Alternative Fuel Demonstration Project

Summary Waste Report

St. Marys Cement Inc. (Canada) – Bowmanville Cement Plant ECA 1255-7QVJ2N, Condition 53

Report to: District Manager, Ministry of the Environment, Conservation and Parks

Prepared for: St. Marys Cement Inc. (Canada) Bowmanville Cement Plant

Site Address: 410 Bowmanville Ave. (formerly 400 Waverly Road) Bowmanville, ON L1C 3K3

Prepared by: HDR Consultants

Date: May 2019

Executive Summary

Project Description

This Report has been prepared as required and in accordance with Condition 54 of the Environmental Compliance Approval (ECA) (Waste) Number 1255-7QVJ2N (Appendix A) issued on March 11, 2015 for the St. Marys Cement Plant located at 410 Bowmanville Avenue (formerly 400 Waverly Road) in Bowmanville, Ontario to undertake an alternative fuel demonstration project (the Demonstration Project).

The ECA (Air) 4614-826K9W (Appendix B) issued on November 5, 2014 sets out the conditions related to the collection of site specific air quality data for the Demonstration Project.

Under the ECA (Waste) for the Demonstration Project:

- Alternative fuels means: residuals derived from industrial and/or post-consumer sources, including plastic polymers, paper fibres and woody materials, received as single streams or blends, classified as Municipal Solid Waste under Ontario Regulation 347. The ECA (Waste) allows for use of alternative fuels at a rate not to exceed 350 tonnes per day.
- Demonstration Project means: the demonstration project where up to 30% of Conventional Fuel is substituted with alternative fuel in the cement kiln.
- Facility means: those operations associated with the Demonstration Project located on the property where the Cement kiln is located.

Under the ECA (Air) for the Demonstration Project, up to 12 tonnes per hour of alternative fuels could be utilized. Alternative fuels are described and the maximum input rate is defined as follows:

Alternative Fuel	Description	Maximum Input Rate (tonnes/hour)
Post-composting plastic polymers and wood residuals	Shredded and dried plastic film and other plastic materials removed from finished compost.	5.5
Plastic polymers, paper fibres and woody residuals derived from industrial and/or post-consumer sources.	Shredded plastic and other materials removed from post-consumer recycling or from industrial manufacturing process.	6.5

The purpose of the Demonstration Project was to:

- Demonstrate that the Facility can successfully operate with the use of alternative fuels.
- Demonstrate that the operation of the Facility using alternative fuels will not cause or be likely to cause an adverse effect. This includes:

- Demonstrating compliance with Regulation 419/05 Schedule 3 standards at the maximum Point-Of-Impingement using the results of the source testing program and air dispersion calculations;
- Assessing any statistically significant changes in emissions from the cement kiln stack and POI concentrations of the test contaminants resulting from the use of alternative fuel, if any, relative to baseline conditions; and
- Assessing any statistically significant changes in ambient air concentrations resulting from the use of alternative fuel, if any, relative to the baseline conditions.

St. Mary Cement Inc. (SMC) completed two alternative fuel trials as part of the Demonstration Project during the period from September 25, 2018 to December 10, 2018. The two alternative fuel trials tested two different blends of approved alternative fuel materials in accordance with the Demonstration Project ECAs (Waste and Air). Alternative fuels were generated at two locations within Durham Region and shipped to the Facility on transfer trailers. The transfer trailers were received in an alternative fuels building, where they were docked into a fuel feed system. Alternative fuel was introduced into the calciner burner at the Bowmanville Cement plant using a dedicated Schenck fuel feed, conveyor and metering system. The maximum feed rate possible for the system was 12 tonnes per hour.

Work undertaken on the Demonstration Project included:

- Alternative fuel inspection, sampling and reporting as documented in this Report. Alternative fuels were tested for parameters specific to SMC alternative fuel specifications including metals and total halogens. This was undertaken prior to the demonstration to select fuel materials, and during the Demonstration Project.
- Operational monitoring of the Facility as undertaken by SMC throughout the Demonstration.
- Raw feed and conventional fuel sampling which consisted of metals and total halogens, as documented in the report required under the ECA (Air). This was undertaken for i) baseline conditions, ii) during the use of alternative fuels, and iii) post-baseline.
- Kiln stack testing and modelling for an extensive suite of compounds as well as continuous emission monitoring, as documented in the report required under the ECA (Air). This was undertaken for i) baseline conditions, ii) during the use of alternative fuels, and iii) post-baseline.
- Ambient air monitoring for an extensive suite of compounds as documented in the report required under the ECA (Air). This was also undertaken for i) baseline conditions, ii) during the use of alternative fuels, and iii) post-baseline.

Overview of Trial 1 (September 25 to October 12, 2018)

The alternative fuel used in Trial 1 consisted of post-composting residuals and post-consumer residual materials from a materials recycling plant, and included woody

residuals, post-consumer paper and plastic materials unsuitable for recycling. The alternative fuels were processed and blended at the Simtor Environmental Ltd. facility located at 113 Warren Road, Whitby, Ontario (otherwise referred to as the Simtor facility, Simtor, or Durham Disposal in this report and attached documents). The alternative fuel was inspected on behalf of SMC and was tested for fuel quality.

Alternative fuel feed system testing and ramp up from 100% petroleum coke to a blend of petroleum coke and alternative fuel occurred on September 25, 2018, and October 3-4, 2018. Adjusted alternative fuels blends were developed for Trial 1 to resolve issues associated with performance of the fuel within the fuel feed system.

Alternative fuel was substituted at a maximum rate deemed reasonable by SMC within the rate limits achievable by the equipment and in accordance with the limits set out in the ECAs (Waste, Air) during the period from October 10-12, for the purpose of collecting the source test data specific to alternative fuel consumption. The average fuel feed rate achieved was 3.72 tonnes per hour, and the maximum feed rate was 5.48 tonnes per hour. A total of 93.62 tonnes of alternative fuel was consumed in the calciner during Trial 1.

Baseline source testing for the Demonstration Project was undertaken on September 30, October 1 and 2, 2018. Source testing during the use of alternative fuel for Trial 1 was undertaken on October 10 and 12, 2018. Baseline ambient air monitoring for the demonstration as a whole was undertaken on September 30 and October 1, 2 and 4, 2018. Ambient air monitoring for Trial 1 was undertaken on October 3, as well as October 10, 11 and 12, 2018.

Overview of Trial 2 (November 20 to December 10, 2018)

The alternative fuel used in Trial 2 consisted of woody residuals from post-consumer sources as well as residual plastic material from an industrial source unsuitable for recycling. This adjusted blend of alternative fuels was processed and blended at U-Pak Disposal 1740 McPherson Court, Pickering Ontario (otherwise referred to as U-Pak in this report). The alternative fuel was inspected on behalf of SMC and was tested for fuel quality. Modifications to the fuel blend for Trial 2 were discussed and confirmed with the MECP prior to developing the fuel blend.

Alternative fuel feed system testing with the adjusted blend of alternative fuels for Trial 2 was undertaken on November 20, 2018.

Alternative fuel was substituted at a maximum rate deemed reasonable by SMC within the rate limits achievable by the equipment and in accordance with the limits set out in the ECAs (Waste, Air) during the period from December 6 to 8, for the purpose of collecting the source test data specific to alternative fuel consumption. The average fuel feed rate was 8.3 tonnes per hour and the maximum feed rate was 11.97 tonnes per hour. A total of 237 tonnes of alternative fuel was consumed in the calciner during Trial 2.

Source testing and ambient air monitoring during the use of alternative fuel for Trial 2 was completed on December 4, 5 and 6, 2018. Post-demonstration baseline source testing and ambient air monitoring for the Demonstration Project as a whole, was undertaken on December 7 and 8, 2018.

At the conclusion of the Demonstration Project, the remaining alternative fuel at the Facility was consumed on December 10, 2018 with activities on this date serving as the ramp down or transition back to 100% conventional fuel use.

Summary of Results

This report provides the following information in compliance with the ECA (Waste) Condition 54:

1. A detailed daily summary of the information required by Condition 53 (daily log book) is provided in Section 5.1.3 of this report.

   The activities undertaken during the Demonstration Project fully complied with the ECA (Waste) 1255-7QVJ2N Conditions of Approval as documented in Section 5 of this report.

