

APPENDIX E

Design Criteria

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Stage 1 Construction Design Criteria

Site Conditions & Equipment Standards 02 10 00 SPE Technical Specification

Project Name:	Eagle Gold Feasibility Study	Project Number:	11548601.00
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1 INTRODUCTION

1.1 GENERAL

Project: Eagle Gold Feasibility Study

Owner/Operator: StrataGold Corporation

1.2 PROJECT DESCRIPTION

StrataGold Corporation (SGC), a Canadian Corporation proposes to develop the Dublin Gulch gold deposit in the Yukon Territory. The Project will involve open pit mining at a production rate of approximately 10 million tonnes per year (Mt/y) ore, an average strip ratio (amount of waste: amount of ore) of 1.45:1.0 and gold extraction using a three stage crushing process, heap leaching, and a carbon adsorption, desorption, and recovery system over a 10 year mine life.

1.3 LOCATION

The Eagle Gold Project is located within the Dublin Gulch Property, in central Yukon Territory, approximately 85 km north-northeast of the village of Mayo and 350 km north of the Yukon Territory capital of Whitehorse within portions of NTS sheets 105M/13, 105M/14, 106D/3, 106D/4, 115P/16 and 116A/1. The property is rectangular in shape and extends approximately 26 km in an east-west direction and 13 km in a north-south direction. The centre of the property is at approximately 7,100,950mN, 463,750E (NAD 83, Zone 8). The geographic co-ordinates are approximately 64°02'13" N latitude and 135°44'33" W longitude.

1.4 ACCESS TO SITE

The property can be accessed from Mayo by following Silver Trail (Highway 11) for 39km, then heading along the South McQuesten Road for 21 km. The South McQuesten River Bridge will be strengthened. The last 25 km of the access road to the Project are not maintained by government maintenance crews and are unpaved, but are generally in good repair and allow passage for cars, trucks, and heavy haul highway truck and trailer units. Access within the greater property is currently by a network of four-wheel-drive roads and a crossing over Haggart Creek in the vicinity of the Dublin Gulch property will be constructed.

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Figure 1.1 Project Location Map

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1.5 MINING

SGC proposes to develop a bulk tonnage, low grade, heap leachable gold deposit on its Eagle Gold property. The proposed project will be developed as a conventional open pit mining operation at a production rate of 10 million tonnes per year (Mt/y) ore with an approximate average waste to ore ratio of 1.45 over the estimated 10 year production life of the mine. The open pit deposit will be drilled and blasted. Ore material will be loaded by a hydraulic shovel into a haul truck and delivered to the primary crusher located on the north side of the open pit. Waste rock will be loaded into a haul truck and hauled to either the Platinum Gulch waste rock dump located on the south side of the open pit or to the Eagle Pup waste rock dump located on the north side of the open pit.

1.6 THREE-STAGE CRUSHING

Ore will be crushed in a three stage process. Ore will be moved from the open pit via heavy haul truck and delivered to the primary gyratory crusher located on the north edge of the pit. Product from the primary crusher will be transported via covered conveyor to the secondary, tertiary cone crushers and screening plant located 250 m to the north. From the tertiary crusher discharge, ore will be transported via covered conveyor and then stacked on the heap leach pad.

1.7 MINERAL PROCESSING

1. The process will be a heap leach system whereby the ore heaps will be leached using a dilute solution of NaCN, applied by a system of drip emitters. Sprinklers can also be utilized in the late spring and summer months when increased evaporation may be required to maintain the system water balance.
2. The dilute cyanide leach solution will percolate through the ore and collect on the geomembrane liner at the base of the heap. Drainage pipes above the liner will deliver the solution to the in-heap pregnant solution storage area. Vertical turbine pumps located in sumps in the heap will pump pregnant solution directly to the ADR plant. All exposed pipelines will be insulated and heat traced.
3. In order to minimize the risk of freezing the drip irrigator lines and to maintain a “heat sink” within the heap, a low-pressure steam boiler and heat exchanger will be used, when required, to warm the barren solution. A bleed stream from the barren solution tank will be pumped through the heat exchanger and back to the barren solution tank. The boiler is sized for a maximum barren solution temperature rise of approximately 2.8°C (5°F).

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2 GENERAL CLIMATIC CONDITIONS

1. Climatic data is provided by Meteorological Service Canada, except where noted. The climatic conditions shown below have been established as general conditions for the site.
2. For design criteria specific to the area of design, such as mining, heap leach facility, dams, embankments, etc. refer to the appropriate design criteria document.

