Appendix P CAMM Documentation

Ministry of the Environment and Climate Change

Ministère de l'Environnement et de l'Action en matière de changement climatique

Ontario

Standards Development Branch
40 St. Clair Avenue West
7th Floor
Toronto ON M4V 1M2

Direction de l'élaboration des normes
40, avenue St. Clair ouest
7e étage
Toronto, ON M4V 1M2

September 22, 2014

Owens Corning Composite Materials Canada LP – Guelph Glass Facility
247 York Road
Guelph, Ontario
N1H 6P6

Attn: Robert Nixon, Engineering Leader

RE: Approval of Plan for deriving emission rates for use in Information to be included with Request for site-specific standard, September 2014

Dear Robert,

The Ministry is in receipt of your documents entitled "Test Protocol - Evaluation of Hexavalent Chromium Emissions from the T107 Furnace and Forehearth Stacks at the Owens Corning Guelph Plant" that was submitted on May 9, 2014, "CAMM Plan and Source Testing Plan in Support of a Site Specific Standard Owens Corning Canada LP Guelph, Ontario REVISION 1" that was submitted on July 24, 2014, the letter regarding a retest of Source B38 that was submitted September 3, 2014, and "Test Report: Evaluation of Hexavalent Chromium Emissions from Selected General Ventilation Exhausts at the Owens Corning Guelph Plant" that was submitted on August 8, 2014 (all describing the Plan).

The Ministry has reviewed the Plan, and is satisfied that the approach to be used is likely to provide an accurate reflection of emissions. I approve the Plan. I am of the opinion that a report prepared in accordance with section 26, using an emission rate determined in accordance with paragraph 2 of subsection 11 (1) will accurately determine the concentrations of hexavalent chromium.

Please call (416-212-4457) or e-mail Bruce Gillies at bruce.gillies@ontario.ca if you have any questions.

Yours truly,

S. Klose

Steve Klose, P.Eng.
Director, Section 11, Ontario Regulation 419/05
Director, Standards Development Branch

CAMM Plan and Source Testing Plan in Support of a Site Specific Standard Owens Corning Canada LP Guelph, Ontario REVISION 1

Confidential Commercially Sensitive Information

Jointly Prepared by:

LEHDER Environmental Services Limited
704 Mara Street, Suite 210
Point Edward, ON
N7V 1X4

Owens Corning Composite Materials Canada LP
Guelph Glass Facility
247 York Road
Guelph, ON

Project No.: 144539
July 2014

Executive Summary

The Owens Corning Composite Materials Canada LP - Guelph Glass Plant is located at 247 York Road, in Guelph, Ontario (OC Guelph). The facility produces textile glass yarn and fiberglass for reinforcements for commercial and industrial markets worldwide. The NAICS code for the OC Guelph facility is 327214: Glass Manufacturing. This NAICS code is not listed on either Schedule 4 or Schedule 5 of O.Reg. 419/05.

The Owens Corning Guelph Glass Facility has initiated the process of pursuing a Site Specific Alternate Standard for hexavalent chromium pursuant to O. Reg. 419/05 S. 32.

Chromium-containing refractory is universally used by the fiberglass industry as the material to construct the channels that contain molten glass due to its superior corrosion resistance, which significantly reduces waste and provides acceptable operational efficiency. This refractory is the source of di and tri valent chromium which is partially converted to the hexavalent form in furnace and forehearths prior to emission. The exposure of the chromic oxide refractory to the combustion environment, above the molten glass level, and alkalis in the glass are expected to be the primary mechanisms for the generation of hexavalent chromium.

In 2013 the facility installed full scale prototype refractory, forehearth sealing techniques and combustion control systems on a portion of the forehearth referred to as the East Forehearth. This channel and associated stack (Source B38) now represent a separate operating condition from the remainder of the forehearth channel which remains with the standard construction and combustion system (Source B11).

The combustion atmosphere in the furnace and forehearths are controlled environments due to ratio controlled combustion and near air tight refractory construction. Emissions from the melting process are emitted through three primary stacks and several general ventilation exhaust stacks. Therefore, the CAMM process is not suited for this site.

The sources of hexavalent chromium emissions from the facility are well defined and can be accurately measured using MOE-approved source testing protocols. Owens Corning proposes that source testing alone be utilized to obtain refined hexavalent chromium emission estimates for the purpose of the ESDM Report supporting the Site Specific Standard application.

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List of Appendices

1. Intention to Apply for a Site Specific Standard

As indicated in a letter to Kevin Noll at the Guelph District Office of the MOE on December 12, 2013, the Owens Corning Guelph Glass Facility will pursue a Site Specific Alternate Standard for hexavalent chromium pursuant to O. Reg. 419/05 S. 32.

Subsequent to the above letter, Owens Corning met with MOE personnel from the Regional Technical Support Section and the Standards Development Branch on January 28, 2014 to initiate discussions and share information about the facility. An outcome from the January meeting was a site visit at the Guelph Glass Plant for MOE personnel to have a facility tour and develop a more thorough understanding of the processes and emission points. This site visit was completed on February 20, 2014. The following MOE personnel were in attendance on February 20: Bruce Gillies, Nicholas Ting, Sean Avery, Patricia Wang, Edward Chang-Yen, and Kevin Noll.

Two source testing programs were completed in May and June of 2014 to collect data in support of an Application for a Site Specific Standard. Information collected from these testing programs is incorporated into this revised report.

2. Facility Description

The Owens Corning Composite Materials Canada LP - Guelph Glass Plant is located at 247 York Road, in Guelph, Ontario (OC Guelph). The facility produces textile glass yarn and fiberglass for reinforcements for commercial and industrial markets worldwide. This facility is the sole producer of Continuous Filament Mat (CFM) in Ontario and Canada. Owens Corning in Guelph has been in operation since 1951 and is recognized as the World's leading producer of high quality CFM and Chopped Strand Mat (CSM).

The NAICS code for the OC Guelph facility is 327214: Glass Manufacturing. This NAICS code is not listed on either Schedule 4 or Schedule 5 of O.Reg. 419/05 (Air Pollution – Local Air Quality). The facility operates the furnace and forehearths under Amended Certificate of Approval (Air) Number 8-2181-99-999 originally issued in September 1999. Two subsequent notices (amendments) were issued in April 2003 (Notice No. 1) and March 2006 (Notice No. 2). A copy of the current Certificates of Approval related to the furnace and forehearths are located in Appendix A.

A general location drawing and a simplified process flow diagram for the overall facility are located in Appendix B.

2.1 Process Details Related to Hexavalent Chromium

The furnace and forehearth structures that contain and transport the molten glass are lined with various types of refractory brick. Chromium-containing refractory is universally used by the fiberglass industry as the material to construct the channels that contain molten glass due to its superior corrosion resistance which significantly reduces waste and provides acceptable operational efficiency. This refractory is the source of di and tri valent chromium which is partially converted to the hexavalent form in furnace and forehearths prior to emission.