2. A summary of the reporting information required by Environmental Compliance Approval (Air) Number 4614-826K9W Condition 9 (Demonstration Project Summary Report) is provided in Section 4 of this report.

   The complete results, analysis and discussion related to the air monitoring program are reported separately in the Demonstration Project Summary Report for the ECA (Air) prepared under separate cover by BCX Environmental dated April 2019. This includes the results of the source testing program (stack tests) and the ambient air quality monitoring program.

   The SMC plant fully complied with their Operational Limits, their Performance Objectives, and with Reg 419 while firing any amount of alternative fuel. The data obtained from the source testing program demonstrated that, with the exception of SO2 and HCl, there was no statistically significant difference in kiln stack emissions and POI concentrations of all contaminants as a result of the use of alternative fuel, relative to baseline conditions.

   With respect to SO2, since the sulphur content in the raw feed was consistent under all operating conditions and the sulphur content in the alternative fuel was significantly less than in the conventional fuel, the change in SO2 emissions and POI concentrations is expected to be a result of fluctuations in kiln operating conditions rather than a function of either raw feed or fuel (conventional and/or alternative fuel).

   With respect to HCl, an analysis of chlorine content in the raw feed, conventional fuel and alternative fuel indicates that the emission rate is more closely related to the chlorine content in raw feed than in fuel. A review of SMC's historical source testing data for HCl confirms that the emission rates for HCl under all operating conditions are within the normal range.

   Notably the maximum POI concentrations for SO2 and HCl for all operating conditions remained below and well below the POI limits, respectively.

   The data obtained from the ambient monitoring program demonstrated that there was no statistically significant difference in ambient air concentrations of any contaminant as a result of the use of alternative fuel, relative to baseline conditions.

3. Information on any environmental and operational problems that caused or were likely to cause an adverse effect, which were encountered during the operation of the

Facility and during the facility inspections and any actions taken to mitigate these problems.

No significant environmental or operational problems associated with the Bowmanville Cement Plant, that could cause or that would be likely to cause an adverse effect, were encountered during the operation of the Facility or were noted during facility inspections over the course of the Demonstration Project. Discussion regarding adjustments to the alternative fuel feed system and the design and operations of the Demonstration Project are discussed in Section 3 and 5.1.3. of this report.

4. Any recommendations to minimize environmental impacts from the operation of the Facility and to improve Facility operations and monitoring programs in this regard. Recommendations are discussed in Section 6.

   The alternative fuel visual screening and inspection protocols followed during Trial 1 and 2 allowed for trouble-shooting and adjustments to the alternative fuel blends. The alternative fuel blends developed and used during the demonstration generally met the operational quality parameters identified by SMC.

   The exception was in relation to halogen content in the fuel for Trial 2, which on average had a total halogen content of 1.49 % based on variation in the plastic content in the industrial residual materials, compared to SMC's operational quality parameter of < 1%. This difference as compared to the operational quality parameters is not expected to have made any difference as it relates to plant emissions. As noted above, an analysis of chlorine content in the raw feed, conventional fuel and alternative fuel indicates that the emission rate is more closely related to the chlorine content in raw feed than in fuel. A review of SMC's historical source testing data for HCl confirms that the emission rates for HCl under all operating conditions are within the normal range.

   In regards to regular full-time use of alternative fuels it is recommended that:

   - In regards to fuel quality, SMC should apply a six-month fuel acceptance period for alternative fuel materials similar to the approach used for low carbon fuels. This will allow for inspections and testing of alternative fuel materials from new suppliers during the regular use of alternative fuels.
   - In regards to fuel quality related to oversize materials, alternative fuel production equipment capabilities coupled with options to detect and remove oversized materials, should be considered in the selection of processing equipment and/or alternative fuel suppliers.
   - If SMC proceeds to use the existing low carbon fuel feed system for the regular use of alternative fuels in the calciner burner, the alternative fuel blends should include sufficient woody carrier materials to allow for effective fuel feed operation.
   - As the design and operations approach used for the Demonstration Project successfully avoided any environmental impacts, the design and operations applied to future full-time use of alternative fuels at the SMC Bowmanville Cement Plant, should reflect the design and operations plan for the Demonstration Project with appropriate adjustments to reflect changes in the fuel feed system and including consideration of alternative fuel blend properties.

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1 Introduction and Background

This Report has been prepared as required and in accordance with Condition 54 of the Environmental Compliance Approval (ECA) (Waste) Number 1255-7QVJ2N (Appendix A) issued on March 11, 2015 for the St. Marys Cement Plant located at 410 Bowmanville Avenue (formerly 400 Waverly Road) in Bowmanville, Ontario to undertake an alternative fuel demonstration project (the Demonstration Project).

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- Facility means: those operations associated with the Demonstration Project located on the property where the Cement kiln is located.

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The purpose of the Demonstration Project was to:

- Demonstrate that the Facility can successfully operate with the use of alternative fuels.

- Demonstrate that the operation of the Facility using alternative fuels will not cause or be likely to cause an adverse effect. This includes:
    - Demonstrating compliance with Regulation 419/05 Schedule 3 standards at the maximum Point-Of-Impingement using the results of the source testing program and air dispersion calculations;
    - Assessing any statistically significant changes in emissions from the cement kiln stack and POI concentrations of the test contaminants resulting from the use of alternative fuel, if any, relative to baseline conditions; and
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This report includes the following information per Condition 54 of the Certificate:

- A detailed summary of the information required by Condition 53 (daily log book), presented in Section 5.1.3.
- A summary of the reporting information required by Certificate of Approval (Air) Number 4614-826K9W, presented in Section 4.
- Reporting of any environmental Information on any environmental and operational problems that caused or were likely to cause an adverse effect, which were encountered during the operation of the Facility and during the facility inspections and any actions taken to mitigate these problems. Discussion regarding adjustments to the alternative fuel feed system and the design and operations of the Demonstration Project are discussed in Section 3 and 5.1.3.
- Any recommendations to minimize environmental impacts from the operation of the Facility and to improve Facility operations and monitoring programs in this regard. Recommendations are discussed in Section 6.

This report also includes reporting regarding compliance with the Certificate (Section 5) and the results of the alternative fuel quality testing undertaken during the Demonstration Project (Section 3).

2 Project Description

St. Marys Cement Inc. (SMC) was granted approval from the Ontario Ministry of the Environment, Conservation and Parks (MECP) to conduct an alternative fuel demonstration at the Bowmanville, Ontario cement plant (the Facility) to demonstrate that utilizing alternative fuels to offset a portion of conventional fuel is acceptable in regards to operational and environmental requirements. The Bowmanville Cement Plant is currently using low carbon fuels (woody biomass) as part of their regular operations under separate approvals (ECA 7024-9XUK4C).

St. Mary Cement Inc. (SMC) completed two alternative fuel trials as part of the Demonstration Project during the period from September 25, 2018 to December 10, 2018. The two alternative fuel trials tested two different blends of approved alternative fuel materials in accordance with the Demonstration Project ECAs (Waste and Air).

Alternative fuels were generated at two locations within Durham Region and shipped to the Facility on transfer trailers. The transfer trailers were received in an alternative fuels building, where they were docked into a fuel feed system. Alternative fuel was introduced into the calciner burner at the Bowmanville Cement plant using a dedicated Schenck fuel feed, conveyor and metering system. The maximum feed rate possible for the system was 12 tonnes per hour.

Work undertaken on the Demonstration Project included:

- Alternative fuel inspection, sampling and reporting as documented in this Report. Alternative fuels were tested for parameters specific to SMC alternative fuel specifications including metals and total halogens. This was undertaken prior to the demonstration to select fuel materials, and during the Demonstration Project.
- Operational monitoring of the Facility as undertaken by SMC throughout the Demonstration.
- Raw feed and conventional fuel sampling which consisted of metals and total halogens, as documented in the report required under the ECA (Air). This was undertaken for i) baseline conditions, ii) during the use of alternative fuels, and iii) post-baseline.
- Kiln stack testing and modelling for an extensive suite of compounds as well as continuous emission monitoring, as documented in the report required under the ECA (Air). This was undertaken for i) baseline conditions, ii) during the use of alternative fuels, and iii) post-baseline.
- Ambient air monitoring for an extensive suite of compounds as documented in the report required under the ECA (Air). This was also undertaken for i) baseline conditions, ii) during the use of alternative fuels, and iii) post-baseline.