2.1 TEMPERATURES

Monthly Temperature (Jan. Dry 2.5%)	°C	-43.0
Monthly Temperature (Jan. Dry 1.0%)	°C	-45.0
Monthly Temperature (Jul. Dry 2.5%)	°C	20.0
Monthly Temperature (Jul. Wet 2.5%)	°C	15.0
Degrees Day Below 18°C		81

2.2 ANNUAL PRECIPITATION

Annual Total Precipitation	mm	590
Rain	mm	270
Moisture Index		0.59

2.3 RAINFALL

15 mins	mm	8
24 hours	mm	42
Annual Total	mm	270

2.4 SNOW

Snow Load (1/30 year)		
Ground Snow Load (Ss)	kPa	2.9
Associated Rain Load (sr)	kPa	0.1
Snow Load (1/50 year)		
Ground Snow Load (Ss)	kPa	3.2
Associated Rain Load (sr)	kPa	0.1

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2.5 WIND

Exposure Category		Open Terrain
Prevailing Wind Direction		S. / S.E.
Hourly Wind Pressures:		
1/10	kPa	0.23
1/30	kPa	0.28
1/50	kPa	0.31
1/100	kPa	0.34

2.6 SEISMIC

1. Building guidelines are based on the National Building Code seismic hazard calculation specific to the Eagle Gold Project site.
2. Design and construction of the heap leach facility and geotechnical structures including dams and embankments shall incorporate considerations made in the Canadian Dam Association's Dam Safety Guidelines (2007).
3. For design criteria specific to the area of design, such as mining, heap leach facility, dams, embankments, etc. refer to the appropriate design criteria document.

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3 DESIGN AND FABRICATION (NON-MINING EQUIPMENT)

3.1 GENERAL

1. The design life for the plant and all static equipment shall be a minimum of 15 years.
2. All equipment shall be capable of operating in accordance with the performance specification in the equipment data sheet. The plant operating time is as follows:

Operating days per year	365
Operating hours per day	24
3. All designs shall facilitate ease of access for handling, transportation, installation, adjustment, control, maintenance and repair.
4. The equipment shall be the manufacturer's standard heavy-duty design, incorporating the best materials and practices in line with modern engineering concepts, suitable for continuous operation for the duty specified.
5. All materials used in the construction or assembly of equipment shall be new, free of defects and suitable for the duty and service intended.
6. Unless otherwise specified in the standard specification, the manufacturer's standard surface protection system for all proprietary plant and equipment shall be provided. This system shall be suitable for the conditions on site.
7. Suppliers are not required to depart from their standard design or specification, but significant non-fundamental differences between their product and the requirements of the bid documents must be explained in their quotation. Where no differences are explained, the Supplier undertakes to supply equipment and/or materials in accordance with the bid documents.

3.2 UNITS

The project will be designed in the metric system. It is requested that Suppliers use these units in all specifications and drawings whenever possible.

3.3 NOISE

Noise levels of emissions from any equipment shall not exceed 85 dBa at one (1) metre, and noise level for control rooms and offices shall not exceed 60 dBa at 1 m.

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3.4 SITE ELEVATION

Site elevation varies between 1050 and 855 MASL as follows:

Primary Crusher – Upper Pad	1050m
Secondary Crusher	1008m
Tertiary Crusher	986m
Truck Shop	855m
ADR Plant	860m

3.5 UTILITY SUPPLY

1. Compressed air and water will be supplied as follows:

Service Code	Service	Operating			Pipe Spec.*	Pipe Material	Remarks
		Temp (°C)	Press. (kPag)	Press. (kPag)			
		Normal	Normal	Max.			
Compressed Air							
APL	Plant Air	Amb.	620	690	CB61 CB01	ASTM A53B	690 kPa (nom.) Oil Traces
AIN	Instrument Air	Amb.	620	690	GB01	ASTM A53B	500kPa (nom.) Pneumatic Instruments Dew Pt. @ 500kPa = below - 40° C
Water							
WPT	Potable Water	Amb.	170	206	GB65 GB01 MB21	ASTM A53B	
WFI	Fire Water	Amb.	690	875	CB61 CB01 HB44	ASTM A53B	
WGL	Gland water supply	Amb.	410	450	CB61 CB21	ASTM A53B	

* To be confirmed

2. Air compressors and components provided shall be altitude de-rated to permit continuous operation at the site elevation referenced elsewhere in this document.

3.6 NATURAL GAS SUPPLY

Propane will be available for camp use as well as for air heaters and building supplement or emergency heating as required.

3.7 POWER SUPPLY

1. Main power to the site will be supplied by a new 69kV transmission line that will run 45 km along the access road to the Yukon Energy grid. The 69 kV transmission line will feed a main substation on site.