Most of the batch materials are mined and contain trace (ppm) amounts of chromium. This facility does not use any recycled glass in the form of cullet or off-spec products in the furnace due to quality control issues. Only native batch materials are used. Batch materials are not anticipated to be a significant contributor to chromium emissions. A mass balance around the glass melting process indicates that the finished glass product contains more chromium than is contributed by the raw batch materials.

A simplified process flow diagram for hexavalent chromium sources and a drawing of the facility indicating the location of the sources of interest are located in Appendix B.

2.2 Mechanisms for Hexavalent Chromium Generation

This page contains confidential information. Please see Appendix Q.

2.3 Hexavalent Chromium Reduction Efforts

This facility has completed a number of improvements to reduce hexavalent chromium generation and emission from a significant portion of the forehearth that recently required a re-build. This section, designated as the T107 East Forehearth, is serviced by Source B38. The improvements are as follows for the T107 East Forehearth (Source B38):

- Installed prototype refractory with modified refractory chemistry (increased resistance to chromium sublimation)
- Installed new combustion ratio control system to reduce excess oxygen (and reduce chromium sublimation)
- Installed castable refractory seal to reduce air ingress, a source of oxygen (and reduce chromium sublimation)

Reduction of excess oxygen, achieved by the combination of the castable refractory seal and the utilization of precision oxygen/gas ratio combustion controls, is expected to be the predominant factor in emissions reduction as compared to the use of the new, lower sublimation chrome refractory.

Details of these improvements (full scale prototypes) were provided in a letter to Kevin Noll at the Guelph District Office in August of 2013. A copy of this letter is located in Appendix C.

3. Validated Source Testing

Exhaust gases from the glass melting and molten glass transfer process (via the forehearths) are known to contain hexavalent chromium compounds. LEHDER Environmental Services Limited (LEHDER) was retained by the facility to conduct an emissions testing program to establish refined hexavalent chromium emission estimates. The facility completed a voluntary, validated source testing program on June 12, 2014 for the three primary sources emitting hexavalent chromium. The results of this program are intended to support an application for a Site Specific Standard for hexavalent chromium at the facility.

The sampling program involved measuring hexavalent chromium emissions from three sources servicing the T107 glass melting and transfer process. Specifically, the following sources were sampled:

- T107 Furnace West Stack (Source B1);
- T107 West Forehearth Stack (Source B11); and
- T107 East Forehearth Stack (Source B38)

The west forehearth consists of standard forehearth construction and the emissions are exhausted through Source B11. The east forehearth was re-built in early 2013 as a prototype of new technologies and the emissions from this area are exhausted through Source B38. Triplicate test runs were performed for each of the three sources under the current production rate of approximately 6800 lb/h molten glass pull.

The source testing was attended by MOE personnel Caitlyn Ruddy and Guillermo Azocar. The Source Testing Report will be submitted to the MOE Technology Standards Section (TSS) as required for validated testing programs.

3.1 Operating Conditions

The production rate at the facility is stated in terms of molten glass pull (i.e. lb molten glass pulled from the furnace per hour). Significant time (on the order of months) is required to introduce a step change in the molten glass pull rate. During the transition period to a new pull rate, significant quantities of waste glass are produced while the correct operating conditions to obtain the required product specifications are determined. The facility utilizes long range forecasting for production needs (~ year) to set the furnace capacity (production) at a steady rate.

This type of manufacturing process is not conducive to performing source testing at a range of production throughputs during a single source testing campaign. An assessment of data from two previous source testing programs in addition to this validated source testing program does not indicate a relationship between

hexavalent chromium emissions and furnace production rate. A detailed discussion is provided below.

3.1.1 Historical Data and Other Facility Data

This facility has now conducted source testing on the furnace and forehearth stacks in 2011, 2013 and 2014 using the same testing method (Method 0061). The 2014 testing program was completed as a validated source testing program. All three testing campaigns were completed with all three stacks tested simultaneously and in triplicate.

Evaluation of the three testing programs supports the position that the production rate (molten glass throughput) is not a significant variable in the generation of hexavalent chromium emissions. A graph of available data for hexavalent chromium emission rates vs furnace glass pull (updated to include the 2014 data) is located in Appendix D.

The past programs have included measurements before and after the construction of the full scale prototype (east) forehearth configuration. Several different combustion conditions (excess oxygen levels) were evaluated post prototype (2013). The data suggested a relationship between the amount of excess oxygen in the combustion area and the generation of hexavalent chromium. A graph of this data is provided in Appendix D.

Additional testing data is available from other Owens Corning facilities; however it is restricted to hexavalent chromium from furnace stacks only. Another drawback to these data sets is that either a single operating condition has been tested, or the furnace and forehearth configuration and firing environments for these other facilities are different and cannot be directly compared to the furnace and forehearths at the Guelph Facility.

The facility most closely resembling the Guelph facility is in Besana, Italy. However, their furnace and forehearths are natural gas/air-fired in comparison to the Guelph facility which is natural gas/oxygen-fired. The facility in Besana is considering conducting a testing program for hexavalent chromium emissions but data is not likely to be available in time to support this application.

3.1.2 Operating Conditions for Testing Purposes

As discussed in the previous section, the mechanism for the generation of hexavalent chromium is not expected to be related to the glass production rate. The facility has now collected data at three separate production rates (6850, 8300, 9000 lb/hr).

Additionally, the facility completed a validated source testing program under a range of operating conditions represented by the two different forehearth configurations. The standard construction (west) forehearth is served by Source B11. The full scale prototype (east) forehearth is served by Source B38. These are significantly different operating conditions due to their varied construction as well as the combustion controls.

4. General Ventilation Exhaust Source Testing

In response to the comments received from the MOE on April 24, 2014 regarding the original CAMM and Source Testing Plan submitted, Owens Corning initiated some additional sampling. LEHDER performed a source sampling program of limited scope to confirm or refute the presence of hexavalent chromium in air that is exhausted from Furnace Hall general ventilation units.

Three general exhausts were sampled for hexavalent chromium:

- Source B8: General Exhaust located above the melter/furnace
- Source B10: General Exhaust located above a section of the west forehearth
- Source C80: General Exhaust located above the East (CFM) forehearth

The selected units service different areas of the Furnace Hall, thereby providing a good representation of general exhaust from the furnace and each of the forehearth areas. Sampling from the rooftop ventilator locations provided the most controlled location to assess the presence of hexavalent chromium in general exhaust air.

