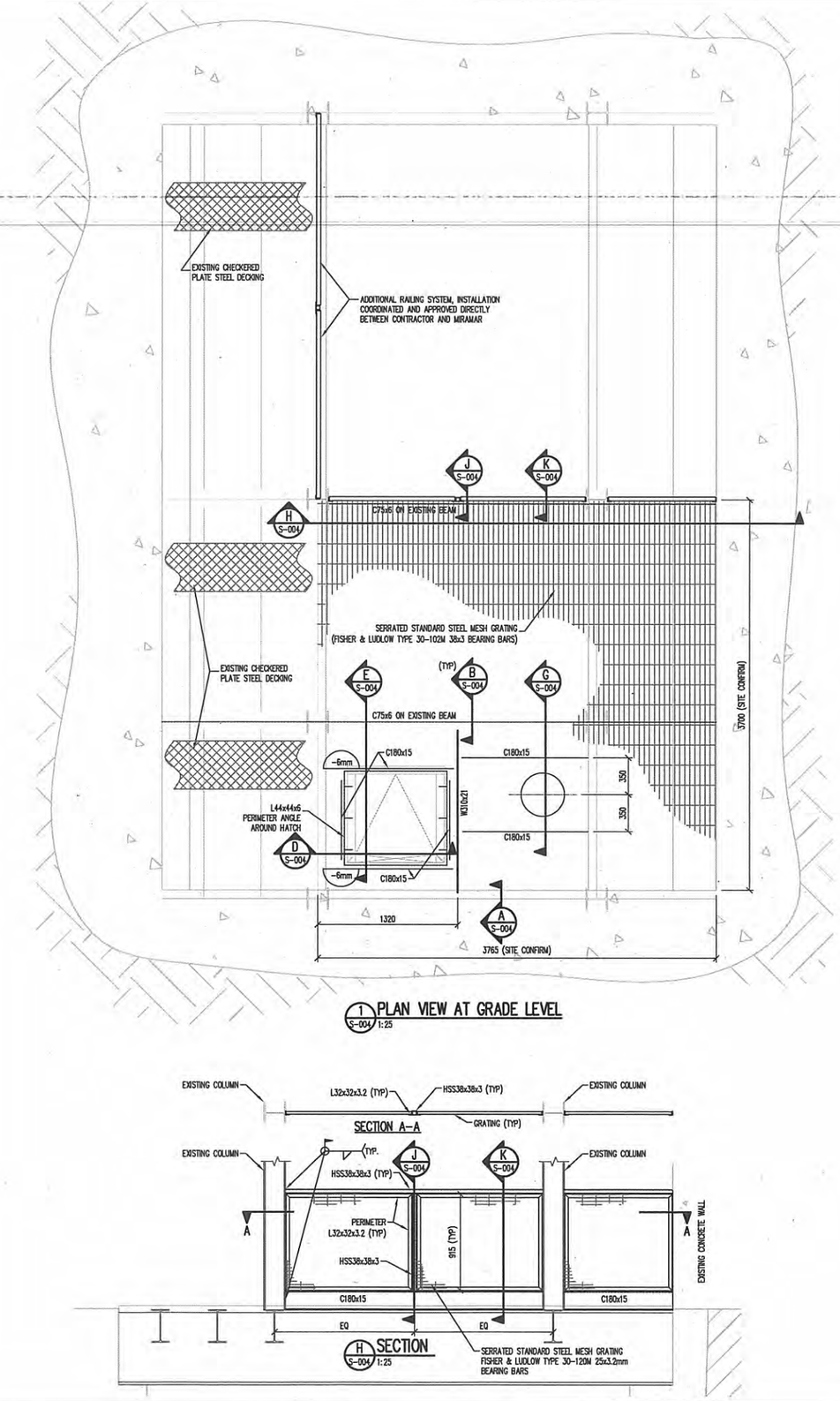
NEWMONT The Gold Company

JOB TITLE:
CON MINE
ROBERTSON SHAFT
CAP DESIGN

DWG TITLE:
STAIRWAY TO SHAFT CAP
PLAN, SECTIONS, AND DETAILS

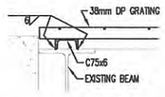
DWN. BY:	DES. BY:	PROJ. MGR.:
JG	JG/KR	JC
PEER REVIEW:	DATE: (YY-MM-DD)	SCALE:
AL	2010.11.25	AS NOTED
CLIENT PROJ. #		WE PROJ. #
		20948.00