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2. Power will be distributed at 25 kV to the Crushers and Process Plant.

3.8 POTABLE WATER

1. Potable water quality will be provided by treatment/disinfection as necessary to meet or exceed the parameters and guidelines defined in the following documents:

Guidelines for Canadian Drinking Water Quality prepared by Federal-Provincial-Territorial Committee on Drinking Water of the Federal-Provincial-Territorial Committee on Health and the Environment – May 2008.

3.9 FRESH / FIRE WATER

1. The Fire Water supply system will be provided by Fresh/Fire water storage tanks located in close proximity to the service areas and should be based on the following:

National Fire Protection Association (NFPA).

3.10 CODES AND STANDARDS

1. The latest additions of Codes and Standards of the following Organizations are applicable:

Institution	Description
ABMA	American Bearing Manufacturers' Association
ACI	American Concrete Institute
AGMA	American Gear Manufacturers' Association
AISI	American Iron and Steel Institute
ANSI	American National Standards Institute
API	American Petroleum Institute
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWS	American Welding Society
AWWA	American Water Works Association
ASME	Boiler & Pressure Vessel Code Section VIII Division 1
CEC	Canadian Electrical Code
CEMA	Conveyor Equipment Manufacturers' Association
CISC	Canadian Institute of Steel Construction
CSA	Canadian Standards Association
CWB	Canadian Welding Bureau
CMI	Cyanide Management Institute
EEMAC	Electrical Equipment Manufacturers Association
FM	Factory Mutual

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Institution	Description
HI	Hydraulic Institute
ICEA	Insulated Cable Engineers Association
IEEE	Institute of Electrical and Electronics Engineers
IESNA	Illuminating Engineering Society of North America
IFE	Industrial Fasteners Institute
IHEOH	Industrial Hygiene, Environmental, Occupational Health
ISA	International Society of Automation
ISMA	Industrial Silencer Manufacturers' Association
ISO	International Organization for Standardization
JIC	Joint Industrial Council
MHIA	Material Handling Industry of America
MHEA	Material Handling Engineers Association
MPTA	Mechanical Power Transmission Association
MSHA	Mine Safety and Health Administration
YWCHSB	Yukon Worker's Compensation Health and Safety Board
MSS	Manufacturers' Standardization Society
NACE	National Association of Corrosion Engineers
NBC	National Building Code of Canada
NEC	National Electrical Code (US)
NEMA	National Electrical Manufacturers' Association
NESC	National Electrical Safety Code
NFC	National Fire Code
NFPA	National Fire Protection Association
NFPI	National Fluid Power Institute
OSHA	Occupational Safety and Health Act
PFI	Pipe Fabrication Institute
PPI	Plastics Pipe Institute
RMA	Rubber Manufacturers' Association
SMACNA	Sheet Metal & Air Conditioning Contractor's National Assoc.
SNT	Society of Non-Destructive Testing
SAE	Society of Automotive Engineers
SSPC	Steel Structure Painting Council
TEMA	Tubular Exchanger Manufacturers' Association
UL	Underwriters Laboratories
ULC	Underwriters Laboratories of Canada
WHMIS	Workplace Hazardous Materials Information System

2. For all electrical and instrumentation devices and systems refer to:

- 26-00-00-DC Electrical Design Criteria

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- 40-90-00 DC Instrumentation Design Criteria.

3.11 HAZARDOUS MATERIALS AND ENVIRONMENTAL CONSIDERATIONS

1. The following materials shall not be used:
 - asbestos and compounds thereof;
 - poly-chlorinated bi-phenyl's (PCB's) and compounds thereof.
2. The following materials shall not be used without specific approval:
 - chloro-fluoro-hydrocarbons (CFC's) and compounds thereof.
3. The Supplier's equipment, materials and products (including, but not limited to, products of a toxic, hazardous, flammable or corrosive nature) shall be identified by the required labelling at the place of origin or manufacture for transportation, handling and storage of such equipment, materials and products in accordance with all applicable legislation at that place.
4. The Supplier shall comply with all applicable laws, orders, and regulations concerning the control and abatement of land, water and air pollution.
5. The Supplier's on-site activities shall be performed by methods that will prevent entrance or accidental spillage of solid, liquid or gaseous matter, contaminants, debris, and other objectionable pollutants and wastes on unprotected ground, into streams, water courses, lakes, underground water sources and the atmosphere. Such pollutants and wastes include but are not limited to refuse, garbage, cement, concrete, sewage effluent, industrial waste, radioactive substances, oil and other petroleum products, aggregate processing tailings, substances capable of producing toxic or otherwise objectionable leachate, mineral dust and thermal pollution. Sanitary wastes shall be disposed of on land by burial at an approved site or by other approved means.

