Design Build: SGM and VLS-PGM Components for a Shared FOE Area

6.8.80.4 Rev.0

Date: 02-June-26

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REVISION HISTORY

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A	02-May-24	Original Draft	Ian Coulthard
B	02-June-26	Revised	Ian Coulthard
0	02-June-26	Issued for use.	Ian Coulthard

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INTRODUCTION

1.1. PURPOSE

This document specifies the requirements for 9 beamline sections that house 5 mirrors, slits, beam stops, beam transport, and Gas Bremsstrahlung plug to be designed in detail, constructed, and installed on the floor at the Canadian Light Source (CLS). These components will be part of the variable line spacing plane grating monochromator (VLS-PGM) and high-resolution spherical grating monochromator (SGM) beamlines.

1.2. SCOPE

The VLS-PGM and SGM beamlines specified by the user community require high resolution and flux combined with a reasonably small beam size at the sample. This specification details the requirements for the detailed design, fabrication, supply, and installation of 9 beamline sections. The insertion devices for these two lines are to be placed in the same ring straight section and are to be canted with respect to each other. Thus the FOE area for both lines must be carefully designed and constructed to allow both lines to perform as required as well as separate the two beams. This specification includes but is not limited to:

-detailed design of all specified sections,
-mirror cooling and mirror mounts,
-white beam slits and beam stops,
-all required tables and motorization,
-beamline support structures,
-required beam pipes and vacuum chambers,
-gas Bremsstrahlung stop,
-vacuum quality testing,
-delivery and installation at CLS,
-installation of completed optics into chambers,
-quality assurance and safety,
-this specification does NOT include any mirrors

1.3. BACKGROUND

The Canadian Light Source is a national facility under construction at the University of Saskatchewan campus in Saskatoon, Saskatchewan. This facility is a third generation synchrotron light source that will produce a high intensity source of infrared, visible, ultraviolet, and x-ray radiation. Based upon the needs of the Canadian synchrotron community, a low energy (5-250 eV) plane grating monochromator beamline and a high-resolution spherical grating monochromator (230-1940 eV) beamline are being constructed with a goal of being operational when the facility is declared operational in early 2004. The challenge inherent in the construction of these beamlines is resultant of the decision to place the insertion devices, canted with respect to each other, into the same ring straight section. This presents the challenge in the common first optics enclosure (FOE) area for these lines to separate the two beams while maintaining the quality, performance, and safety of both lines.

2.0 DEFINING SECTIONS REFERRED TO IN THE SPECIFICATION

2.1 REFERENCE DOCUMENTS AND TABLES

Refer to the following supplied documents and drawings to aid in the definition of each section requiring design and construction. Please note that these supplied documents and tables also list components not covered in this specification. Any information in these documents considered to be non-relevant to this specification may be deleted.

a) Ruben Reininger, "Technical Preliminary Design Report For the Variable Line Spacing-Plane Grating Monochromator (VLS-PGM) Beamline for the Canadian Light Source, July 16, 2001 [1].
b) Table 1:Optical components and design parameters of the beamline. Units are in mm and degrees. Positions are relative to the center of the insertion device. Rotations are relative to previous element (SHADOW nomenclature) [2].
c) Ian Coulthard, "Technical Preliminary Design Report For the Madison Spherical Grating Monochromator (SGM) Beamline to be Modified for the Canadian Light Source", May 31, 2001 [3].
d) "High Resolution Spherical Grating Monochromator (SGM) Beamline General Assembly Plan View." Drawing # 11ID-1/ME/0066200 [4].

2.2 Section #1 – PGM M1

This section refers to the vacuum chamber housing the M1 mirror of the VLS-PGM line.

2.3 SECTION #2 – PGM White Beam Slits and SGM Beam Transport

This section refers to a vacuum section containing white beam slits for the VLS-PGM line and also used as beam transport for the SGM line.

2.4 Section #3 –PGM M2

This section refers to the vacuum chamber that will contain the M2 mirror for the VLS-PGM line.

2.5 Section #4 – SGM White Beam Slits

This section refers to the vacuum chamber that contains the white beam slits for the SGM line.