The three ventilation fans were sampled concurrently for hexavalent chromium emissions over an approximate 7½ hour period on May 7, 2014. An extended sample period was selected to improve the concentration reporting limit for the samples and to ensure each sample was more representative of general exhaust conditions, mitigating possible emissions variability due to process operations. A single sample was collected from each source for this program, except where subsequently noted.

4.1 Sampling Methodology

The sources were sampled for hexavalent chromium using a modified version of EPA Method 0061: Determination of Hexavalent Chromium Emissions from Stationary Sources. This is the same methodology employed to sample the Forehearth and Furnace Stacks. The sources are not suitable for standard source sampling equipment as currently configured with short stacks and capped exhaust points.

The samples were collected for concentration analyses only; that is, the exhaust gas flow rates were not measured and the samples were not collected isokinetically due to the significant challenges presented by the stack configuration. Sampling was performed at a fixed sampling rate from a single sampling point for each source. Two samples were collected simultaneously from Source B10 as a quality assurance / quality control (QA/QC) measure, to verify reproducibility of results.

4.2 Results & Quantification

The results indicate that hexavalent chromium was present in low but measurable quantities in the Furnace Hall general ventilation exhaust air. In response to these results, a meeting was held at the facility on June 12, 2014 to discuss how to best proceed with this information. The meeting was attended by Mike Denomme and Penny McInnis (LEHDER), Rob Nixon (Owens Corning), and Caitlyn Ruddy, Guillermo Azocar and Bruce Gillies (MOE). It was agreed that due to the absence of particulate exhausted through the general exhausts, isokinetic testing would not be necessary. Additionally, since sampling times were almost 8 hours in duration and a representative cross section of general exhausts were sampled, the concentration data collected on May 7, 2014 could be used in combination with fan curve flow data to estimate emission rates.

A source testing report for the General Ventilation Testing Program will be submitted to Caitlyn Ruddy and Guillermo Azocar.

5. CAMM Plan

As outlined in the *Guide to Requesting an Alternative Air Standard*, a Plan for a Combined Modelling/Monitoring (CAMM) Results Assessment must be submitted prior to completing an ESDM Report as part of a Section 32 request.

It is understood that the purpose of a Combined Modelling/Monitoring Program is to obtain emission estimates with the highest data quality. These emission estimates are then incorporated into a refined ESDM Report.

CAMM programs are intended for (and more ideally suited for) facilities with fugitive emissions that cannot accurately be measured for subsequent use in air dispersion models. The characteristics of the processes generating emissions at the Guelph Glass facility are such that fugitive emissions are not anticipated as outlined in the following sections.

5.1 Source Characterization

The furnace is completely enclosed with the exception of several small observation ports around the furnace which are usually closed except during short periods of furnace observation by operators. The furnace atmosphere is a controlled environment due to the supply of oxygen at greater than 90% purity. Emissions from the furnace are directed through a stack above the furnace.

The molten glass flows by gravity through an enclosed sump into the enclosed forehearth channel. The gravity flow in the channel is controlled by adjusting the elevation of the base of the channel sections. All of the sections of the forehearths (T107 west and T107 east) are enclosed. Small, natural gas/oxygen fired burners are located at regular intervals throughout the forehearth channels to maintain glass viscosity.

There are two forehearth exhaust stacks as noted previously in Section 3. These exhausts are constructed of refractory brick near the bottom and have a hood type enclosure above the brick. There is a small opening between the brick and the hood where air in the surrounding room is drawn in by the venturi type effect of the hot forehearth combustion gases (~1500 °C) moving quickly up the exhaust stack. This entrained air helps to cool the forehearth exhaust gases to a temperature of less than 200 °C when exiting the stack.

The molten glass atmosphere is enclosed up until the molten glass is fed through the bushings at which point it is almost instantaneously cooled to a solid glass fiber. At the bushings and beyond, there are no opportunities for hexavalent chromium to be generated. Any trace amounts of chromium remaining in the glass remains inert and chromium bearing refractory (the source of the chromium) is not utilized in the process beyond the furnace and forehearths.

There are several building ventilation exhaust fans in the general Furnace Hall area to remove the radiant heat emitted into the building from furnace and forehearth operations. Because of the enclosed furnace and forehearth arrangements and the configuration of the process exhausts, the primary sources of hexavalent chromium emissions are the three point source stacks identified as the furnace and forehearth stacks. The residual trace amounts of hexavalent chromium not captured by the furnace and forehearth stacks are emitted through the general ventilation exhaust stacks.

5.2 Requested Approach

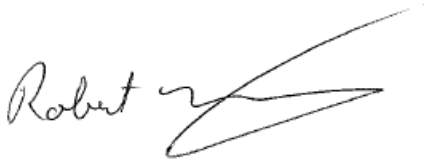
The sources of hexavalent chromium emissions from the facility are well defined and can be accurately measured using MOE-approved source testing protocols. Therefore, the CAMM process is not suited for this site.

Owens Corning requests that source testing alone (completed to date) be utilized to obtain refined hexavalent chromium emission estimates for the purpose of the ESDM Report supporting the Site Specific Standard application.

6. Closure

Thank you for the opportunity to present this submission related to the requirements of the Site Specific Standard process. We trust that this meets your requirements. Should you have any questions or require additional information on any aspect, feel free to call us at (519) 336-4101 ext. 245.

Yours truly,



LEHDER Environmental Services Ltd	Owens Corning Guelph Glass Plant
Penny McInnis, P. Eng.	Robert Nixon, B.Sc (Eng.)
Principal	Engineering Leader

CAMM Plan / Source Testing Plan

Appendix A Current Certificates of Approval

Ontario

Ministry of the Environment | Ministère de l'Environnement

AMENDED CERTIFICATE OF APPROVAL
AIR
NUMBER 8-2181-91-999

received Oct 6/99

Owens-Corning Canada Inc.
247 York Road
P.O. Box 3603
Guelph, Ontario
N1E 3G4

Located at:

247 York Road
Guelph, Ontario

You have applied in accordance with Section 9 of the Environmental Protection Act for approval of:

- four (4) natural gas fired furnaces for the production of glass fibres as listed in the attached Schedule "A";
- twenty (20) dust collectors to control particulate emissions as listed in the attached Schedule "B";
- three (3) blowers as listed in the attached Schedule "C";
- one (1) process trial for the recycle of glass into the T105 Furnace,

all in accordance with the two (2) applications for a Certificate of Approval (Air) and supporting information submitted by Owens-Corning Canada Inc., both signed by Mike McCaig, dated July 21, 1999 and September 7, 1999; and letter from Owens-Corning Canada Inc., signed by Rod Irving and dated September 7, 1999.