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Revision History

Rev.	Issue Date	Issued for	Signatures				
			Prepared By	Reviewed By	Project Engineer	Project Manager	Client
A	Feb 4, 2011	Internal Review	KS	AF	RY		
B	Feb 22, 2011	Client Review	KS		RY	MR	
C	Mar 7, 2011	Final Issue	KS		RY	MR	MP
D	May 25, 2011	Procurement RFP Package	RY		RY	MR	
E	May 27, 2011	Procurement RFP Package	RY		RY	MR	
F	Jul 07, 2011	Procurement RFP Package	FJ		RY	MR	
G	May 13, 2013	QML Application	AC			IS	

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End of Section



Stage 1 Construction Design Criteria

Structural 05 00 00 DC Design Criteria

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1 GENERAL

This Design Criteria document is intended as a structural design guide for the Eagle Gold Project Feasibility Study. The information contained herein outlines principles necessary to estimate the project cost and to establish directions for execution in later phases of the project.

1.1 Climatic Conditions

Based on data received from Meteorological Service of Canada (Environment Canada) for the project area (Latitude 64° 2' 3" and Longitude 135° 50' 28") at Elevation of 820 m, the climate data for structural design are as follows:

1. Design Temperatures

January Dry 2.5%	-43.0 °C
January Dry 1%	-45.0 °C
July Dry 2.5%	20 °C
July Wet 2.5%	15 °C
Degree Days Below 18 °C	81

2. Precipitation

Total Annual Precipitation	590 mm
Total Annual Rain	270 mm
Moisture Index	0.59
15 mins Rain	8.0 mm
24 hours Rain	42 mm

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3. Snow

Snow Load (1/50 years)	
Ground Snow Load (S _s)	3.2 kPa
Associated Rain Load (S _r)	0.1 kPa

4. Wind

Exposure Category	Open Terrain
Hourly Wind Pressure:	
1/10 years	0.23 kPa
1/50 years	0.31 kPa

5. Seismic

Based on seismic hazard information from the National Resources Canada, the National Building Code of Canada (NBCC) design ground motions corresponding to a 2% probability of exceedance in 50 years (0.000404 per annum) for the project area are detailed below:

S _a (0.2)	0.513
S _a (0.5)	0.312
S _a (1.0)	0.156
S _a (2.0)	0.087
PGA (g)	0.245

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2 STRUCTURAL STEEL AND CONCRETE

2.1 Codes and Standards

1. All structural designs will be carried out in accordance with the latest revision of the following standards, regulations, specifications and codes:
 - National Building Code of Canada (NBCC)
 - Supplement and Commentaries to the National Building Code of Canada (SNBCC)
 - Canadian Standards Association (CSA) Standards
 - Occupational Safety and Health Administration Standards (OSHA)
 - American Society for Testing Materials (ASTM)
 - Mine Safety and Health Administration (MSHA)
 - National Fire Protection Association (NFPA)
 - National Fire Code (NFC)
 - Society for Fire Protection Engineering (SFPE)
 - Canadian Institute of Steel Construction (CISC)
 - National Lumber Grades Authority (NLGA)
 - American Petroleum Institute (API)
 - American Water Works Association (AWWA)
 - Metal Building Manufacturer's Association (MBMA)
 - American Society of Civil Engineers (ASCE)
 - American Concrete Institute (ACI)
 - American Welding Society (AWS)
 - Concrete Materials and Methods of Concrete Construction (CAN/CSA-A23.1)
 - Methods of Test for Concrete (CAN/CSA-A23.2)
 - Design of Concrete Structures (CAN/CSA-A23.3)
 - Welded Steel Wire Fabric for Concrete Reinforcement (CAN/CSA-G30.5)
 - Billet Steel Bars for Concrete Reinforcement (CAN/CSA-G30.18)
 - Engineered Design in Wood -Limit States Design (CAN/CSA-086.1)
 - Design for Masonry Structures-Limit States Design (CAN/CSA-S304.1-04)
 - Limit States Design of Steel Structures (CAN/CSA-S16.09)
 - North American Specification for the Design of Cold-Formed Steel Structural Members (CAN/CSA-S136)
 - General Requirements for Rolled or Welded Structural Quality Steel (CAN/CSA-G40.20)
 - Structural Quality Steels (CAN/CSA-G40.21)