DWG # S-003 SHT # 4 REV # 1



1 S-004 PLAN VIEW AT GRADE LEVEL 1:25

H S-004 SECTION 1:25



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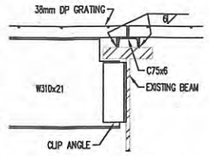

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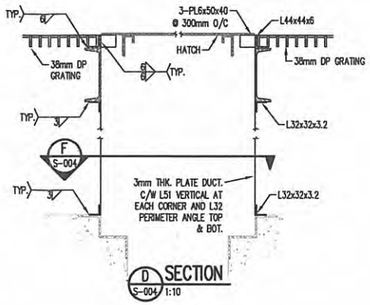

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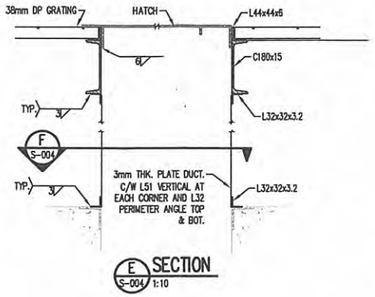

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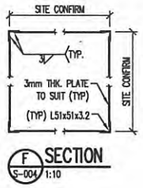

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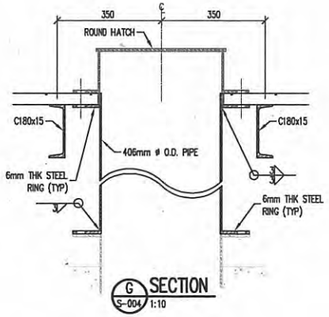

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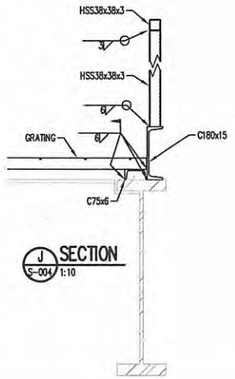
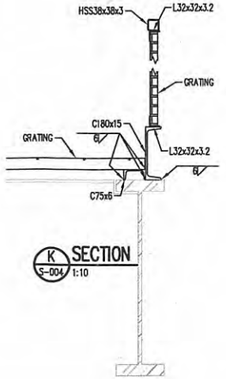


J S-004 SECTION 1:10



K S-004 SECTION 1:10

REVISIONS

NO.	DESCRIPTION	YYYY.MM.DD	BY	APP.
0	DECK ADDITION	2011.01.27	AL	JC
1	RECORD DRAWINGS	2011.09.02	PC	JC

RECORD DRAWING

DRAWINGS WERE BASED UPON INFORMATION SUBMITTED FROM OTHER PARTIES AND THE ENGINEER DOES NOT WARRANT OR CERTIFY THAT THE INFORMATION FROM THESE OTHER PARTIES IS ACCURATE.

DATE (YYYY MM DD): 2011.09.02

DRAWING NO. | DESCRIPTION

REFERENCE DRAWINGS

FOR BEST PLOTTING RESULTS, BE SURE TO USE WILLIAMS ENGINEERING CANADA AUTOCAD PLOT CONFIGURATION FILES AVAILABLE FROM: www.williamsengineering.com

LEGEND

A A-001 SECTION # SOURCE / REFERENCE DWG.

1 E-001 DETAIL # SOURCE / REFERENCE DWG.

PERMIT STAMP:

PERMIT TO PRACTICE
WILLIAMS ENGINEERING CANADA INC.
PERMIT NUMBER
P 646
NWT/NU Association of Professional Engineers and Geoscientists

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WILLIAMS ENGINEERING CANADA

NEWMONT The Gold Company

JOB TITLE:
CON MINE
ROBERTSON SHAFT
CAP DESIGN

DWG TITLE:
HATCHES, STEEL DECK & RAILING LAYOUT AND SECTIONS

DWN. BY: JK	DES. BY: JB	PROJ. MGR.: JC	
PEER REVIEW: AL	DATE: (YY-MM-DD) 2011.01.25	SCALE: AS NOTED	
CLIENT PROJ. #:		WE PROJ. #: 20948.00	
DWG #: S-004	SHT #: 4	REV #: 1	