You are hereby notified that this approval is issued to you subject to the terms and conditions outlined below:

TERMS AND CONDITIONS

DEFINITIONS

1. For the purpose of this Certificate:

   (1) "Act" means the *Environmental Protection Act;*

   (2) "Certificate" means this Certificate of Approval, including Schedules "A", "B" and "C", issued in accordance with Section 9 of the Act;

(3) "Company" means Owens-Corning Canada Inc.;

(4) "Equipment" means the dust collectors described in the Company's application, this Certificate and in the supporting documentation referred to herein, to the extent approved by this Certificate, as listed in Schedule "B" attached to this Certificate;

(5) "Manual" means a document or a set of documents that provide written instructions to staff of the Company; and

(6) "Ministry" means the Ontario Ministry of the Environment.

2. The process trial for the recycle of glass into the T105 Furnace shall expire June 30, 2000.

OPERATION AND MAINTENANCE

3. The Company shall ensure that the Equipment is properly operated and maintained at all times. The Company shall:

(1) prepare, not later than three (3) months after the date of this Certificate, and update, as necessary, a Manual outlining the operating procedures and a maintenance program for the Equipment, including:

(a) routine operating and maintenance procedures in accordance with good engineering practices and as recommended by the Equipment suppliers;

(b) emergency procedures;

(c) the frequency of inspection and replacement of the filter material in the Equipment;

(d) procedures for any record keeping activities relating to operation and maintenance of the Equipment;

(2) implement the recommendations of the operating and maintenance Manual; and

(3) retain, for a minimum of two (2) years from the date of their creation, all records on the maintenance, repair and inspection of the Equipment, and make these records available for review by staff of the Ministry upon request.

The reasons for the imposition of these terms and conditions are as follows:

1. Condition No. 1 is included to define the special terms that are used throughout the Certificate.

2. Condition No. 2 is included to allow the Company sufficient time to carry out the process trial.

3. Condition No. 3 is included to emphasize that the Equipment must be maintained and operated according to a procedure that will result in compliance with the Act, the regulations and this Certificate. In addition, the Company is required to keep records and provide information to staff of the Ministry so that compliance with the Act, the regulations and this Certificate can be verified.

This Amended Certificate of Approval (Air) revokes and replaces Amended Certificate of Approval (Air) No. 8-2181-91-978 dated May 13, 1997.

In accordance with Section 139 of the Environmental Protection Act, R.S.O. 1990, Chapter E-19, as amended, you may by written Notice served upon me, the Environmental Appeal Board and in accordance with Section 47 of the Environmental Bill of Rights, S.O. 1993, Chapter 28, the Environmental Commissioner, within 15 days after receipt of this Notice, require a hearing by the Board. The Environmental Commissioner will place notice of your appeal on the Environmental Registry. Section 142 of the Environmental Protection Act, provides that the Notice requiring the hearing shall state:

1. The portions of the approval or each term or condition in the approval in respect of which the hearing is required, and;
2. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

The Notice should also include:

3. The name of the appellant;
4. The address of the appellant;
5. The Certificate of Approval number;
6. The date of the Certificate of Approval;
7. The name of the Director;
8. The municipality within which the works are located;

And the Notice should be signed and dated by the appellant.

This Notice must be served upon:

The Secretary*,
Environmental Appeal Board,
2300 Yonge St., 12th Floor,
P.O. Box 2382,
Toronto, Ontario.
M4P 1E4

The Environmental Commissioner,
1075 Bay Street,
Suite 605,
6th Floor,
Toronto, Ontario.
M5S 2B1

The Director,
Section 9, *Environmental Protection Act*,
Ministry of the Environment,
2 St. Clair Avenue West, 12A Floor,
Toronto, Ontario.
M4V 1L5

* ***Further information on the Environmental Appeal Board's requirements for an appeal can be obtained directly from the Board by: Tel: (416) 314-4600, Fax: (416) 314-4506 or Web Site: www.ert.gov.on.ca***

This instrument is subject to Section 38 of the Environmental Bill of Rights, that allows residents of Ontario to seek leave to appeal the decision on this instrument. Residents of Ontario may seek to appeal within 15 days from the date this decision is placed on the Environmental Registry. By accessing the Environmental Registry, you can determine when the leave to appeal period ends.

The above noted works are approved under Section 9 of the Environmental Protection Act.

DATED AT TORONTO this 27th *day of* September, 1999.

S. Klose, P.Eng.,
Director,
Section 9,
Environmental Protection Act.

RT/ba

cc: -District Manager, MOE Guelph District Office
-S. Lethbridge, LEHDER Environmental Services Limited

SCHEDULE "A"

This Schedule "A" forms part of Certificate of Approval (Air) No. 8-2181-91-999

DESCRIPTION	STACK NUMBER	EXHUAST GAS VOLUME (cubic metre per second)	STACK EXIT DIAMETER (metre)	STACK HEIGHT ABOVE ROOF (metres)	STACK HEIGHT ABOVE GRADE (metres)	FURNACE THROUGHPUT (kilograms per hour)	FURNACE TEMPERATURE (degrees Celsius)	GAS USAGE (cubic metres per hour)	HEAT SOURCE
101 Forehearth	A37	0.5	0.41	2.7	15.5			130	natural gas/air
101 Furnace	A38	1.6	0.76	14.8	27.6	500	1625	400	natural gas/air
103 Forehearth	A26	0.5	0.41	2.7	25			130	natural gas/air
103 Furnace	A28	1.5	0.76	5.3	27.6	727	1625	400	E Boost, natural gas/air
105 Furnace (east)	B24	1.3	0.53	4	27.8	1182 (total)	1625	220	natural gas/oxygen
105 Furnace (west)	B25	1.2	0.53	4	27.8		1625	220	natural gas/oxygen
105 Forehearth	B38	0.5	0.46	3.7	16.5			130	natural gas/air
107 Furnace (west)	B01	2.1	0.8	4.6	32	4536 (total)	1625	450	E Boost, natural gas/oxygen or E Boost, natural gas/air

DESCRIPTION	STACK NUMBER	EXHUAST GAS VOLUME (cubic metre per second)	STACK EXIT DIAMETER (metre)	STACK HEIGHT ABOVE ROOF (metres)	STACK HEIGHT ABOVE GRADE (metres)	FURNACE THROUGHPUT (kilograms per hour)	FURNACE TEMPERATURE (degrees Celsius)	GAS USAGE (cubic metres per hour)	HEAT SOURCE
107 Furnace (east)	B02	2.1	0.8	4.6	32		1625	450	E Boost, natural gas/oxygen or E Boost, natural gas/air
107B Forehearth	B11	0.5	0.61	2.3	15.1			90	natural gas/air
107C Forehearth	B12	0.5	0.46	3.3	16.1			90	natural gas/air
107A Forehearth	B37	0.5	0.46	2.4	15.2			90	natural gas/air
107C Forming Scrap Tunnel	B15	19.2	1.2x1.5	2.1	14.9				
107B Forming Scrap Tunnel	B16	19.2	1.2x1.5	2.1	14.9				
107A Forming Scrap Tunnel	B39	14	0.9x1.1	2.1	14.9				