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- Welded Steel Construction (CAN/CSA-W59)
- Hot Dip Galvanizing of Irregularly Shaped Articles (CAN/CSA-G164)
- Certification of Companies for Fusion Welding of Steel (CAN/CSA-W47.1)
- Welded Tanks for Oil Storage (API 650)
- Welded Carbon Steel Tanks for Water Storage (AWWA D100)
- Standard Specification for Carbon Structural Steel (ASTM A36)
- Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated, Welded & Seamless (ASTM A53)
- Standard Specification for Carbon Steel Bolts and Studs (ASTM A307)
- Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Tensile Strength (ASTM A325)
- Standards for Primer and Paint (CGSB/CISC/CPMA)
- Specifications for Cleaning Steel Surface (SSPC)
- Crane-Supporting Steel Structures Design Guide (CISC-Crane Design Guide)
- Foundations for Dynamic Equipment (ACI 351.3R).

2. Reference Handbooks:

- Concrete Design Handbook by CPCA
- Handbook of Steel Construction by CISC
- Wood Design Manual by Canadian Wood Council
- Engineered Masonry – Limit State Design.

2.2 Units

1. All notes, calculations, data instructions, dimensions on drawings, and specifications shall be in Metric Units.
2. Materials and equipment shall all be specified in Metric units. Where certain items are available in imperial sizes only, they shall be specified in Metric units after soft conversion, with corresponding imperial sizes specified in brackets.

2.3 Design

1. Preliminary design will be carried out for reinforced concrete structures, foundations, structural steel supports, steel structures, access ways and platforms like:
 - Gyrotory Primary crushing
 - Secondary and Tertiary Crushing Building
 - Screening Building

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- ADR Plant Building Contains Refinery, Acid Plant, and Reagent Storage and the administration offices
- Mobile Shop/Warehouse/mine offices/Dry/wash bay
- Metallurgical Laboratory
- Camp//Recreation Complex
- Emergency Vehicles/First Aid Station
- Water Treatment Plant
- Main Substation
- Diesel Tanks
- Conveyors
- Gate House

2. Importance Category

The Importance Category of all buildings and structures shall be categorized as “Normal”. The Importance Factor of Normal category as defined in the National Building Code of Canada shall be taken as 1 for all buildings and structures including the Administration Building, unless noted otherwise. The Shop/Warehouse/mine offices building, part of which will accommodate an ambulance/emergency vehicles and mine rescue operations, may be deemed as a post-disaster building. An approval from the Local Authorities for this classification will be required.

3. Expansion Joints

Maximum length of buildings and structures between expansion joints shall be 120 m.

4. Deflection

Do not exceed the following deflection (D) to span (L) or height (H) ratios under live loads:

- Vertical D/L

Crane runway beams	1/800
Floor members	1/360
Roof members supporting plaster	1/360
Roof framing with sheet metal cladding	1/180

- Lateral D/H

Walls with sheet metal cladding	1/180
Walls with un-insulated cladding	1/90

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Interior walls with permanent partitions subjected to 0.5 kN/m^2 normal to the walls: with brittle finishes with flexible finishes	1/240 1/120
Crane runway beams* (subject to crane lateral force)	1/600
Building column* (subject to crane lateral force or wind force)	1/300
Building frames (subject to wind forces)	1/300
*Follow manufacturers standards or the following additional crane runway tolerance criteria, whichever produces the most adverse effect:	
Maximum permissible tolerance between rail centers	+/- 5mm
Height tolerance between rails (S = crane span)	S/1000
Permissible height tolerance between two crane rail supports (L = distance between supports)	L/1500

- Member Depths

Recommended depth (d) to span (L) ratios for steel beams and trusses:

	d/L
Trusses	1/14
Equipment Support Beams*	1/16
General Platform Beams	1/20
Walkway Beams	1/24

* A deeper section may be required to avoid the beam resonating at the natural frequency of equipment.

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5. Slab on Grade

- Slab on grade shall be constructed on non-frost susceptible engineered fill over suitable existing subgrade approved by Geotechnical Engineer unless noted otherwise.
- Minimum thickness of slab on grade will be as follows:

General Areas	= 150 mm
Light vehicular traffic areas	= 200 mm
High wheel load areas	= 250 mm

6. Live Loads /Imposed Floor Loads

- Minimum live/imposed loads will be as follows:

General Areas	= 5.0 kPa
Office Areas	= 5.0 + Partition kPa
MCC/Electrical rooms	=15.0 kPa
Mill Operating Floor	=15.0 kPa
Lay down Areas	=12.0 kPa

- In addition to roof snow and live loads, a collateral load of 0.75 kPa shall be allowed for the design of all building roofs unless noted otherwise.