2.6 Section #5 – PGM Beam Transport and Beam Stop

This section refers to beam transport for the VLS-PGM line extending downstream just outside of the FOE shielding. This section includes an insertable beam stop.

2.7 SECTION #6 – SGM M1

This section refers to the vacuum chamber containing the M1 mirror for the SGM line.

2.8 SECTION #7 – SGM M2

This section refers to the vacuum chamber housing the M2 mirror for the SGM line.

2.9 SECTION #8 – SGM M3

This section refers to the vacuum chamber housing the M3 mirror for the SGM line.

2.10 SECTION #9 – SGM BEAM TRANSPORT, BEAM STOP AND GAS BREMSSTRAHLUNG PLUG

This section refers to a beam transport section extending to a point just upstream of the SGM entrance slit footprint. The transport section shall contain an insertable beam stop. This section also contains the tungsten Gas Bremsstrahlung stop.

3. REQUIREMENTS

3.1 GENERAL REQUIREMENTS

3.1.1 All sections shall be capable of sustaining ultra-high vacuum (UHV) conditions.

3.1.2 All sections of the design shall be separated by UHV pneumatic gate valves of VAT manufacture with metal bonnet seal and viton seal and the valve designed to fail in the closed position. These valves should also have 24 V DC solenoids, visual position indicators and manual overrides.

3.1.3 All sections defined by pneumatic gate valves shall contain at least one CLS supplied ion pump (no dead spaces with regards to pumping), a port for a CLS supplied ion gauge, and a manual UHV all-metal valve for the attachment of a turbo-molecular roughing pump with a KF adaptor on the valve. The KF adaptor shall be equipped with a blank that can be removed for pumping.

3.1.4 All flanges shall utilize Conflat™ seals. Diameters of flanges along the line shall be designed to be as standardized as possible.

3.1.5 To aid in diagnostics and alignment, the front end of mirror mounts for each optic along the direction of the beam shall have an electrically isolated blade that will register a current if the beam is misaligned on the upstream end of that particular mirror.

3.1.6 All optics tables should also be designed and constructed to contain external fiducial markers for the alignment and placement of these components upon the floor at CLS. The position of these markers relative to the optical pole of any given chamber (i.e. the center of any given optic when inserted into the beam), shall be specified to an accuracy of 250 microns or better. The fiducial point shall bebushings with an 8 mm diameter hole. The location of fiducials shall be reviewed and accepted by CLS prior to fabrication.

3.1.7 Designs shall be made under the assumption that all ion pumps and controllers are to be of Varian manufacture.

3.1.8 The proponent shall determine an appropriate ion pump capacity based upon standard Varian ion pumps for each section. These pumps and controllers shall be acquired by CLS for installation by the contractor. Vacuum pressure distribution calculations and graphs shall be provided to the CLS. Short model Starcell type Varian pumps are preferred.

3.1.9 In the design, there should be no direct line of sight from any pump to an optical surface. Each chamber designed to house an optic shall have a viewport for visual examination of the reflective surface of the optic.

3.1.10 The preferred method of movement of all mirrors is via movement of the support table as opposed to internal motorization. Mounting of optics via attachment to the mirror tank is preferred to mounting of optics via flanges.

3.1.11 The proponent shall determine the appropriate capacity of each stepper motor. Choice of motor shall conform to CLS stepper motor and stepper motor control policy [5] where possible. CLS will either acquire the appropriate motors and deliver them for installation or will authorize the proponent to acquire the motors themselves. Motor controllers and software drivers will also be supplied by the CLS.

3.1.12 Ion gauges will be included in the design. However, CLS shall acquire the appropriate number of ion gauges and deliver them for installation. CLS will also supply ion gauge controllers and cabling.

3.1.13 Large chambers and components requiring accurate placement upon the floor shall be designed such that their support structures bolt to the floor via Hilti studs where nuts above and below the flange allow adjustment of the height and tilt of the columns. In addition, a nominal 1.75-inch space between the column and floor is filled with epoxy grout for stability after everything is aligned. (DWG No. 100-104629) [6].