SCHEDULE "B"

This Schedule "B" forms part of Certificate of Approval (Air) No. 8-2181-91-999

PROCESS	STACK	DESCRIPTION	FILTER AREA (square metres)	VOLUMETRIC FLOW RATE (cubic metres per second)	STACK EXIT DIAMETER (metre)	STACK HEIGHT ABOVE ROOF (metres)	STACK HEIGHT ABOVE GRADE (metres)
101	A42	Furnace 101	10.68	0.33	0.15	9.5	22.3
103	A27	Furnace 103	10.68	0.33	0.14	1.2	23.5
105	B31	Furnace 105	10.68	0.33	0.20 x 0.20	10.8	23.6
107	B05	Furnace 107 west	16.72	0.33	0.15	10.8	23.6
107	B06	Furnace 107 east	16.72	0.33	0.15	10.8	23.6
Batch	G32	Zinc Oxide	16.72	0.33	0.14	0.6	7.0
	G39	Batch House	9.94	0.33	0.20 x 0.25		35.7
	G40	Batch House	16.72	0.33	0.20 x 0.25		35.7
	G45	Mixed Batch	16.72	0.24	0.20 x 0.25		35.7
	G46	Bad Batch	9.38	1.32	0.33 x 0.27		12.2
	G47	Bad Batch	10.68	0.33	0.20		5.8
	G48	Batch Ingredient	10.68	0.33	0.14		31.4
	G49	Batch Ingredient	44.59	0.33	0.14		31.4
	G50	Batch Ingredient	44.59	0.33	0.14		31.4
	G51	Batch Ingredient	10.68	0.33	0.14		31.4
	G52	Batch Ingredient	10.68	0.33	0.14		31.4
	G61	Silo 18	16.72	0.24	0.14		21.6
	G62	Silo 19	16.72	0.24	0.14		21.6
	G63	Silo 20	16.72	0.24	0.14		21.6
	G64	Silo 21	37.73	0.24	0.14		21.6

SCHEDULE 'C'

This Schedule "C" forms part of Certificate of Approval (Air) No. 8-2181-91-999

PROCESS	STACK	DESCRIPTION	VOLUMETRIC FLOW RATE (cubic metre per second)	STACK EXIT DIAMETER (metre)	STACK HEIGHT ABOVE ROOF (metres)	STACK HEIGHT ABOVE GRADE (metres)
Batch	G35	Transfer #1	0.33	0.10	1.2	7.6
	G36	Transfer #2	0.33	0.10	0.9	7.3
	G38	Transfer #3	0.33	0.10	2.1	8.5

Ontario

Ministry of the Environment | Ministère de l'Environnement

AMENDMENT TO CERTIFICATE OF APPROVAL
AIR
NUMBER 8-2181-91-999
Notice No. 1

Owens-Corning Canada Inc.
247 York Rd., Box 3603
Guelph, Ontario
N1E 3G4

Site Location: 247 York Road
Guelph City, County Of Wellington

You are hereby notified that I have amended Certificate of Approval No. 8-2181-91-999 issued on September 27, 1999 for natural gas furnaces, dust collectors and blowers, as follows:

to remove the requirement to use E-boost from the operation of 107 furnace, East and West, as described in Schedule "A" of the above Certificate and to operate on natural gas/oxygen firing only;

all in accordance with the Application for Approval signed by Robert Harrison dated February 11, 2003, the supporting documentation prepared by Lehder Environmental Services Limited dated November 2002, the letter from Steve Hawkins of Lehder Environmental Services Limited to A. Khaja of the Ontario Ministry of the Environment dated April 11, 2003 and all the other supporting information.

This Notice shall constitute part of the approval issued under Certificate of Approval No. 8-2181-91-999 dated September 27, 1999

In accordance with Section 139 of the Environmental Protection Act, R.S.O. 1990, Chapter E-19, as amended, you may by written Notice served upon me, the Environmental Review Tribunal and in accordance with Section 47 of the Environmental Bill of Rights, S.O. 1993, Chapter 28, the Environmental Commissioner, within 15 days after receipt of this Notice, require a hearing by the Tribunal. The Environmental Commissioner will place notice of your appeal on the Environmental Registry. Section 142 of the Environmental Protection Act, provides that the Notice requiring the hearing shall state:

1. The portions of the approval or each term or condition in the approval in respect of which the hearing is required, and;
2. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

The Notice should also include:

3. The name of the appellant;
4. The address of the appellant;
5. The Certificate of Approval number;
6. The date of the Certificate of Approval;
7. The name of the Director;
8. The municipality within which the works are located;

And the Notice should be signed and dated by the appellant.

This Notice must be served upon:

The Secretary*
Environmental Review Tribunal
2300 Yonge St., 12th Floor
P.O. Box 2382
Toronto, Ontario
M4P 1E4

AND

The Environmental Commissioner
1075 Bay Street, 6th Floor
Suite 605
Toronto, Ontario
M5S 2B1

AND

The Director
Section 9, *Environmental Protection Act*
Ministry of Environment and Energy
2 St. Clair Avenue West, Floor 12A
Toronto, Ontario
M4V 1L5

*** Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 314-4600, Fax: (416) 314-4506 or www.ert.gov.on.ca**

This instrument is subject to Section 38 of the Environmental Bill of Rights, that allows residents of Ontario to seek leave to appeal the decision on this instrument. Residents of Ontario may seek leave to appeal within 15 days from the date this decision is placed on the Environmental Registry. By accessing the Environmental Registry at www.ene.gov.on.ca, you can determine when the leave to appeal period ends.

The above noted works are approved under Section 9 of the Environmental Protection Act.

DATED AT TORONTO this 25th day of April, 2003

Neil Parrish, P.Eng.
Director
Section 9, *Environmental Protection Act*

AK/
c: District Manager, MOE Guelph
Rob Harrison, Owens-Corning Canada Inc.

Ontario

Ministry of the Environment | Ministère de l'Environnement

AMENDMENT TO CERTIFICATE OF APPROVAL
..AIR
NUMBER 8-2181-91-999
Notice No. 2
Issue Date: March 3, 2006

Owens Corning Canada Inc.
P.O. Box 3603
Guelph, Ontario
N1H 6P6

Site Location: 247 York Road, Guelph, Ontario.