2.4 Materials Specifications

1. Structural Steel

- Conform to latest edition of NBCC and CAN/CSA-S16.09.

Hot rolled structural steel W & WT shapes	CAN/CSA-G40.20/G40.21-350W General Requirements for Rolled or Welded Structural Quality Steel Grade 350W/ 350 WT (see note below)
Hot rolled structural steel angles, channels, plates and bars	CAN/CSA-G40.20/G40.21-300W Steel Grade 300W
Hollow sections	CAN/CSA-G40.21-M Class C Grade 350W
Structural Pipes	ASTM A53 Grade 240 MPa
Sag rods & Pins	ASTM 307

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Bolted connections	ASTM A325
Welded connections	AWS D1.1 CSA-W59 Series E49XX low hydrogen type
Anchor bolts	CAN/CSA-G40.21 Grade 300W
Floor grating	32mm x 4.8mm Welded Standard "Flowforge" type Serrated grating : 38mm x 4.8mm
Trench grating	32mm x 4.8mm Welded Standard "Flowforge" type Serrated grating: 38mm x 4.8mm
Checkered plates	8mm minimum checker plate with raised pattern 6mm minimum for lightly loaded area
Stair treads	Grating tread with checker plate nosing 32mm x 4.8mm Welded Standard "Flowforge" type Treads with serrated grating: 38mm x 4.8mm Stair tread width – 308mm
Railing and handrails	DN 40 STD pipe rail, DN 40 XS pipe post
Kickplates	150 mm high

- Note: For primary members subject to tensile fatigue stresses or high impact and in exposed cold weather condition, steel grade 350 WT, category 2 shall be used.

2. Concrete

- Conform to NBCC and CAN/CSA-A23.3 (latest edition).
- Cement shall conform to CAN/CSA-A3000 Portland Cement Type GU Normal, unless noted otherwise. Use corrosive resistant cement where applicable.
- Use sulphate resisting cement where applicable.
- The specified compressive strength of concrete shall be as follows:

	28 Day Strength	Max. Aggregate	W/C ratio
Structural Concrete	30 MPa	20mm	0.45 0.40 (corrosive)
Mass foundation	15 MPa	40mm	0.45 0.40 (corrosive)
Blinding Concrete	15 MPa	20mm	0.45 0.40 (corrosive)

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3. Reinforcing Steel

Deformed type billet steel bar	CAN/CSA-G30.18-M Billet Steel Bars for Concrete Reinforcement fy = 400 MPa
Welded Wire Fabric	CAN/CSA-G30.5-M

4. Grout

- Normal grout shall be non-shrink, non-metallic and non-corrosive cementitious grout.
- Epoxy based non-shrink grout shall be used under sensitive equipment only.

5. Masonry

- Modular metric size as per CAN/CSA-A165 Series.
- Minimum compressive strength of hollow core concrete block unit shall be 15 MPa.
- Mortar shall be Type M or S.
- Compressive strength of masonry grout shall not be less than that of the concrete block used.

Revision History

Rev.	Issue Date	Issued for	Signatures				
			Prepared By	Reviewed By	Project Engineer	Project Manager	Client
A	Feb 18, 2011	Issued for Internal Review	FN		RY		
B	Feb 21, 2011	Draft Issued for Client Review	FN		RY	MR	
C	May 13, 2013	QML Application	AC			IS	

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Civil Design Criteria 26 00 00 Design Criteria

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1 SCOPE OF WORK

1.1 Climatic Conditions

The design criteria cover the following project areas:

1. Clearing & grubbing process plant site, truck shop and ancillary areas - includes pads and interconnecting roads for the following:
 - Primary Crusher Area
 - Secondary Crusher Area
 - Tertiary Crusher Area
 - 100 Day Storage
 - Process Bldg
 - Assay Lab
 - Water Treatment and Detox Plant
 - Truck Shop
 - Diesel Tank farm
 - Diesel Fueling Station
 - Explosives Storage Facility
 - Magazine Storage facility
 - Camp area
 - Event, feed and sediment control ponds
 - Site fencing/security for explosives facility
 - Plant site drainage (see exclusions)
 - Horizontal & vertical design of access roads for the following areas:
 - Crushers
 - Conveyor access road/haul road
 - Road into/around Heap Leach
 - Road to Explosives/Magazine site
 - Road to Truck shop from Pit
 - Road from access road into process area

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2. Civil works will mainly include the clearing and grubbing, rough and final grading of the main access road, building pads and the interconnecting access roads; site drainage (see exclusions) and permanent site drainage sediment control. This will include:
 - horizontal/vertical design of external and internal roads; produce key plan, large scale horizontal and profile drawings for same;
 - detail/section drawings
 - rough and final grading drawings for all building/process pads
 - drainage & sediment control details and criteria; does not including major drainage works