3.1.14 Lighter areas containing beam pipes and ion pumps that also require support may be mounted with smaller columns that bolt via Hilti studs but do not require the epoxy grout layer.

3.1.15 A Finite element analysis (FEA) has been performed on the mirrors. This analysis is now complete and the results of this are now incorporated into this specification.

3.1.16 *In the case of all components requiring water-cooling:* Direct water to vacuum joints will not be used in the design. An example of appropriate design would be to have water carried by Teflon tubing that is inside of a UHV quality bellows where in the event of a leak, the water would travel through the bellows to be expelled outside of the chamber.

3.1.17 All mirror supply is NOT included in this specification. All mounts, holders and cooling systems for the mirrors and gratings that will be housed in these sections ARE included in this specification. Sufficient details of mirror and grating parameters shall be provided by the CLS to allow for proper design of mounts, holder, and cooling.

3.1.18 The proponent shall provide technical support for the installation and mounting of the optics fabricated for the sections defined in this specification.

3.1.19 The position of the following optics: PGM M1, PGM M2, SGM M3, may not be altered during the course of the detailed design. The positions of the M1 and M2 for the SGM line, these optics being non-focusing, and purposefully slightly over sized in length, may be altered as necessary to satisfy the rest of the demands of this specification. The precise positions of the unalterable optics on the plan view [4] may be taken as correct with respect to their position on the optical axis relative to the source point. The M1 of the PGM may also be moved slightly if no other alternative is available.

3.1.20 All sections housing slits, or mirrors, shall be designed with viewports for visual examination of the optics.

3.1.21 In all beam transport sections, the internal diameter of the vacuum pipe shall be approximately 63 mm (2.5 inches). Flanges and valves shall have an internal diameter of approximately 100 mm (4 inches).

3.1.22 All vacuum chambers shall be capable of sustaining 150 ^{o}C bake-out conditions.

3.1.23 The proponent shall ensure, where both beams travel in the same vacuum chambers, the non component(s) of one line interfere with the passage of beam form the other line.

3.1.24 The design shall not include the detailed design of the FOE shielding hutch but shall keep the required existence of said hutch in mind. In particular, utilities such as electricity and water and compressed air shall be assumed to be originating from lines mounted to either the nearest wall and /or ceiling of the shielding hutch. Interfaces shall be clearly labeled as inlet or outlet. The proponent shall submit service interface point locations to CLS for review and acceptance.

3.1.25 All motorized components shall have adjustable limit switches for each motorized degree of freedom in addition to hard stops for each motorized degree of freedom.

3.1.26 The position of the FOE shielding hutch walls on the plan view is completely conceptual and may be altered to accommodate the final design. Any alternations shall be reviewed and accepted by CLS.

3.1.27 Machining on the sides of all substrates shall conform to the conceptual diagram for machining required to mate substrate to optical mounts [11]. In each case this machining consists of two steps/ledges, one along each side of the long axis of the substrate at the base. This step shall be 10 mm in height and 10 mm in width.

3.1.28 All widths/heights of substrates as specified in the document shall refer to the width/height of the optic at the optical surface and NOT the width/height at the base of the substrate where the steps/ledges are found.

3.1.29 All optic substrates shall be made of this shape with only the length and width of the optical surface varying between substrates. All optical mounts must be designed to accommodate this specific shape of substrate.

3.1.30 For components requiring water-cooling, CLS house water at 26 degrees Celsius shall be utilized. Specifications for flow rates, pressure gradients etc. must conform to CLS standards and should be submitted to CLS for review and acceptance.

3.2. SECTION #1 (PGM M1) SPECIFIC REQUIREMENTS

3.2.1 The beams travel through this section level to the floor at a height of 1.4 meters.

3.2.2 Upstream of this section is a dual fixed high heat load aperture chamber. This high heat load aperture chamber is 880 mm long from flange to flange and is found starting 110 mm downstream of the gate valve to the differential pumping section shown. The footprint of this section is marked on the plan view provided [4]. This section must not impinge upon the footprint of this other component. This section shall mate to this heat head load aperture chamber via a VAT valve with an outside diameter of 152.4 mm (6 inches).