You are hereby notified that I have amended Certificate of Approval No. 8-2181-91-999 issued on September 27, 1999 for a facility producing glass fibres, as follows:

- the use of sodium sulphate salt cake in the batch materials in the production of glass fibres;

- the replacement of an existing silo baghouse dust collector (G52) with a new silo baghouse dust collector (G65), having a filtering velocity of 2.5 centimetres per second and a volumetric capacity of 0.44 cubic metre per second, discharging at 35.7 metres above grade;

all in accordance with the application for a Certificate of Approval (Air) and all supporting information dated October 3, 2005, signed by C. White.

Other Terms and Conditions remain the same.

This Notice shall constitute part of the approval issued under Certificate of Approval No. 8-2181-91-999 dated September 27, 1999.

In accordance with Section 139 of the Environmental Protection Act, R.S.O. 1990, Chapter E-19, as amended, you may by written Notice served upon me, the Environmental Review Tribunal and in accordance with Section 47 of the Environmental Bill of Rights, S.O. 1993, Chapter 28, the Environmental Commissioner, within 15 days after receipt of this Notice, require a hearing by the Tribunal. The Environmental Commissioner will place notice of your appeal on the Environmental Registry. Section 142 of the Environmental Protection Act, provides that the Notice requiring the hearing shall state:

1. The portions of the approval or each term or condition in the approval in respect of which the hearing is required, and;
2. The grounds on which you intend to rely at the hearing in relation to eachportion appealed.

The Notice should also include:

3. The name of the appellant;
4. The address of the appellant;
5. The Certificate of Approval number;
6. The date of the Certificate of Approval;
7. The name of the Director;
8. The municipality within which the works are located;

And the Notice should be signed and dated by the appellant.

This Notice must be served upon:

The Secretary*
Environmental Review Tribunal
2300 Yonge St., 12th Floor
P.O. Box 2382
Toronto, Ontario
M4P 1E4

AND

The Environmental Commissioner
1075 Bay Street, 6th Floor
Suite 605
Toronto, Ontario
M5S 2B1

AND

The Director
Section 9, *Environmental Protection Act*
Ministry of Environment and Energy
2 St. Clair Avenue West, Floor 12A
Toronto, Ontario
M4V 1L5

*** Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 314-4600, Fax: (416) 314-4506 or www.ert.gov.on.ca**

This instrument is subject to Section 38 of the Environmental Bill of Rights, that allows residents of Ontario to seek leave to appeal the decision on this instrument. Residents of Ontario may seek leave to appeal within 15 days from the date this decision is placed on the Environmental Registry. By accessing the Environmental Registry at www.ene.gov.on.ca, you can determine when the leave to appeal period ends.

The above noted works are approved under Section 9 of the Environmental Protection Act.

DATED AT TORONTO this 3rd day of March, 2006

THIS NOTICE WAS MAILED
ON March 30 2006
SC
(Signed)

Victor Low, P.Eng.
Director
Section 9, *Environmental Protection Act*

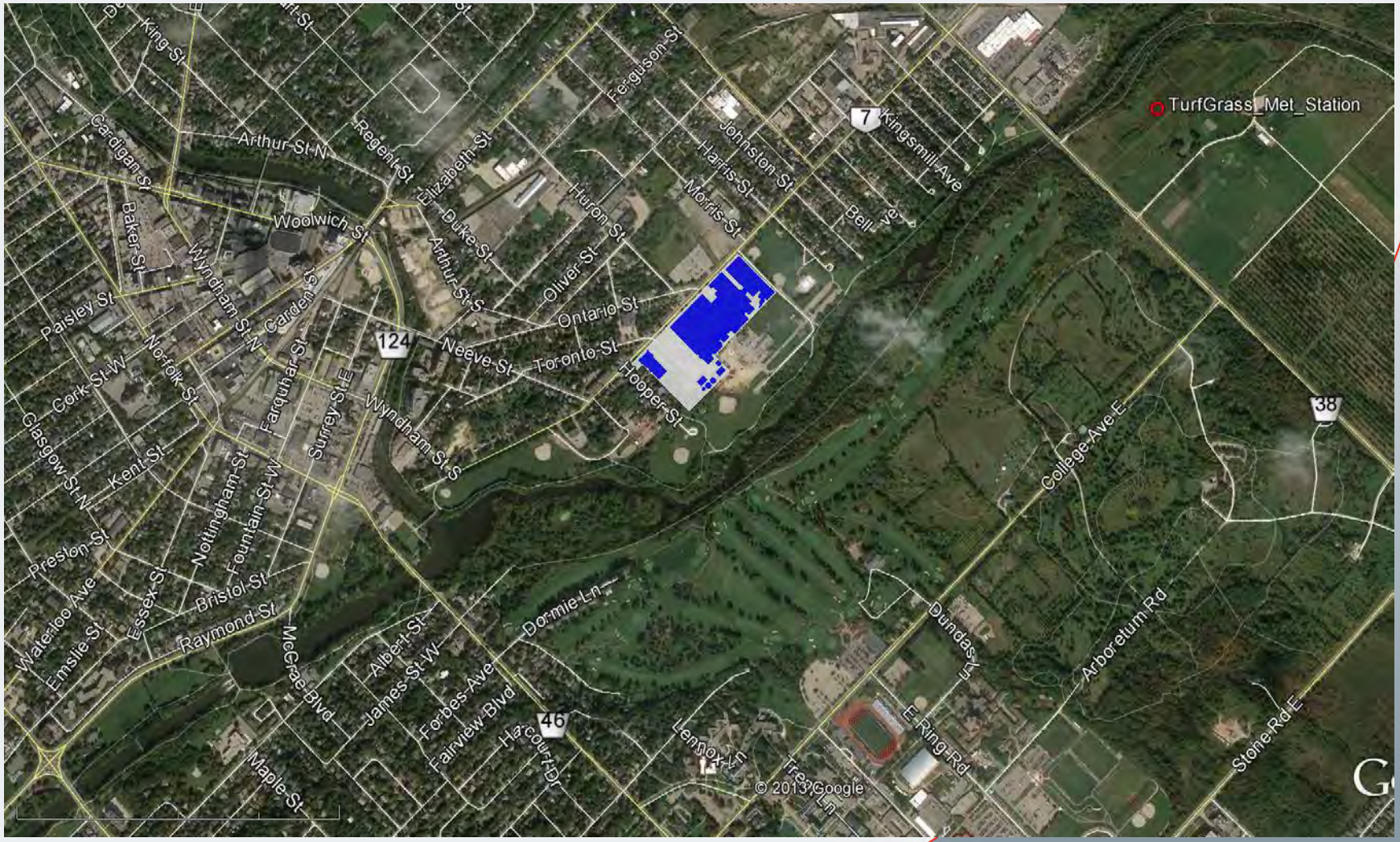
QN/
c: District Manager, MOE Guelph
Rob Nixon, Owens Corning Canada Inc. ✓