3. Rough grading for all building/process pads:
 - Primary Crusher plant
 - Secondary crushing
 - Tertiary crushing
 - 100 day storage area
 - Magazine and explosive plant
 - 23 km long access road to highway
 - Laydown area
 - Truck shop
 - Diesel tank farm/fuel station
 - Substation/back-up generator
 - Guard house

1.2 Site Preparation and Roads

- Site preparation including clearing and grubbing and bulk earthworks.
- Plant site rough grading and haul roads.
- Plant site storm water drainage system and associated appurtenances.
- Rough grading of:
 - Process building pad and related areas
 - Explosives/magazine area facilities
 - Guard house
 - Fire, potable water tanks/pump houses
 - Maintenance complex/mine dry
 - Primary crusher pad
 - Secondary/tertiary crusher pad and interconnecting roads
 - Water Treatment and Detox Plant

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1.3 Excluded Work (done by others)

Includes but is not limited to:

- Fresh water supply to the Potable, Fresh-Fire and Process water tanks.
- Tailings-Waste Rock disposal, seepage/runoff collection treatment and/or return to plant site.
- Major diversion drainage ditches for contact and non-contact water (outside of plant site).
- Civil works for heap leach system
- Underground sewerage system and associated appurtenances.
- Sewage treatment plant, concrete foundation, and disposal
- Fresh-Firewater and Potable water pipelines from the Fresh-Fire water and Potable water tanks/pump houses to the plant site.
- Fresh-Firewater and Potable water pipelines from the Fresh-Fire water and Potable water tanks/pump houses to the plant site.
- Fresh water distribution system.
- Fire protection water distribution system.
- Potable water distribution system.
- Geotechnical and material testing
- Aggregate/concrete production
- Construction sediment control
- Pit dewatering and above pit water diversions and the treatment of those waters
- Power supply construction/access route

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2 CODES AND STANDARDS

2.1 General

1. Where reference is made to a specification, code or standard, the reference shall be taken to mean the latest edition of the specification, code or standard, including latest addendums, supplements and revisions.

- Design of Surface Mine Haulage Roads - Bureau of Mines Information Circular 8758
- Manual of Geometric Design Standards for Canadian Roads and Streets, Transportation Association of Canada
- BC Supplement to TAC Geometric Design Standards manual
- Drainage Manual Volume 2, RTAC
- Storm Water Planning: a guidebook for British Columbia, Ministry of Environment

2.2 Engineering Calculations and Drawings

- All notes, calculations, data instructions, dimensions on drawings, and specifications shall be S.I. Units which has been accepted by the International Standards Organization (ISO).
- Materials and equipment shall generally be specified in SI units. Where certain items are available in imperial sizes only, they shall be specified in SI units after soft conversion, with corresponding imperial sizes specified in brackets.
- Precedence, Deviations and Conflicts

1. The following order of precedence shall apply when a conflict in requirements arises between this Specification and other documents:

- Project Requirements
- Specification
- CAN/CSA Design Codes
- Other referenced Codes and Specifications.

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3 DESIGN DATA

3.1 Geotechnical

1. All earthworks will be designed and constructed in accordance with the latest recommendations of the geotechnical consultant BGC Engineering Inc.
2. The site conditions vary considerably and each location must be reviewed individually. The recommendations were based on relatively low quality soils investigation and should be viewed as preliminary.
3. The following points will be used (unless further investigation requires changes):
 - The site elevation varies from 800 to 1,400 MASL
 - Frost penetration depth of approximately 3.0 m
 - Discontinuous permafrost may be encountered including some areas with excess ground ice.
4. Crusher/stockpile area:
 - Topsoil/overburden: 200 mm thick on average; to be stored/wasted
 - Colluvium (gravity deposited rock, loose gravel, cobbles, silt and sand matrix): varying depth below topsoil; may be suitable for use as general fill, not structural fill.
 - Bedrock¹: directly below colluvium at varying depths; rock is Type 3 with some Type 1 and 2 depending upon depth below surface.
 - Structural fill to be well graded sand and gravel (75mm minus – see Geotech memo for spec)
 - Rock fill to be used where appropriate; selection of materials (type1 to 3) to be site specific.
 - General fill – unfrozen local material; max size 200 mm; compacted to 95% Standard Proctor (SPMDD)
 - Cut and fill slopes (subject to field ratification):
 - Colluvium/topsoil – 2.5H:1V
5. Primary Crusher
 - Rock Cut slope – 75H:1V or shallower (for Type 1, 2, 3 rock); Maximum bench height of 8 m and a bench width subject to individual assessment.
6. Secondary, Tertiary Crusher and Stockpile area
 - Rock Cut slope: 1.75H:1V or shallower (for Type 1, 2, 3 rock) but support may be required.
 - Temporary excavations may be steeper but they will be site specific and will require detailed input from the geotechnical consultant.
 - Rock slope protection: 10 m setback from building and protective ditch/berms to be provided.