3.2.3 A small water-cooled glancing incidence mask shall be placed just upstream of the mirror mount to protect the front end of the mirror substrate from the beam. This mask shall include a thermocouple to monitor the temperature of the mask

3.2.4 The mirror mount shall include water-cooling for the mirror via side contact with OFHC blades with an indium foil or gallium interface.

3.2.5 The mirror mount shall be designed to house a mirror 400 mm long, 40 mm high, and 50 mm thick.

3.2.6 The mirror shall be planar in figure. The substrate shall be Si.

3.2.7 The mirror shall be oriented to deflect the beam 3 degrees outboard (hence a 1.5 degree angle of incidence.

3.2.8 The beam for the SGM line shall pass across the front side of this mirror.

3.2.9 Transverse mirror motion should have a range of 620 mm with a resolution of 60.2 mm or better.

3.2.10 Mirror motion along the direction of the beam should have a range of 6 5 mm with a resolution of 60.2 mm or better.

3.2.11 Vertical mirror motion should have a range of 65 mm with a resolution of 60.2 mm or better.

3.2.12 Mirror yaw adjustment should have a range of 66 mrad with a resolution of 630 micro-rad or better.

3.2.13 Mirror roll adjustment should have a range of 66 mrad with a resolution of 630 micro-rad or better.

3.2.14 Mirror tilt/pitch adjustment should have a range of 65 mrad with a resolution of 60.2 mm or better.

3.2.15 At minimum, roll and tilt for this mirror require stepper motorization with the provision for mounting of Heidenhain encoders.

3.3. SECTION #2 (PGM Slits / Beam Transport) SPECIFIC REQUIREMENTS

3.3.1 The beam travels through this section level to the floor at a height of 1.4 meters.

3.3.2 The beam for the SGM line shall pass across the inboard side of the PGM white beam slits housed in this section. The design must incorporate the necessary white beam slits while still allowing the SGM beam to pass through this section.

3.3.3 The slits shall be water cooled to handle the worst-case power loading (assuming complete interception of the beam) of approximately 50 W and 1.75 W/mm^2 peak power density at 6 degrees angle of incidence.

3.3.4 The slit motions shall be motorized. The limit switches for the slits shall be preset for a maximum opening of 10 mm both horizontally and vertically. The slits should be limited to a minimum opening of 1mm both horizontally and vertically.

3.3.5 The provision for optional encoders shall be included.

3.3.6 Vertical and horizontal slits shall have a range of 25 mm with a resolution of 1 μm and repeatability of approximately 2 μm.

3.4. SECTION #3 (PGM M2) SPECIFIC REQUIREMENTS

3.4.1 The beams travel through this section level to the floor at a height of 1.4 meters.

3.4.2 The beam for the SGM beamline pass along the backside of the mirror mount in this section. The design shall ensure the freedom and safe travel of the SGM beam.

3.4.3 The mirror mount shall include water-cooling for the mirror via side contact with OFHC blades with an indium foil or gallium interface.

3.4.4 The mirror mount shall be designed to house a mirror 200 mm long, 40 mm high, and 50 mm thick.

3.4.5 The mirror shall be toroidal in figure. The substrate shall be Si.

3.4.6 The mirror shall be oriented to deflect the beam 9 degrees outboard (hence a 4.5 degree angle of incidence.

3.4.7 Transverse mirror motion should have a range of 65 mm with a resolution of 61 micron or better.

3.4.8 Mirror motion along the direction of the beam should have a range of 65 mm with a resolution of 60.2 mm or better.

3.4.9 Vertical mirror motion should have a range of 620 mm with a resolution of 60.2 mm or better.

3.4.10 Mirror yaw adjustment should have a range of 66 mrad with a resolution of 630 micro-rad or better.

3.4.11 Mirror roll adjustment should have a range of 65 mrad with a resolution of 65 micro-rad or better. Mirror tilt/pitch adjustment should have a range of 65 mrad with a resolution of 65 micro-rad or better.

3.4.12 At minimum, transverse, roll and tilt for this mirror require stepper motorization with the provision for mounting of Heidenhain encoders.