CAMM Plan / Source Testing Plan

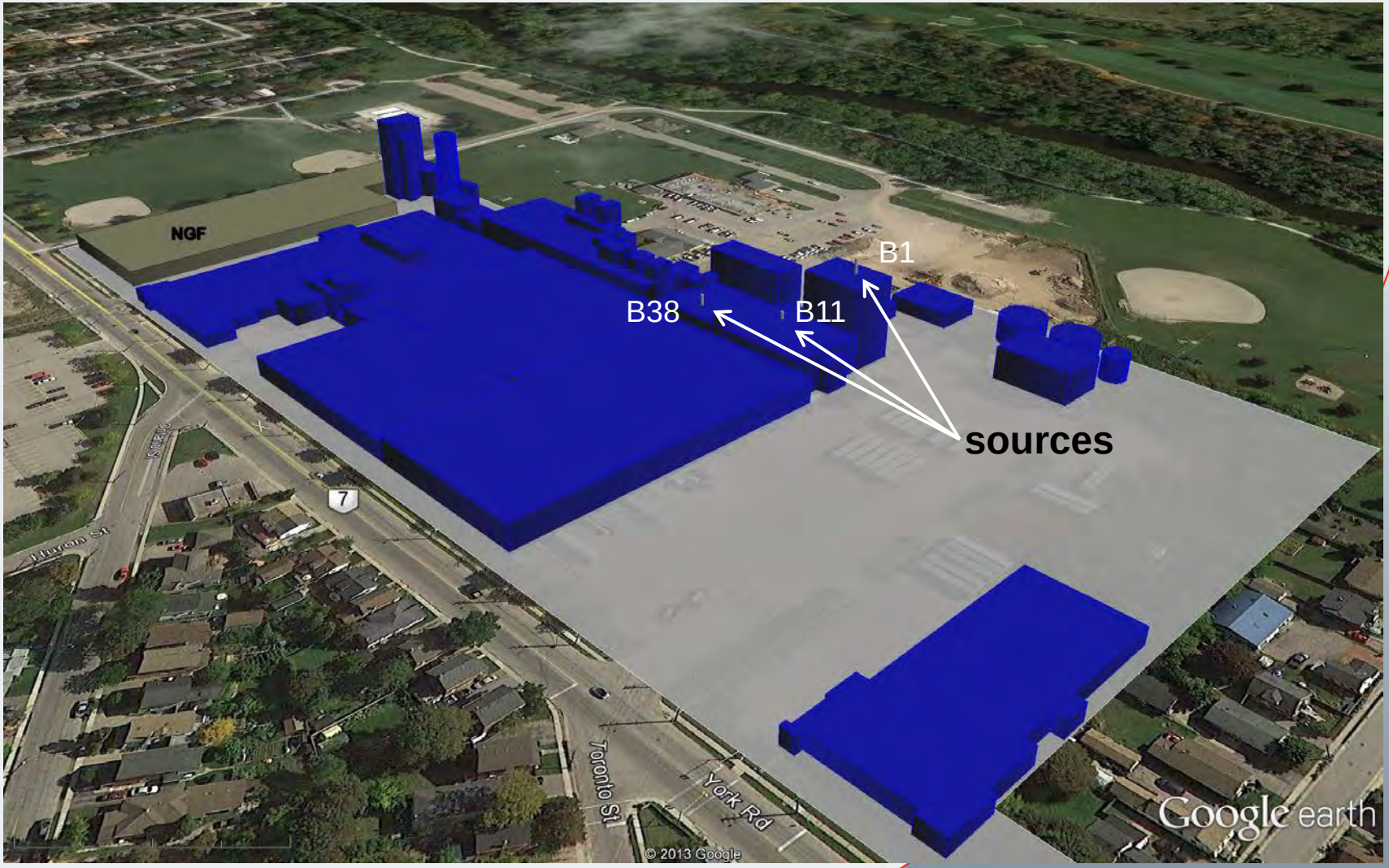
Appendix B **Process Flow Diagrams & Site Drawings**

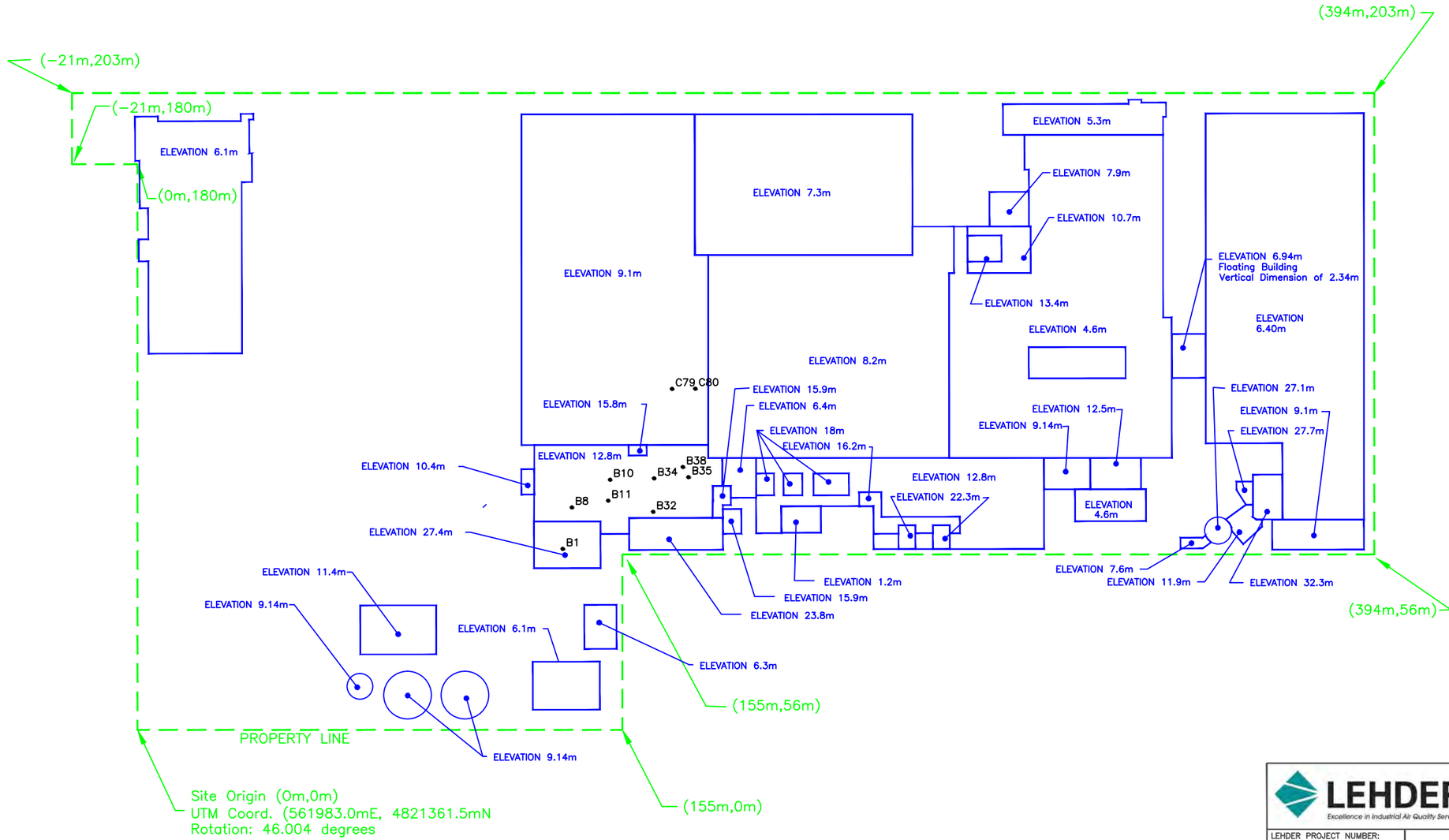
See Appendix Q for additional confidential items