¹Type 3 rock- highly weathered – requires heavy excavator to extract; Type 2 rock - moderately to highly weathered – D8 dozer, ripper teeth; Type 1 – relatively strong – mechanical hammers/drill- blast.

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Permanent engineered fill – 2H:1V or shallower; buildings to be located minimum of 10m from edge (crest) of fill.

7. Plant site

- Topsoil/overburden: 300 mm thick on average; to be stored/wasted
- Colluvium (gravity deposited rock): varying depths below topsoil; may be suitable for use as general fill, not structural fill.
- Bedrock²: directly below colluvium; rock is Type 3 with some Type 1 and 2 depending upon depth below surface.
- Structural fill to be well graded sand and gravel (75mm minus – see Geotech memo for spec)
- Rock fill to be used where appropriate; selection of materials (type 1 to 3) to be site specific.
- General fill – unfrozen local material; max size 200 mm; compacted to 95% Standard Proctor (SPMDD)
- Cut and fill slopes (subject to field ratification):
 - Colluvium/topsoil – 2.5H:1V

8. Truck Shop Area

- Topsoil 300 mm thick on average
- Overburden - moderately thick (typically 7 to 8 m) consisting of frozen silty colluvium with excess ice in the upper 2 to 4 m. Excavated overburden materials will not be suitable for immediate reuse
- Underlying bedrock is Type 3 and will be suitable for use as general fill or for use as structural fill with due care in quality control of material selection, placement and compaction.
- In areas of non-structural fill, topsoil will be stripped and suitable fill material placed directly onto the overburden; settlement of this fill is to be expected and material will topped up as necessary.

3.2 Climatic Conditions

1. The climatic conditions are contained in the Site Conditions and Equipment Standards (021000 SPE).

²Type 3 rock- highly weathered – requires heavy excavator to extract; Type 2 rock - moderately to highly weathered – D8 dozer, ripper teeth; Type 1 – relatively strong – mechanical hammers/drill- blast.

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4 MATERIALS AND METHODS

4.1 Water Demand

This work is to be performed by others (i.e. not civil dept.)

4.2 Plant Site Fire Protection

This work is to be performed by others (i.e. not civil dept.)

4.3 Freshwater

This work is to be performed by others (i.e. not civil dept.)

4.4 Process Water

This work is to be performed by others (i.e. not civil dept.)

4.5 Storm Drainage

This work is to be performed by others (i.e. not civil dept.)

4.6 Sanitary Waste Water

This work is to be performed by others (i.e. not civil dept.)

4.7 Plant Grading And Ancillary Roads

1. Assumed topsoil depth will be as described earlier.
2. A gravel wearing surface will be provided for the plant site area and ancillary roads.
3. Final site grading will be a minimum of 150 mm below adjacent floor slabs and will have a nominal finished grade slope of 4% away from structures (in accordance with the geotechnical report) towards the storm drainage system.
4. The roads will be designed to carry CAT 785D mine haul trucks or equivalent.
5. The design criteria for the plant site and service roads are shown below.

	Plant Site Access Roads	Haul Roads
Travelled Surface Width	6-8m	30 m
Design Speed	30 km/hr	30 km/hr
Cross fall	2%	2%
Max. grade	10%	10%

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Surface	gravel	gravel
Cut side slope	As previously detailed	As previously detailed
Fill side slope	As previously detailed	As previously detailed

* Base and Sub-base thicknesses will vary in accordance with usage/existing conditions and geotechnical recommendations.

6. Roads and plant site travelled areas will be designed in accordance with the Geotechnical Report i.e. utilizing the recommendations on cuts, fills, compaction, material gradations, and temporary and permanent slopes by the Geotechnical Consultant.

Revision History

Rev.	Issue Date	Issued for	Signatures				
			Prepared By	Reviewed By	Project Engineer	Project Manager	Client
A	23 Aug 2011	Issued for Internal Review	MB		RY	MR	
B	23 Feb 2012	Issued for F.S.	MB		RY	MR	MB
C	May 13, 2013	QML Application	AC			IS	

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End of Criteria