Overview of Trial 1 (September 25 to October 12, 2018)

The alternative fuel used in Trial 1 consisted of post-composting residuals and post-consumer residual materials from a materials recycling plant, and included woody residuals, post-consumer paper and plastic materials unsuitable for recycling. The alternative fuels were processed and blended at the Simtor Environmental Ltd. facility located at 113 Warren Road, Whitby, Ontario. The alternative fuel was inspected on behalf of SMC and was tested for fuel quality.

Alternative fuel feed system testing and ramp up from 100% petroleum coke to a blend of petroleum coke and alternative fuel occurred on September 25, 2018, and October 3-4, 2018. Adjusted alternative fuels blends were developed for Trial 1 to resolve issues associated with performance of the fuel within the fuel feed system.

Alternative fuel was substituted at a maximum rate deemed reasonable by SMC within the rate limits achievable by the equipment and in accordance with the limits set out in the ECAs (Waste, Air) during the period from October 10-12, for the purpose of collecting the source test data specific to alternative fuel consumption. The average fuel feed rate achieved was 3.72 tonnes per hour, and the maximum feed rate was 5.48 tonnes per hour. A total of 93.62 tonnes of alternative fuel was consumed in the calciner during Trial 1.

Baseline source testing for the Demonstration Project was undertaken on September 30, October 1 and 2, 2018. Source testing during the use of alternative fuel for Trial 1 was undertaken on October 10 and 12, 2018. Baseline ambient air monitoring for the demonstration as a whole was undertaken on September 30 and October 1, 2 and 4, 2018. Ambient air monitoring for Trial 1 was undertaken on October 3, as well as October 10, 11 and 12, 2018.

Overview of Trial 2 (November 20 to December 10, 2018)

The alternative fuel used in Trial 2 consisted of woody residuals from post-consumer sources as well as residual plastic material from an industrial source unsuitable for recycling. This adjusted blend of alternative fuels was processed and blended at U-Pak Disposal 1740 McPherson Court, Pickering Ontario (otherwise referred to as U-Pak in this report). The alternative fuel was inspected on behalf of SMC and was tested for fuel quality. Modifications to the fuel blend for Trial 2 were discussed and confirmed with the MECP prior to developing the fuel blend.

Alternative fuel feed system testing with the adjusted blend of alternative fuels for Trial 2 was undertaken on November 20, 2018.

Alternative fuel was substituted at a maximum rate deemed reasonable by SMC within the rate limits achievable by the equipment and in accordance with the limits set out in the ECAs (Waste, Air) during the period from December 6 to 8, for the purpose of collecting the source test data specific to alternative fuel consumption. The average fuel feed rate was 8.3 tonnes per hour and the maximum alternative fuel feed rate was 11.97 tonnes per hour. A total of 237 tonnes of alternative fuel was consumed in the calciner during Trial 2. The maximum fuel substitution rate achieved during the overall demonstration, was achieved during Trial 2 at 27.5% (based on the average fuel gross calorific value and maximum fuel feed rate of 11.97 tonnes per hour).

Source testing and ambient air monitoring during the use of alternative fuel for Trial 2 was completed on December 4, 5 and 6, 2018. Post-demonstration baseline source testing and ambient air monitoring for the Demonstration Project as a whole, was undertaken on December 7 and 8, 2018.

At the conclusion of the Demonstration Project, the remaining alternative fuel at the Facility was consumed on December 10, 2018 with activities on this date serving as the ramp down or transition back to 100% conventional fuel use.

The Procedures Manual which outlines all of the procedures and protocols followed during the course of the demonstration is provided in Appendix C.

2.1 Detailed Project Schedule

SMC received Environmental Compliance Approval (Waste Disposal Site) Number 1255-7QVJ2N to conduct an alternative fuel demonstration on March 11, 2015. From the issuance date to the start of the actual demonstration in September of 2018, SMC completed a number of activities, including:

- Adjustments were required for Financial Assurance. Amendment Notice No. 1 issued on March 17, 2017 amended the Financial Assurance conditions 15 and 16. Financial Assurance was submitted to the Director as of April 26, 2017.
- Adjustments were required to the location of and configuration of the alternative fuel feed system. Amendment Notice No. 2 issued on October 17, 2017 included amendments to recognize use of the Alternative Fuel building developed for the Low Carbon Fuel project and modifications to the fuel feed system. This amendment permitted the demonstrations to be conducted using the same feed system as approved and installed at the cement plant for the low carbon fuel. The low carbon system was not contemplated at the time of the original application for the demonstration testing.
- Ensuring that the demonstration was scheduled for an appropriate time at the Facility (e.g., normal operating conditions, time to complete demonstration, stack tester availability, location of ambient air monitors, etc.).
- Development, construction and commissioning of the alternative fuel building and the fuel feed system (developed for the low carbon fuel project).
- Investigating a number of potential fuel suppliers within the market place capable of providing a sufficient amount of fuel to SMC for the plant trial demonstration. Investigations included performing additional sampling and testing of the alternative fuel to determine if fuel quality would meet the specified fuel acceptance criteria prior to the start of the demonstration.

Demonstration Project: Trial 1

During the week of September 24, 2018 fuel feed system performance testing was undertaken using the proposed alternative fuel blend for Trial 1. A trial load of material was prepared on September 25, 2018 (approximately 15 tonnes) and delivered to the cement plant alternative fuel building for initial testing of the fuel delivery system, and to monitor the transitional period within the facility. The initial load was processed within the facility on Wednesday September 26, 2018.

Blending of the material prior to shredding of the alternative fuel material by the alternative fuel supplier (Simtor) for Trial 1, commenced September 28, and shredding of the blended material for the trial began October 1, 2018. Blending and shredding of material continued until October 12, 2018.

Ambient air testing for Trial 1 began the morning of September 30 and ran during testing until October 12, 2018. Three ambient air monitoring stations were set up and ran during the demonstration. Details of the ambient air monitoring program are included in the summary report related to the Air ECA.

Stack testing at the plant under normal operating conditions occurred during September 30 to October 2, 2018, to establish the baseline for the Demonstration Project as a whole (both Trial 1 and Trial 2).

The ramp up of the alternative fuel demonstration (when alternative fuel was actually being consumed in the kiln) was undertaken on October 3 and 4, 2018. During the transition/ramp-up from 100% coal to using some alternative fuel, there were several disruptions with the flow of the alternative fuel. This was caused by some material in the feed that was too large to be conveyed into the calciner burner as well as lighter material becoming plugged within the system, in several cases bridging at locations. Only a minimal amount of material was processed during these days of testing.

In response to the feed issues encountered several troubleshooting measures were undertaken in order to resolve the problem:

- The feed rate to the calciner was reduced to a rate capable of being sustained based on the nature of the alternative fuel blend.
- A pneumatic assist was installed in order to reduce the risk of blockage at the bin.
- Adjustments were made to the fuel to increase the quantity of wood present, as the characteristics of the wood (somewhat denser material) are beneficial within the fuel feed system.
- Increased monitoring of the processed material was undertaken at the source location (Simtor) particularly during shredding startup/shutdown to remove with oversized materials from the alternative fuel.

As a result of continued problems with the feed system, two trailer loads of material were sent to landfill disposal, and two trailer loads were sent back to the source location for the alternative fuel (Simtor) to allow for the addition of a higher proportion of wood in the alternative fuel. During re-blending the material was visually screened for any oversized pieces not detected previously. As a result of the continued challenges, it was decided to focus on adjusting the blend of the alternative fuel material and to proceed with source testing related to the Low Carbon Fuel (LCF) in the interim. The processing of alternative fuel for Trial 1 and the Trial 1 stack testing was delayed until October 10th.

The stack testing for the LCF was conducted on October 5 and October 9, 2018 as part of the low carbon fuel approvals. The LCF used during the stack testing was consistent with the material being utilized on an ongoing basis within the facility under ECA 7024-9XUK4C. HDR visited the LCF fuel source on October 9 to confirm the fuel characteristics and take a sample of the available material.

Stack testing for the Demonstration Project Trial 1 restarted at the facility on October 10. Issues with performance of the fuel feed system based on the characteristics of the alternative fuel material limited the testing to a 3 hour period that day. On October 11 the system was operated for an additional 1.5 hrs to complete the stack testing from the previous day. On October 12 the stack testing continued with 2 tests being conducted. As a result of continued problems with the feed system, the final test was conducted with a blend including additional wood materials in order to obtain a higher alternative fuel feed rate.