3.4.13 Downstream of this section, the beams for each beamline should be housed in separate beam pipes and/or vacuum chambers.

3.5. SECTION #4 (SGM WHITE BEAM SLITS) SPECIFIC REQUIREMENTS

3.5.1 The beam travels through this section level to the floor at a height of 1.4 meters.

3.5.2 The slits shall be water cooled to handle the worst-case power loading (assuming complete interception of the beam) of approximately 300 W and 3.25 W/mm^2 peak power density at 6 degrees angle of incidence.

3.5.3 The slit motions shall be motorized. The limit switches for the slits shall be preset for a maximum opening of 5 mm both horizontally and 2.5 mm vertically. The slits should be limited to a minimum opening of 0.5 mm both horizontally and vertically.

3.5.4 Vertical and horizontal slits shall have a range of 25 mm with a resolution of 1 um and repeatability of approximately 2 micron.

3.5.5 The provisions for optional encoders shall be included.

3.6. SECTION #5 (PGM BEAM TRANSPORT AND BEAM STOP) SPECIFIC REQUIREMENTS

3.6.1 The beam travels through this section level to the floor at a height of 1.4 meters.

3.6.2 This section should extend no closer than 0.5 meters to the PGM entrance slit marked upon the plan view.

3.6.3 The insertable beam stop in this section shall be found within the FOE shielding wall. This stop is to be inserted into the beam path when the line is not operational. The stop should be pneumatic such that the fail position intercepts the beam.

3.6.4 The beam stop shall be water cooled and capable of dissipating a maximum heat load of approximately 12 W with a peak power density of approximately 150 W/mm^2.

3.7. SECTION #6 (SGM M1) SPECIFIC REQUIREMENTS

3.7.1 The beam travels through this section level to the floor at a height of 1.4 meters.

3.7.2 The mirror mount shall include water-cooling for the mirror via side contact with OFHC blades with an indium foil or gallium interface.

3.7.3 The mirror mount shall be designed to house a mirror 400 mm long, 40 mm high, and 50 mm thick.

3.7.4 The mirror shall be planar in figure. The substrate shall be Si.

3.7.5 The mirror shall be oriented to deflect the beam 1.5 degrees outboard (hence a 0.75 degree angle of incidence.

3.7.6 Transverse mirror motion should have a range of 65 mm with a resolution of 60.2 mm or better.

3.7.7 Mirror motion along the direction of the beam should have a range of 65 mm with a resolution of 60.2 mm or better.

3.7.8 Vertical mirror motion should have a range of 620 mm with a resolution of 61 micron or better.

3.7.9 Mirror yaw adjustment should have a range of 66 mrad with a resolution of 630 micro-rad or better.

3.7.10 Mirror roll adjustment should have a range of 66 mm with a resolution of 65 micro-rad or better.

3.7.11 Mirror tilt/pitch adjustment should have a range of 66 mm with a resolution of 65 micro-rad or better.

3.7.12 At minimum, vertical, yaw, roll and tilt for this mirror require stepper motorization with the provision for mounting of Heidenhain encoders.

3.8. SECTION #7 (SGM M2) SPECIFIC REQUIREMENTS

3.8.1 The beam travels through this section level to the floor at a height of 1.4 meters.

3.8.2 The mirror mount shall include water-cooling for the mirror via side contact with OFHC blades with an indium foil or gallium interface.

3.8.3 The mirror mount shall be designed to house a mirror 400 mm long, 40 mm high, and 50 mm thick.

3.8.4 The mirror shall be planar in figure. The substrate shall be Si.

3.8.5 The mirror shall be oriented to deflect the beam 1.5 degrees outboard (hence a 0.75 degree angle of incidence.

3.8.6 Transverse mirror motion should have a range of 65 mm with a resolution of 60.2 mm or better.

3.8.7 Mirror motion along the direction of the beam should have a range of 65 mm with a resolution of 60.2 mm or better.

3.8.8 Vertical mirror motion should have a range of 620 mm with a resolution of 61 micron or better.

3.8.9 Mirror yaw adjustment should have a range of 66 mrad with a resolution of 630 micro-rad or better.

3.8.10 Mirror roll adjustment should have a range of 66 mm with a resolution of 65 micro-rad or better.

3.8.11 Mirror tilt/pitch adjustment should have a range of 66 mm with a resolution of 65 micro-rad or better.

3.8.12 At minimum, vertical, yaw, roll and tilt for this mirror require stepper motorization with the provision for mounting of Heidenhain encoders.