Facility Location



3D Facility Overview





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LEHDER PROJECT NUMBER: 144539	GUELPH GLASS PLANT OWENS CORNING CANADA
DATE: July 2014	
LEHDER DRAWING NUMBER: B−044112_HCR	SITE PLAN AND HEXAVALENT CHROMIUM SOURCE INVENTORY

0 25m 50m 75m 100m

SCALE: 1:1500 (1mm=1.5meter)

CAMM Plan / Source Testing Plan

Appendix C Full Scale Prototype Installations

OWENS CORNING CANADA
GUELPH GLASS PLANT
P.O.BOX3603
247 YORK ROAD
GUELPH, ONTARIO N1H 6P6
519.823.7219

INNOVATIONS FOR LIVING®

Mr. Kevin Noll
Senior Environmental Officer
Ministry of Environment
Guelph District Office
West Central Region
1 Stone Road West, 4th Floor
Guelph, ON, N1G 4Y2

September 19, 2013

Dear Mr. Noll

This letter is in response to your request for Owens Corning to detail recent technology deployments aimed at reducing chromium emissions from our Guelph Facility.

During a recent capital investment at our facility, we installed three prototype technologies in an attempt to reduce chromium emissions from our facility. We are currently in the final stages of commissioning these technologies. In summary, they include:

1) **Modified refractory chemistry:** We believe the main source of chromium emissions from our process is the sublimation of this material from its solid form into a gaseous state due to the environment and temperature in which it operates. The supplier of our chromium bearing refractory material has been working to develop a new refractory that has increased resistance to sublimation. With an increased resistance to this reaction through a slightly altered composition, emissions should be reduced. During our recent project, we replaced the traditional material in the 105 Forehearth with this prototype material. This installation represents the first production scale manufacture by our supplier and first ever installation of this prototype material.

2) **Improved combustion ratio control:** The environment in which our refractory operates is largely the products of natural gas combusted in an essentially oxygen atmosphere. Excess oxygen in the combustion process that would be present in this operating environment is believed to increase the rate of refractory sublimation. Insufficient oxygen in the combustion process leads to a corrosive operating environment resulting from the incomplete combustion of natural gas. Historical combustion controls did not allow for precise oxygen/gas ratio control leading to an operational set up of high excess oxygen to provide a margin of safety to prevent from operating with an oxygen deficient ratio. During our recent project, we installed combustion controls that allow much more precise combustion control providing the ability to operate closer to ideal combustion. With reduced excess oxygen in the operating environment, the rate of sublimation should reduce, leading to lower emissions. These controls were developed and trialed internal to Owens Corning. This installation is the first production scale use of the equipment.

3) **Improved sealing of the refractory package:** Traditional furnace construction consists of a refractory package constructed of individual blocks approximately the size of a typical exterior brick found in residential construction. This results in a significant number of joints that must be mortared using an appropriate material. However, in the event of craftsmanship issues or natural degradation of the mortar over time, these joints provide a potential pathway for ambient air ingress into the process. When this happens, the operating environment sees an increase in oxygen, potentially resulting in an increased rate of sublimation and emission. During our recent project, we installed a castable refractory seal around our system to dramatically reduce the potential for air ingress. This leads to greater assurance of avoiding excess oxygen in the operating environment. This installation was the first of its kind in our business.

As mentioned, each of these technologies are new and in the pilot stage. We are hopeful that, in combination, these changes will result in lower chromium emissions from our process. However, the potential success of these efforts is, at best, unpredictable at this time.

If you have further questions around our activities, please do not hesitate to contact me.

Sincerely

Robert Nixon
Maintenance & Engineering Leader
Owens Corning - Guelph Glass Plant

CAMM Plan / Source Testing Plan

Appendix D **Summary of Historical Testing and Production Rates**

See Appendix Q for additional confidential items

September 3, 2014
Project No.: 144539B

Guillermo Azocar
Source Assessment Specialist
Technology Standards Section
Standards Development Branch
40 St. Clair Ave. West, 7th Floor
Toronto, ON M4V 1M2

Re-Testing to Evaluate Hexavalent Chromium Emissions at Owens Corning Guelph Facility

LEHDER Environmental Services Limited (LEHDER) conducted a source emission survey at the Owens Corning Glass Plant in Guelph, Ontario on June 12, 2014. During the survey, three sources from the 107 furnace/forehearth were evaluated for emissions of hexavalent chromium in accordance with the accepted test protocol dated May 8, 2014. Notification of the date and location of the source testing was provided to the Ministry of Environment by LEHDER on May 27, 2014. Sampling was witnessed by Mr. Guillermo Azocar, Ms. Caitlyn Ruddy and Mr. Bruce Gillies over the course of the day.

After completion of testing, it was discovered that operating conditions which affect one of the three sources were not correct. Consequently, measured emissions from that source were not representative of typical/normal operations. The affected source was the 107 East Forehearth Stack (Source B38). This process condition has since been rectified and retesting of the source is proposed.

This represents formal notification for the retesting of Source B38 at the target process setpoint. Hexavalent chromium sampling will be carried out using the same protocol used for the June 2014 survey (i.e. USEPA Method 0061). Three test runs, each 72 minutes in duration, will be conducted. **The test date is Tuesday, September 16, 2014**. The LEHDER field leader is Mr. Guy Bastien (e-mail: gbastien@lehder.com). Please call me of Guy if you have any questions pertaining to this testing.

Respectfully submitted,

LEHDER Environmental Services

Mike Denomme

cc. Caitlyn Ruddy (MOE SDB)
Bruce Gillies (MOE SDB)
Rob Nixon (OC Guelph Glass)
Penny McInnis/Guy Bastien (LEHDER)