Demonstration Project: Trial 2

Following the challenges encountered during Trial 1, a second trial was completed with fuel materials sourced from alternative post-consumer and industrial locations and processed at U-Pak. The goal of this was to obtain better control over the material size, as well as simplify the blending process.

For this Trial a load of material was prepared on November 19 and tested within the facility November 20 to determine the ability of the system to handle the fuel.

For Trial 2 blending of the material commenced November 30 and continued December 3. HDR was on site at the U-Pak facility during these days to monitor fuel properties, observe blending, and sample the material during preparation. Blending of material continued through December 5, 2018.

Stack testing for Trial 2 commenced December 4, and continued to December 6, 2018. For all days of stack testing the fuel feed rates were maintained at approximately 12 tonnes per hour.

Post-baseline stack testing for the Demonstration Project (both Trial 1 and Trial 2) was completed on December 7-8, 2018 following Trial 2. Ambient air monitoring was undertaken from December 4 to December 8, 2018. Once complete, the ambient air monitoring stations were shut down, signalling completion of the demonstration project.

Stack Testing and Ambient Monitoring Schedule Summary

The following tables summarize the stack testing schedule and the ambient air monitoring schedule undertaken during the Demonstration Project.

Table 2-1 – Stack Testing Schedule Summary

Condition	Test No.	Date
Baseline	1	September 30th, 2018
	2	October 1st, 2018
	3	October 2nd, 2018
Alternative Fuel Substitution (Trial 1)	1	October 10th, 2018
	2	October 12th, 2018
	3	October 12th, 2018
Alternative Fuel Substitution (Trial 2)	1	December 4th, 2018
	2	December 5th, 2018
	3	December 6th, 2018
Post-baseline	1	December 7th, 2018
	2	December 7th, 2018
	3	December 8th, 2018

Table 2-2 – Ambient Air Monitoring Schedule Summary

Sample Date/Frequency	Condition	Duration
September 30, 2018	Baseline	24 hrs
October 1, 2018	Baseline	24 hrs
October 2, 2018	Baseline	24 hrs
October 3, 2018	Alt Fuels	24 hrs
October 4, 2018	Baseline	24 hrs
October 10, 2018	Alt Fuels	24 hrs
October 11, 2018	Alt Fuels	24 hrs
October 12, 2018	Alt Fuels	24 hrs
December 4, 2018	Alt Fuels	24 hrs
December 5, 2018	Alt Fuels	24 hrs
December 6, 2018	Alt Fuels	24 hrs
December 7, 2018	Baseline	24 hrs
December 8, 2018	Baseline	24 hrs

3 Results of Alternative Fuel Testing and Sampling

3.1 Description of the Alternative Fuel

A blend of alternative fuels as permitted in the ECAs (waste and air) were used in the Demonstration Project. The materials were obtained from a number of suppliers and blended at permitted facilities prior to being transported to the site for processing.

The materials processed consisted of a number of materials that fall into the category of residuals derived from industrial and/or post-consumer sources, including post-composting plastic polymers and woody residuals.

The post-composting residual consists primarily of plastic film i.e. plastic bags removed from compost generated from some residential organics collection programs as well as plastic film associated with sanitary paper products (e.g. diapers) that are allowed in these programs, as well as woody material which has not degraded during the composting process. Under Ontario Regulation 347, the post-composting residual is classified as municipal waste.

Residuals from industrial and post-consumer sources includes residues from industrial and commercial manufacturing as well as residues from recycling operations. For the

Demonstration Project the post-consumer materials were sourced from material recovery/recycling facilities including recycling residuals and wood waste materials.

Challenges to sourcing and processing (shredding and blending) the post-composting material in sufficient quantities to permit testing were identified during Trial 1, as a result consultation was undertaken with the MECP prior to Trial 2 to allow use of materials equivalent to the composition of the post-composting residuals from other sources in the alternative fuel blend.

3.1.1 Alternative Fuel Blend: Trial 1

The alternative fuel used during Trial 1 consisted of:

- Post composting material obtained from the Region of Peel's compost Curing Facility. The material consisted of material exceeding the 3" final screen of the finished compost. The material was generally a mixture of large wood pieces and plastics.
- Post composting material obtained from GFL Environmental Inc. The material was predominantly plastics obtained from post compost screening with some wood residuals.
- Post-consumer wood material obtained from Simtor.
- Post-consumer paper and plastics obtained from Canada Fibers single stream Materials Recycling Facility (MRF) located in North York. The material was reject material from the MRF fiber processing line and consisted primarily of paper and plastics unsuitable for recycling.

The alternative fuel was inspected after delivery to the transfer station facility, and was blended to the target ratio using construction equipment (front end loader and excavator) and shredded.

During fuel receipt it was noted that the material from GFL was putrescible and had a higher than anticipated moisture content. As a result this material was initially segregated while further review occurred and ultimately the material was rejected and sent for disposal (refer to section 3.3).

The shredded and blended alternative fuel was inspected and samples were taken for testing. The material was loaded into walking floor or self-discharging trailers before being transported to the Facility. A total of 165 tonnes of alternative fuel was delivered to the facility; of which 93.62 tonnes of alternative fuel was consumed in the cement kiln during the demonstration project. Approximately 57 tonnes of fuel was returned to Simtor, roughly half of which was re-shredded and sent back to be used as fuel, and half was sent to landfill, following the test an additional 15 tonnes of fuel which was prepared was sent for disposal as it was not required.

The fuel blend was developed to satisfy the conditions of the Certificate and the ECA (Air) as well as performance requirements of the fuel feed system. As a result of challenges encountered regarding the characteristics of the alternative fuel and the behaviour of the alternative fuel within the fuel handling system at the Facility during the testing, the blend was adjusted on several occasions to improve the performance of the fuel blend in the system. The alternative fuel blend characteristics are presented below.

Table 3-1 – Alternative Fuel Blend Characteristics for Trial 1 *

Blend	Date of Production	Post-Consumer Woody Residuals	Post-Consumer Plastic Residuals	Post-Composting Residuals
1	Sept 25 – Oct 5	12%	49%	40%
2	Oct 6 – Oct 9	27%	42%	32%
3	Oct 9 - Oct 12	32%	22%	46%

* Numbers do not total correctly due to rounding.

3.1.2 Alternative Fuel Blend: Trial 2

The alternative fuel used during the demonstration for Trial 2 was a blend of several materials.

- Shredded Wood Material provided by U-Pak Disposal Ltd.
- Residual plastics obtained from an industrial source. The material consisted primarily of film plastics recovered during manufacturing but unsuitable for recycling.

Due to logistical challenges and constraints in obtaining and processing materials in the quantities and rates required for the fuel trial, modifications to the fuel blend was discussed and agreed to by the MECP. As a result a binary blend of materials was developed to provide the entire fuel source (both post-composting and industrial/post-consumer residuals). The blend of wood and residual plastic used, was developed to represent a blend of typical wood materials and residual plastics from both the post-composting and industrial/post-consumer streams.

The alternative fuel was inspected after delivery to the U-Pak facility, the plastic component arrived pre-shredded while the wood fraction was processed by UPak at the transfer station. Following shredding the two material streams were blended to the target ratio using construction equipment (front end loader).

For Trial 2, initial material testing indicated the fuel blend should be approximately 27% plastic by mass in order to achieve maximum fuel substitution rate (30% of the conventional fuel based on total energy input) at the maximum input feed rate (12 tonnes per hour), to demonstrate the ability of the system to operate at the most demanding set point within the limits set in the ECA (Air). Based on the relative densities observed at the processing facility, and given the limits of handling large quantities of material at the site, the fuel was mixed on site volumetrically at a ratio of 3:1 wood to plastic

The blended material was inspected and samples were taken for testing. The material was loaded into walking floor or self-discharging trailers before being transported to the Facility. A total of 215 tonnes of alternative fuel was delivered to the Facility; all of which was consumed in the cement kiln during the Demonstration Project.

3.2 Alternative Fuel Specifications

SMC established specifications for the alternative fuel in order to meet both operational and environmental objectives. The following table presents an overview of these specifications.