3.9. SECTION #8 (SGM M3) SPECIFIC REQUIREMENTS

3.9.1 The beam travels through this section level to the floor at a height of 1.4 meters until it reaches the vertically focusing mirror after which it travels downward at a angle of 2 degrees.

3.9.2 The mirror mount shall include water-cooling for the mirror via side contact with OFHC blades with an indium foil or gallium interface.

3.9.3 The mirror mount shall be designed to house a mirror 150 mm long, 40 mm high, and 50 mm thick.

3.9.4 The mirror shall be cylindrical in figure. The substrate shall be Si.

3.9.5 The mirror shall be oriented to deflect the beam 2 degrees downward (hence a 1 degree angle of incidence.

3.9.6 Transverse mirror motion should have a range of 620 mm with a resolution of 60.2 mm or better.

3.9.7 Mirror motion along the direction of the beam should have a range of 65 mm with a resolution of 60.2 mm or better.

3.9.8 Vertical mirror motion should have a range of 620 mm with a resolution of 61 micron or better.

3.9.9 Mirror yaw adjustment should have a range of 66 mm with a resolution of 65 micro-rad or better.

3.9.10 Mirror roll adjustment should have a range of 66 mm with a resolution of 65 micro-rad or better.

3.9.11 Mirror tilt/pitch adjustment should have a range of 65 mrad with a resolution of 630 micro-rad or better.

3.9.12 At minimum, vertical, transverse, yaw, roll and tilt for this mirror require stepper motorization with the provision for mounting of Heidenhain encoders.

3.10. SECTION #9 (SGM BEAM TRANSPORT, BEAM STOP, AND GAS BREMSSTRAHLUNG PLUG) SPECIFIC REQUIREMENTS

3.10.1 The beam travels downward through this section at an angle of 2 degrees.This section extends to the edge of the footprint of the SGM entrance slit as indicated in the plan view.

3.10.2 The last two components in this section following the beam downstream shall be a VAT valve followed by an ion pump. This ion pump is to be the pumping for the section housing the entrance slit for the SGM beamline. CLS define as well as provide the appropriate pump size in this case.

3.10.3 The gas Bremsstrahlung stop shall be located inside the FOE shielding wall but outside of the vacuum envelope.

3.10.4 The gas Bremsstrahlung stop shall be centered at the mid point between the two canted insertion devices (i.e. 0.625 mrad between each devices initial ray).

3.10.5 The gas Bremsstrahlung stop shall be made of Tungsten.

3.10.6 The gas Bremsstrahlung stop shall have the dimensions 23 cm wide by 23 cm high by 18 cm thick.

3.10.7 The diameters of any beam pipes in proximity to the beam stop may be altered (reduced) from the standards in this specification if it is necessary to ensure the beam line and the beam stop do not interfere with each other.

3.10.8 The insertable beam stop in this section shall be found within the FOE shielding wall. This stop is to be inserted into the beam path when the line is not operational. The stop should be pneumatic such that the fail position intercepts the beam.

3.10.9 The beam stop shall be water cooled and capable of dissipating a maximum heat load of approximately 18 W with a peak power density of approximately 180 W/mm^2.

4. SAFETY, ENVIRONMENTAL, AND RELIABILITY

4.1 The vacuum chambers shall be capable of operation in an ambient temperature range of 10 to 40 degrees C. The normal ambient temperature on the experimental floor is 21 degrees C. The expected temperature stability of the building will be plus or minus 1 degree C during normal operation.

4.2 The components shall be able to withstand a relative humidity range of 0% to 95%. The expected relative humidity limits under operation are from 25% during the winter months and a maximum of 50% during the summer months. The expected relative humidity range for components under storage will be the same as previously mentioned.

4.3 All equipment and structures shall conform to the BKL report “Vibration Isolation Mechanical Equipment”. [7]

5. QUALITY ASSURANCE

5.1 The proponent shall maintain and apply a quality assurance program compliant with ISO-9001 for the design, manufacture, procurement, testing and installation of all four sections.

5.2 Sections shall be vacuum tested after arrival and installation at CLS for the purposes of remediation of vacuum leaks created during transport. This is in addition to vacuum factory testing done before shipment as stated earlier. Proponent shall verify out gassing and leak rate after installation.

6. TESTING

6.1 All factory vacuum test results for each section, performed with CLS supplied ion pumps and ion pump controllers, shall be submitted to the CLS for approval prior to section shipment. These tests shall demonstrate a base pressure of better than $1 * 10^{-9}$ Torr after bake out for chambers containing no optics, and pressures of better than $5 * 10^{-10}$ Torr for chambers that shall house slits, or mirrors. RGA tests should show that the sum of the partial pressures of gases having a mass >46 AMU does not exceed 10^{-11} Torr in all chambers.

6.2 Vacuum tests shall be performed both with and without water circulating through water-cooled components.

7.. APPLICABLE CODES, STANDARDS, AND PROCEDURES

This work shall meet the following standards. The issue of any standard shall be the issue in effect as of the date of request for tender. Any conflicts between this specification and the referenced documents shall be brought to the attention of the CLS in writing for resolution before any related action is to be taken by the proponent.

American Welding Society (AWS)
American Society for Testing and Material (ASTM)
American Society of Mechanical Engineers, Boiler and Pressure Vessel Code (ASME-BPVC)
American National Standards Institute (ANSI)
International Standards Organization (ISO)
Canadian Light Source Vacuum Component Cleaning Technical Procedure [8]
Canadian Light Source Vacuum Component Leak Test Technical Procedure [9]
Fasteners shall be American standard thread. Proponent may propose metric fasteners if spares are included.

8.. OTHER REQUIREMENTS

8.1 All components of each section shall be completed, delivered, and installed at CLS by September of 2003.

8.2 Packaging to be used during shipping of components shall ensure protection of the components from water, dust, oil, and vibration during shipping. In the case of the mirrors, the packaging should be hermetically sealed.

8.3 Components shall be held securely in the shipping containers to prevent chafing or scratching that could damage the components and / or generate contaminants.

8.4 Vacuum chambers should be shipped pressurized with dry nitrogen gas at a pressure slightly above the highest ambient atmospheric pressure.

8.5 The shipping containers shall be properly labeled in English to ensure proper care during shipment.

8.6 All documentation to the CLS shall be in English and conform to CLS document specification[10].Documentation supplied to the CLS shall be provided in hard copy in triplicate plus one electronic copy. All drawings shall be supplied in AutoCAD format. All drawings and other documentation should also be appropriately labeled, numbered, and include a revision history.

8.7 All supports shall be painted.

8.8 A list of proposed spares, for components, and in particular for motors, encoders and limit switches shall be provided for review.

9. REFERENCES

1 Ruben Reininger, "Technical Preliminary Design Report For the Variable Line Spacing-Plane Grating Monochromator (VLS-PGM) Beamline for the Canadian Light Source, July 16, 2001.

2 Table 1:Optical components and design parameters of the beamline. Units are in mm and degree. Positions are relative to the center of the insertion device. Rotations are relative to previous element (SHADOW nomenclature).

3 Ian Coulthard, "Technical Preliminary Design Report For the Madison Spherical Grating Monochromator (SGM) Beamline to be Modified for the Canadian Light Source", May 31, 2001.

4 "High Resolution Spherical Grating Monochromator (SGM) Beamline General Assembly Plan View." Drawing # 11ID-1/ME/0066200.