Table 3-2 - Target Values for Alternative Fuel Operational Specifications

Operational Specification	Parameter	Rationale
Moisture	≤ 25% by weight	▪ Fuel quality ▪ Prevention of run-off ▪ Consistent heating value
Total Halogen Content	≤ 1% by weight	▪ Fuel quality ▪ Similar to regulatory guideline in other jurisdictions for similar alternative fuel materials (materials including wood, plastic, paper, and textiles) ▪ Testing undertaken in accordance with CSA C22.2 No. 0.3 or MIL-DTL-24643
Calorific Value	≥ 10 MJ/kg	▪ Similar to guidance provided by US EPA under CFR 241.3 (d)(1) for non-waste fuels ▪ Ease of operation

Table 3-3 - Alternative Fuel Environmental Specifications

Environmental Specification	Parameter	Rationale
Metals and Metal Hydrides	Testing for the following metals in accordance with current adjunct fuel requirements in the St. Marys Plant ECA (Air): ▪ Antimony ▪ Arsenic ▪ Barium ▪ Beryllium ▪ Cadmium ▪ Chromium ▪ Cobalt ▪ Iron ▪ Lead ▪ Manganese ▪ Mercury ▪ Nickel ▪ Selenium ▪ Silver ▪ Tin ▪ Vanadium	▪ Quarterly testing of the alternative fuel for metals currently listed on Schedule of D of the ECA (Air) Number 0469-9YUNSK, Condition 9. (1) (a). ▪ Results of POI concentration modeling based on determination of the proportion of the contribution of the alternative fuel to the mass of the material to the cement plant, should indicate that the POI would not be exceeded. ▪ Applies the current approach for testing of Fuel Adjunct Materials in the Bowmanville Plant ECA (Air) 0469-9YUNSK Condition 4. (1) (a)

During the demonstration, sampling and testing of the alternative fuel was completed to determine that the alternative fuels used during the demonstration were in keeping with the above noted alternative fuel specifications. Both visual screening/inspection and laboratory testing of the alternative fuel was completed.

3.3 Visual Screening and Inspection of Alternative Fuel

All alternative fuel generation locations were inspected and materials sampled prior to the material being accepted for use in the Demonstration Project. The inspection was performed by a trained operator who was familiar with the required composition of the alternative fuel.

All loads of material were inspected prior to processing at the transfer station, and the shredding process was monitored for overall performance.

If the inspector observed any material in the load which was deemed to be unsuitable for use, the material was not sent to the Facility. Unacceptable materials or conditions included:

- Excessively wet material. This included any obvious material that has visible moisture and presence of pools or drips of moisture in or from the material being loaded.
- Oversized material. This included any obvious items larger than 8” in length apparent in the load of material.
- Non-combustible materials. This included any glass items, metal items, rock or debris that is obviously non-combustible.
- Hazardous materials. This included any batteries or materials of a potentially hazardous nature.
- Highly odorous materials. This included any materials that appeared not to have been composted (visible food items, intact diapers etc.)

3.3.1 Inspections: Trial 1

One of the loads of post-composting residual material received from GFL for the first trial was noted to be putrescible and had a high moisture content. This material was rejected and returned to the producer for disposal at a permitted landfill facility.

Following identification that oversized materials were passing through the system the inspector monitored the end of the conveyor from final shredding. Any materials which were observed which were likely to result in system plugging (approx. >8” in length and >1” in the other dimensions were removed from the mix when observed).

The visual screening and inspection protocol followed during the demonstration can be found within the Procedures Manual, a copy of which is included in Appendix C. One modification was made to the visual screening and inspection protocol during the demonstration. Originally it was the intention that, the external laboratory results for each sample would be received prior to releasing each load of alternative fuel material for delivery to the Facility. Due to longer than expected laboratory turn-around, and limitations with the number of trailers and amount of materials that could be stored (as the materials were being blended), fuel properties were determined by conducting testing on test loads of materials, and by testing the properties of the fuel as it was ready to the extent possible. This typically allowed for quality of alternative fuel materials to be understood prior to the initial days of testing, with confirmation samples being taken and sent to the lab as the testing progressed.

A total of fourteen (14) loads of material were sent from Simtor to SMC during trial 1 including one load of material sent on September 25 which was used to test and calibrate the feed system with the blended material.

Of the loads sent to the site, 4 were ultimately rejected (two for reblending and two for disposal) this was completed as a result of issues with the physical properties of the blended material. The lower density shredded paper and plastics in material bridging in the fuel feed system and some larger wood materials passed through the shredding system and jammed the fuel feed system. Two loads were sent back to have additional shredded wood added in order to provide additional bulk density, during blending further observation was used to remove oversize materials.

As a result of challenges with material handling within the fuel feed system, a pneumatic assist was installed at a location where materials were commonly becoming stuck. The assist results in a pulse of compressed air entering the system to agitate any materials in the area to restore flows.

3.3.2 Inspections: Trial 2

During Trial 2, eleven (11) trailers, including the initial trailer sent for feed system testing were prepared by U-Pak and sent to the Facility. Although no loads were rejected during the trial, the inspector on site noted several issues which were addressed during processing including storage and handling of the industrial plastic residuals and presence of oversized woody materials all of which were addressed.

Sampling was conducted during production of the various batches of material prepared during the alternative fuel blending process, prior to loading for delivery to the Facility.

3.4 Sampling and Laboratory Testing of Alternative Fuel

Alternative fuel sampling and testing was performed during the demonstration to verify that the alternative fuel met the above-mentioned alternative fuel specifications. Laboratory testing was conducted at Petro Laboratories Inc. which is a fully accredited laboratory service provider.

Alternative fuel sampling took place in the months preceding the demonstration in order to assess and characterize potential fuel sources for potential use during the Demonstration. This information was used to identify the potential sources of material provided to Simtor and U-Pak for alternative fuel blending.

During the demonstration, composite samples of the alternative fuel were prepared at the processing sites where blending was occurring (Simtor and U-Pak). Composite samples were taken at the processing facility during processing and trailer loading. Sampling was completed by trained personnel during material preparation prior to the alternative fuel material being loaded into the transport trailers to be sent to the Facility.

The sampling protocol followed can be found attached to the Procedures Manual, a copy of which is included as Appendix C.

It should be noted that several adaptations were made to the protocol during the demonstration in order to accommodate logistical challenges encountered during the trial. Initially it was intended that the materials would be processed, sampled and stored

on site until laboratory results were received at which point the materials would be released to the site. However, due to restrictions with the available number of trailers and limited storage capacities at the source and processing sites this was not possible.

In order to have more immediate information on fuel values and chemistry, it was preferred that laboratory results were obtained as soon as possible. In addition to characterization testing completed prior to the fuel trial, samples from loads prepared before the test commencement were rush-couriered to the laboratory, and submitted for immediate analysis – this resulted in results being available approximately 48 hours after sampling. Samples from loads which were consumed within 48 hrs of production were submitted with standard processing times. Duplicate samples were taken, but laboratory analysis was completed once for each load of material initially.

Table 3-4 presents the average results of the laboratory analysis completed on the alternative fuel during the demonstration in comparison to the previously noted target values for the alternative fuel specifications.

Table 3-4 Comparison of Alternative Fuel Test Results to the Target Values for Alternative Fuel Specifications

Parameter	Criterion	Test Results Trial 1 (median value)	Test Results Trial 2 (median value)
Moisture	25%	18.0%	20.5%
Total Halogen Content	≤1%	0.18%	1.36%
Heat Value	≥ 10 MJ/kg	17.5	16.5

Table 3-5 presents the results of laboratory testing performed on the alternative fuel used during the demonstration for a broader range of parameters.

The majority of the parameters were similar (similar order of magnitude) between the Trial 1 and Trial 2 alternative fuel materials.

Table 3-5 - Median Results of Laboratory Tests Completed on Alternative Fuel

Parameter	Units	Alternative Fuel Used During Trial 1 (Median Value)	Alternative Fuel Used During Trial 2 (Median Value)
Calorific Value	MJ/kg	17.491	16.5
Moisture Content	% wt.	18.04	20.49
Total Halogen Content	% wt.	0.18	1.36
Total Chlorine	% wt.	0.16	1.32
Sulfur	% wt.	0.165	0.19
Carbon	% wt.	41.74	38.82
Ash Content	% wt.	5.04	4.36
Antimony (Sb)	ug/g	<0.1	18.475
Arsenic (As)	ug/g	<0.1	<0.1
Barium (Ba)	ug/g	25.9	37.725
Beryllium (Be)	ug/g	<0.1	<0.1
Cadmium (Cd)	ug/g	<0.1	<0.1
Chromium (Cr)	ug/g	9	13.3
Cobalt (Co)	ug/g	<0.1	0.95
Iron (Fe)	ug/g	581.6	941.95
Lead (Pb)	ug/g	<0.1	<0.1
Manganese (Mn)	ug/g	33.8	65.35
Nickel (Ni)	ug/g	4.8	4.725
Selenium (Se)	ug/g	<0.1	<0.1
Silver (Ag)	ug/g	<0.1	<0.1
Tin (Sn)	ug/g	<0.1	<0.1
Vanadium (V)	ug/g	<0.1	<0.1
Mercury (Hg)	ug/g	<0.001	<0.001

In terms of moisture content, for Trial 2 one of the loads of material had been stored outside and was exposed to precipitation impacting the moisture content of that load of material. Similarly while the wood included in the process for Trial 2 is stored mostly under an open ended structure, it is likely that the wood had been stored outside prior to shredding as an alternative fuel. As a result variations in moisture content will be present in keeping with the weather patterns during the demonstration and length of storage.

Total halogens and total chlorine content for Trial 2 were likely impacted by a shift in one of the loads of delivered material as described in section 3.4.1. It is unclear why there is a difference in levels of some trace metals in the Trial 2 alternative fuel material.

A table summarizing the results of all laboratory tests conducted on the alternative fuel blends can be found in Appendix D.

3.4.1 Outliers and Samples Exceeding Target Values

Following the receipt of sample results from days 2 and 3 of Trial 2 it was noted that the raw plastic samples from one of the trailer loads, and several of the subsequent samples of alternative fuel blends resulted in elevated total halogen and chlorine numbers. Based on differences in the results of the plastics testing, it seems likely there was a difference in composition of at least one of the loads of plastic material, resulting in additional PVC materials being entrained. This has been attributed to operations at one of the processing facilities where the materials originated. Further investigation into the production source to determine if chlorinated materials can be separated prior to processing as fuel may be warranted if this source were to be used in the future.

A 6-month acceptance period to support the regular use of alternative fuel materials, similar to the approach used for low carbon fuels, will allow for the determination of variability of the fuels and allow ongoing adjustment of the blends to support the target alternative fuel composition.

4 Summary of the Reporting Information Required by ECA (Air) 4614-826K9W

The ECA (Air) permitting the Demonstration Project is 4614-826K9W, a copy of which is included as Appendix B. As described in condition 9, a Demonstration Project Summary Report is to be completed within six months after completion of the demonstration. This report must include as a minimum:

1. A summary of emission data and analysis obtained through the Source Testing Programs, the Ambient Air Quality Monitoring Program and the Continuous Emissions Monitoring Program, conducted during the Demonstration Project, prepared in accordance with the requirements of the Reporting Procedures described in Schedule “C” attached to the ECA (Air), as applicable.

   Complete stack testing, ambient air monitoring and raw feed/conventional fuel testing results were obtained for three operating conditions (baseline, alternative fuel, post-baseline). All testing was carried out according to the various test plans and methodologies approved by the MECP.

   The complete results, analysis and discussion related to the air monitoring program are reported separately in the Demonstration Project Summary Report for the ECA (Air) prepared under separate cover by BCX Environmental dated April 2019. This includes the results of the source testing program (stack tests) and the ambient air quality monitoring program.

   The SMC plant fully complied with their Operational Limits, their Performance Objectives, and with Reg 419 while firing any amount of alternative fuel. The data obtained from the source testing program demonstrated that, with the exception of SO2 and HCl, there was no statistically significant difference in kiln stack emissions and POI concentrations of all contaminants as a result of the use of alternative fuel, relative to baseline conditions.

With respect to SO2, since the sulphur content in the raw feed was consistent under all operating conditions and the sulphur content in the alternative fuel was significantly less than in the conventional fuel, the change in SO2 emissions and POI concentrations is expected to be a result of fluctuations in kiln operating conditions rather than a function of either raw feed or fuel (conventional and/or alternative fuel).

With respect to HCl, an analysis of chlorine content in the raw feed, conventional fuel and alternative fuel indicates that the emission rate is more closely related to the chlorine content in raw feed than in fuel. A review of SMC's historical source testing data for HCl confirms that the emission rates for HCl under all operating conditions are within the normal range.

Notably the maximum POI concentrations for SO2 and HCl for all operating conditions remained below and well below the POI limits, respectively.

The data obtained from the ambient monitoring program demonstrated that there was no statistically significant difference in ambient air concentrations of any contaminant as a result of the use of alternative fuel, relative to baseline conditions.

2. A summary of all comments received by the Company during the Demonstration Project that pertain to the Demonstration Project from the public, the Ministry, or any other party.

   As noted in Section 5.1.3 below, no comments from the public, the Ministry or any other party were received regarding the plant operations. One comment was received during the period of the Demonstration Project, related to noise associated with the ambient air monitoring equipment.

5 Compliance with ECA (Waste Disposal Site) 1255-7QVJ2N

The following section outlines how the Demonstration Project was completed in compliance with ECA 1255-7QVJ2N (the Certificate).

5.1.1 General Conditions

Conditions 2-3 Compliance

All persons authorized to carry out work on or operate any aspect of the Facility were made aware of the Certificate and all reasonable measures were taken to ensure that all such persons complied with the Certificate.

All persons who were authorized to carry out work or operate any aspects of the Facility complied with the Certificate.

Condition 4 Build in Accordance

Except as otherwise provided by the Certificate, the Facility was designed, developed, built, operated and maintained in accordance with the applications for this Certificate, the

Design and Operating Manual, and all other supporting documents listed in Schedule "A" of the Certificate.

Notice 2 for the certificate amended the approach to allow for the utilization of the alternative fuel building and low carbon fuel feed system.

Condition 11-12 Adverse Effects

As required in the Certificate, steps were taken to minimize and ameliorate any adverse effect on the natural environment or impairment of water quality that could result from the operations at the Facility.

The potential for litter production was minimized during the demonstration in the following manner:

- Alternative fuel was not exposed to the elements once processing commenced and at all times was contained either within a closed transfer trailer (delivery, storage) or the closed fuel delivery system that was located within an enclosed building at the Facility (the alternate fuel building).
- The alternative fuel was hauled to the Facility via an enclosed or mesh covered trailer.
- The transfer trailers backed into the alternative fuels building and into a docking station that interfaced with the hopper for the fuel delivery system.
- The alternative fuel was fed into a closed conveyor/fuel delivery system and was not exposed to the elements at any time.

The potential for odour to be generated and/or emitted from the alternative fuel was addressed using the following methodology:

- The alternative fuel arrived at the Facility ready to be used as a fuel. As the moisture level of the fuel did not exceed 25% (in accordance with the test results as presented previously), the potential for microbial action and odour generation from the materials was minimal.
- The alternative fuel was inspected during blend development, upon arrival at the processing sites (Trial 1 Simtor, Trial 2 U-Pak), during processing and prior to loading onto the transfer trailers to verify that the materials shipped to the Facility met specifications.
- The alternative fuel was not exposed to the elements and at all time was contained either within closed trailers (delivery, storage) or the closed fuel delivery system located within the alternative fuel building at the Facility.

The Facility has a fugitive dust management plan that remained in place over the course of the demonstration. A copy of this plan can be found attached to the Procedures Manual which can be found in Appendix C.

Noise modelling was completed for the low carbon fuel feed system as part of a separate application, the acoustic assessment was provided as part of the documentation for the ECA amendment to allow for the use for the low carbon fuel feed system during the test. The modelling indicated that the contribution of the alternative fuel feed system to noise emissions would be negligible.

Condition 13-14 Change of Owner

No changes were made to ownership of the Facility, operation of the Facility, the address of the Owner or Operator of the Facility, or the name of the corporation. No portion of the Facility was transferred or encumbered prior to or during the demonstration period.

Condition 15-17 Financial Assurance

Conditions 15 and 16 in the original permit were revoked and replaced under ECA amendment notice No. 1 dated March 17, 2017.

Financial assurance, in the amount of $8,820, was submitted to the Director as of April 26, 2017.

A written re-evaluation of the amount of financial assurance amount will be provided to the Director, before March 31, 2020.