5 E. Matias, "Control System Technical Specification", CLS Design Specification 7.4.39.1 Rev. 2

6 McPherson Inc., "Column Mounting Assy.", 100-104629, Nov. 1, 2001.

7 BKL Consultants Ltd "Vibration Isolation Mechanical Equipment". 0395-99A, June 3, 1999.

8 Canadian Light Source Vacuum Component Cleaning Technical Procedure, 8.7.33.1, September 13, 2000.

9 Canadian Light Source Vacuum Component Leak Test Technical Procedure, 8.7.33.2, September 13, 2000.

10 D.S. Lowe. "CLS Document Specification", 0.4.1.1 Rev. 2 14 Dec 2000

11 Concept drawing of standard substrate shape including base steps/ledges for mating substrates to mirror mounts.

RFP Selection Criteria

a)	Technical • understanding the scope of the work • fabrication, assembly, installation plan • ability to meet minimum functional and performance requirements • performance ability • quality and duration of proposed warranty periods • proposed delivery if different from stated	35%
b)	Cost • proposal pricing • cost saving proposals • value added benefits and incentives • proposed payment structure	35%
c)	Proponent Qualifications	20%
d)	Economic Benefits and Incentives Program	5%
e)	Any other factors the CLS may consider appropriate	5%
	TOTAL	100%

Note: All bids are to be submitted in Canadian dollars and may in addition also be submitted in the vendor's currency.

SCOPE OF WORK

The Proponent shall provide all material, labour, equipment, and services required to complete the Work as set out in the RFP. The Work shall be that which is called for in specifications and drawings. The Work shall include but is not limited to the following:

1. Supply and complete the planning, design, and engineering to carry out the Work.
2. Plan and implement the procurement of materials, equipment, and services to carry out the Work.
3. Provide and implement a Quality Assurance and Control Program (QA/QC) for the Work. The QA/QC program to include the testing, certifications, and inspections specified within this RFP.
4. Carry out, document, and distribute the results of testing, certifications, and inspections as specified within this RFP.
5. Provide documentation as specified within this RFP.
6. Provide the components specified in this document including all nine beamline sections.
7. Provide all measurement and testing as defined or required to perform the Work. Provide copies of all results to the CLS.
8. Provide packaging and transportation of finished product to designated CLS site.
9. Assemble and vacuum test finished product on the experimental floor at CLS.

PROPOSAL COST SUMMARY FORM

Proponents shall provide their proposal cost summary using the following format in Canadian dollars:

Design Build: Nine Vacuum Sections, Slits, and Monochromator Mechanism for The Variable Line Spacing Plane Grating Monochromator (VLS-PGM) Beamline

Item#	Description	Quantity	Unit Rate	Total
1	Detailed design for all 9 sections	1		
2	Fabrication Section #1	1		
3	Fabrication Section #2	1		
4	Fabrication Section #3	1		
5	Fabrication Section #4	1		
6	Fabrication Section #5	1		
7	Fabrication Section #6	1		
8	Fabrication Section #7	1		
9	Fabrication Section #8	1		
10	Fabrication Section #9	1		
11	Factory Testing	1		
12	Vacuum testing and optics install at CLS	1		
13	Subtotal			
14	PST			
15	GST			
16	Duties			
17	Shipping			
18	Subtotal			
19	Total			

Special Requirements to be Included in RFP

1. Proponent shall provide examples of previous work that demonstrates the proponent's capacity to fabricate beamline components with similar performance to the components specified in this document.

2. Provide names and phone numbers of two references to which the proponent has supplied synchrotron beamline components to that may be contacted by the CLS.

3. Proponent shall provide a list of any exceptions or alterations to statements, parameters, and tolerances in this document and attached drawings.

4. CLS reserves the right to visit the proponent's facility before awarding a contract.

5. CLS reserves the right to inspect components and facilities during fabrication.

6. The proponent shall propose a schedule with the following milestones:

   -start
   -completion of detailed design of optic holders, mounts, and cooling
   -completion of total detailed design
   -completion of vacuum chambers
   -completion of support structures
   -factory vacuum tests
   -shipment to CLS
   -assembly vacuum tests at CLS
   -mounting of optics at CLS

The proponent shall also propose a schedule of site visits by representatives of the CLS. It is suggested that these visits occur at approximately the following milestones:

   -factory vacuum tests
   -just before shipment to the CLS

7. The proponent shall propose a payment schedule for the Work.