Condition 18 - Inspections

No person hindered or obstructed a Provincial Officer in the performance of their duties, including any and all inspections undertaken during the Demonstration Project.

Condition 19 – 20 Information and Record Retention

Records required to be kept by this Certificate have been retained at the Facility and will be provided to the Ministry, upon request.

Records will be retained for five (5) years except if otherwise authorized in writing by the Director.

5.1.2 Construction

Condition 21

As a consequence of amendment Notice 2 dated October 17, 2017, approval was granted to allow for the use of the alternative fuel building and low carbon fuel feed system at the site, constructed under separate approval (ECA Waste Disposal Site Number 7024-9XUK4C, Notice No. 1). Layout drawings, and acoustic and air quality reports were provided as part of the low carbon fuel application (original application of May 2014 and amendment application of January 2017) and are included in ECA 7024-9XUK4C Schedule “A”.

No construction was undertaken as part of the Demonstration Project.

5.1.3 Operation and Maintenance

Condition 22 – 23 Operation

The Facility was operated and maintained at all times in accordance with the EPA, Regulation 347, the conditions of the Certificate and ECA (Air) 4614-826K9W. At no time was the discharge of a contaminant that causes or is likely to cause an adverse effect permitted.

A Procedures Manual specific to the Facility was prepared more than ninety (90) days prior to the acceptance of any alternative fuel at the Site. The Procedures Manual contained detailed standard operating procedures relating to all aspects of the handling of alternative fuel at the Facility and was maintained current at all times and was kept at the Facility in a central location that was accessible to Site personnel. The last update to the Procedures Manual was undertaken as of September 20, 2018.

The Procedures Manual can be found in Appendix C - Procedures Manual.

During the demonstration, a few system adjustments were made to optimize operations during the ramp-up period as the fuel delivery system was calibrated and adjustments were made to ensure that the alternative fuel would feed appropriately to the calciner burner. These adjustments are described in Section 3.3 and include the addition of a pneumatic assist in an area which clogged with fuel during the demonstration.

Condition 24 Approved Waste Types

The only alternative fuels accepted by SMC for the Demonstration Project consisted of residuals derived from industrial or post-consumer sources, including plastic polymers, paper fibres and woody materials, received as a blended fuel.

SMC did not accept at the Facility any hazardous waste, liquid industrial waste, processed organic waste, or any waste other than those described in Condition 24a.

A summary of the alternative fuel receipts and transfers, and a copy of the daily log book can be found in Appendix G.

Condition 25-27 Approved Limits

The Facility did not receive more than 350 tonnes of alternative fuel per day and did not utilize alternative fuel at a rate greater than 350 tonnes per day. The amount of alternative fuels present at the Facility at any one time did not exceed 75 tonnes. All alternative fuels were stored in covered trailers in the designed Alternative fuels handling area identified in Item 4 of Schedule "A" of this Certificate.

The maximum amount of alternative fuel received on one day during Trial 1 was on October 10, 2018 (65 tonnes received). The maximum amount of alternative fuel that was present at the Facility at any one time occurred on this date. During Trial 2 on December 5, 2018, 66.6 tonnes were received, with a maximum inventory of 52 tonnes being present at the Facility at any one time.

A copy of the daily log book showing how much fuel was utilized, present, stored, and received per day can be found in Appendix G.

Condition 28 - Service Area

Only alternative fuel generated at the Simtor Environmental Ltd. facility located at 113 Warren Road, Whitby, Ontario and U-Pak Disposal 1740 McPherson Court, Pickering Ontario, were received at the Facility.

Condition 29 - Hours of Operation

Alternative fuels were accepted at the Facility at any time 24 hours per day, 7 days per week during the Demonstration Project, in accordance with the schedule for the fuel feed system testing and stack testing.

Condition 30-32 Facility Security and Signage

The Facility was operated and maintained in a secure manner such that unauthorized persons could not enter the Facility. A sign was posted and maintained at the entrance location for the Facility, and was displayed in a manner that was clear and legible at a distance of twenty-five metres from the public roadway bordering the Facility. The sign contained the following information:

- The name of the Facility, the Owner and the Operator
- The number of this certificate
- The normal hours of operation
- The types of alternative fuels that can be accepted;
- A telephone number to which complaints could be directed;
- A twenty-four (24) hour emergency telephone number (if different from above); and
- A warning against dumping outside the Facility.

No queuing of trucks occurred along Bowmanville Avenue (formerly Waverly Road)

Condition 33-34 Receiving

Alternative fuels arriving at the Facility were inspected by a trained person during processing at the alternative fuel generating location (Trial 1: Simtor Environmental Ltd. facility located at 113 Warren Road, Whitby, Ontario and Trial 2: U-Pak Disposal 1740 McPherson Court, Pickering Ontario) prior to being sent to the Facility in accordance with the Facility Design and Operation Manual and the Procedures Manual. A copy of the inspection protocol adhered to during the demonstration can be found in the Procedures Manual located in Appendix C.

In the event a load was rejected, a record was maintained identifying the reason the alternative fuel was refused, the type of alternative fuel that was refused and the generator and/or the origin of the material. A copy of the daily log book which details all loads that were refused can be found in Appendix G.

As mentioned previously in this report, four loads of the initial blend were ultimately rejected during the trail after partial processing at the Facility as a combined result of the presence of oversize materials, and low bulk density. Two of these loads were returned for reprocessing, while two were sent for disposal (landfill) as a result of logistical challenges preventing the return of the fuel.

Condition 35 - Labelling

No onsite storage units were used during the Demonstration Project. The only alternative fuel storage during the Demonstration Project was within the transfer trailers that were located within the alternative fuels building.

Condition 36 - No Processing

No pre-processing of alternative fuel occurred at the Facility. All alternative fuel was pre-processed and blended at the Simtor and U-Pak transfer stations prior to being sent to the Facility.

Condition 37 - Generated Waste

All waste generated at the Facility was disposed in accordance with Reg. 347. Only haulers approved by the Ministry were used to transport waste from the Site.

Several loads of material were rejected during Trial 1:

- Two loads of material were rejected and returned to the Simtor transfer station for disposal as the alternative fuel did not meet specifications.
- Two loads of alternative fuels were returned to the Simtor transfer station for reprocessing.
- The remaining alternative fuel material at the Facility at the conclusion of Trial 1 was returned to the Simtor transfer station for disposal.

Condition 38-39 Facility Inspection

A Trained Person inspected the entire Facility each day the Facility was in operation to ensure that: the Facility was secure; that the operation of the Facility was not causing any nuisances; that the operation of the Facility was not causing any adverse effects on the environment and that the Facility was being operated in compliance with the Certificate. On each operating day, a visual inspection of the following areas was carried out of the:

- Loading/unloading area;
- Storage and staging area; and,
- Delivery system area.

A copy of the daily log book which includes the results of all Facility inspections can be found in Appendix H. The daily log book includes the name of the person that completed each inspection, the date and time of each inspection, a list of any deficiencies discovered, any recommendations for action, and the date, time and description of actions taken. No deficiencies were discovered as a result of any inspection.

Condition 40-41 Other Approvals

No alternative fuels were received at the Facility and no Facility processes and equipment were operated until all approvals under Section 9 of the EPA, where applicable, were obtained. Approvals under Section 9 of the EPA were obtained on November 5, 2014 9ECA (Air) 4614-826K9W.

Any direct discharges from the Facility, including stormwater run-off were managed in accordance with applicable Municipal, Provincial and or Federal Legislation, Regulations and By-laws.

Condition 42-43 Training

As discussed with the District Office and SMC, a training plan was submitted to the District Manager on August 30th, twenty-five (25) days prior to receiving alternative fuel at the Facility.

The training plan was developed, implemented and maintained for any persons that operate the Facility. Only Trained Persons operated the Facility or carried out any activity required under the Certificate. The training plan was prepared to ensure that all persons directly involved with activities relating to the Facility were trained with respect to:

- Relevant waste management legislation, regulations and guidelines;
- Major environmental concerns pertaining to the waste to be handled;
- Occupational health and safety concerns pertaining to the processes and wastes to be handled;
- Management procedures including the use and operation of equipment for the processes and wastes to be handled;
- Emergency response procedures;
- Specific written procedures for the control of nuisance conditions;
- Specific written procedures for refusal of unacceptable waste loads;
- The requirements of this Certificate; and
- The requirements of the Environmental Compliance Approval (Air).

A record showing that all persons directly involved with activities relating to the Facility were trained in accordance with the requirements described above was maintained at the Facility at all times.

A Trained Person was available at all times during the hours of operation of the Facility to supervise any activity required under the Certificate.

A copy of the training plan and attendance logs can be found as part of the Procedures Manual located in Appendix C.

Condition 44 - Public Information Meeting

SMC will hold a public information meeting to update the local community regarding the operation of the Facility no later than 7 months after the completion of the demonstration period for alternative fuel.

At a minimum SMC will present the results of the testing carried out during the demonstration, and shall report on compliance issues relating to the use of alternative fuel at the Site. SMC will place notices in two local newspapers at least one week in advance advising the local community of the date, time and location of this meeting.

Condition 45 - Complaint Response

Two notices of the Demonstration Project were published on SMC's Community Relations webpage on September 19th and 20th, 2018, respectively and the trial was announced at the SMC Community Relationship Committee (CRC) meeting on September 11th, 2018.

No comments from the public, the Ministry or any other party were received regarding the plant operations following the notices, the CRC meeting or during the use of alternative fuels.

One community concern regarding noise was received on October 2nd, 2018, during the baseline period of Trial 1. The noise concern was related to one of the temporary ambient air monitoring stations. SMC reached out to the community member to clarify that the air monitor station was temporary and confirmed that it would not operate on the Thanksgiving weekend and that SMC would review the unit to see if the noise could be reduced. The community member was satisfied with SMC's response.

Condition 46-50 Emergency Response Plan

SMC ensures that the Emergency Response Plan (ERP) for the Facility is reviewed annually and maintained current at all times. The ERP includes, but is not necessarily limited to:

- Emergency Response Procedures to be undertaken in the event of a spill or process upset, including specific cleanup methods for each different type of alternative fuel or other materials the Site is approved to accept;
- A list of equipment and spill cleanup materials available in case of an emergency; and,
- Notification protocol with names and telephone numbers of persons to be contacted, including persons responsible for the Site, the Ministry's District Office and Spills Action Centre, the local Fire Department, the local Municipality, the local Medical Officer of Health, and the Ministry of Labour, and the names and telephone numbers of waste management companies available for emergency response.

The ERP is retained in a central location at the Facility, and is accessible for all staff at all times. SMC ensures that the District Manager, the local Municipality and the Fire Department are notified of any changes to the ERP.

The equipment, materials, and personnel requirements outlined in the ERP are immediately available at the Facility at all times. The equipment is kept in a good state of repair and in a fully operational condition.

All staff that operated the Facility were fully trained in the use of the ERP and in the procedures to be employed in the event of an emergency.

SMC immediately takes all measures necessary to contain and clean up any spill or leak which may result from the operation of the Site and immediately implement the ERP if required.

A copy of the ERP can be found appended (Appendix H) to the Procedures Manual which is provided in Appendix C.

Condition 51 and 52 - Facility Design and Operating Manual

The Design and Operating Manual for the Demonstration Project was retained at the Facility; kept up to date; and was available for inspection by Ministry staff. The Design and Operating Manual contained at a minimum the information specified for a waste processing site as described in the most recent version of the Ministry publication "Guide for Applying for Approval of Waste Disposal Site." The Design and Operating Manual originally provided with the application and included in Schedule “A” of the Certificate, was amended with the updated Design and Operating Manual documentation including the adjustment to the alternative fuel building location and changes to the alternative fuel handling equipment that was submitted and included as part of Notice No. 2.

No changes were made to the Design and Operating Manual during the demonstration.

A copy of the original Design and Operating Manual and amendments including in Notice No. 2. can be found in Appendix E.

Condition 53- Daily Log Book

The daily long book will be maintained at the Facility for a minimum of 5 years and includes the daily records of the following information that pertained to the demonstration:

- The date;
- The types, amounts and source of alternative fuel received at the Facility under the Certificate for use during the demonstration project;
- The amount of each category of material referred to in Condition 24a which was used as an alternative fuel within the cement plant. As per Condition 24a of the Certificate only approved alternative fuel was accepted at the Facility.
- The record of the alternative fuel refusals which included; amounts, reasons for refusal and actions taken;
- The amount, type and location of the alternative fuel that was stored at the Facility. The only storage of the alternative fuel on the Facility occurred within the trailers delivering material to the alternative fuels building. The alternative fuel was managed using a 'just in time' delivery approach such that the alternative fuel arrived within one day of being used.
- The record of daily inspections required by the Certificate;
- A record of any spills or process upsets at the Facility, the nature of the spill or process upset and the action taken for the clean-up or correction of the spill, the time and date of the spill or process upset. There were no spills or process upsets during the course of the demonstration.
- The signature of the Trained Personnel who conducted the inspection and completed the report.

A copy of the daily log book is provided in Appendix G.

The following table (Table 5.1) presents a detailed daily summary of the information included in the daily log book. The loads of fuel consumed at the Facility on September 25 and November 20, 2018, were used to assist with the calibration and performance evaluation of the low carbon fuel system prior to proceeding with the demonstration. For each Trial, one load of 15-25 tonnes of material was consumed with the feed system set at the maximum feed rate. This allowed for the system operators to develop some experience in how the feed system reacted, (where bridging occurred, what motor set points were reasonable) as well as how the plant operated as a whole when fed with material replacing a larger percentage of the heating value.

Table 5-1 Detailed Summary of Daily Log Book

Date	Quantity of Fuel Delivered (Kg)	Quantity of Fuel Disposed/ Returned (Kg)	Reason for Refusal and Action Taken	Quantity of Fuel Consumed (Kg)	Quantity of Fuel On Site (Kg)	Spills or Process Upsets [1]
Trial 1						
25-Sep-18	15,500				15,500	None
26-Sep-18				15,500	0	None
1-Oct-18	16,500	16,500	1 load returned to Simtor for disposal. Did not meet specifications.		0	None
2-Oct-18	31,080				31,080	None
3-Oct-18	15,190			5,000	41,270	None
4-Oct-18		40,270	Three loads returned to Simtor (less fuel consumed on Oct 3 and 4). Did not meet specifications. 1 load disposed, 2 loads reprocessed.	1,000	0	None
10-Oct-18	66,620			15,000	51,620	None
11-Oct-18				16,960	34,660	None
12-Oct-18	20,700			21,730	33,630	None
12-Oct-18		15,170	Returned to Simtor for disposal.	18,460	0	None
Trial 2						
19-Nov-18	Approx 21,500					None
20-Nov-18				21,500		None
3-Dec-18	45,370				45,370	None
4-Dec-18	69,680			68,000	47,050	None
5-Dec-18	66,630			62,000	51,680	None
6-Dec-18	33,790			64,000	21,470	None
10-Dec-18				21,470	0	None

[1] Note: process upsets as referred to in Table 5-1 refer to any process upsets within the calciner or cement kiln operations. Details regarding the operation of the fuel feed system are noted in the Daily log.

Condition 54 Report

This Summary Report has been prepared within 6 months of the completion of the demonstration project. Per the ECA this includes the following:

- a detailed daily summary of the information required by Condition 53 of this Certificate;
- a summary of the reporting information required by the Certificate of Approval (Air);
- any environmental and operational problems, that caused or was likely to cause an adverse effect, encountered during the operation of the Facility and during the facility inspections and any mitigative actions taken;
- any recommendations to minimize environmental impacts from the operation of the Facility and to improve Facility operations and monitoring programs in this regard.

Condition 55-56 Closure Plan

At the conclusion of the Demonstration Project, the remaining alternative fuel at the Facility was consumed on December 10, 2018 with activities on this date serving as the ramp down or transition back to 100% conventional fuel use.

As a result of Certificate amendment Notice 2, which permitted the use of the existing low carbon fuel feed system for the Demonstration Project, no unique equipment was required to be constructed. Closure activities included use of the remaining alternative fuel and demobilization of the ambient monitoring and source testing apparatus.

6 Summary and Recommendations

Overall, the Demonstration Project completed at the Bowmanville Cement Plant successfully showed that:

1. Alternative fuel suitable for use in SMC's Bowmanville Cement plant can be generated by the shredding of a range of residuals derived from industrial and post-consumer sources including some types of post-composting residuals. There was some variation in material quality for the industrial and post-consumer streams.

   The alternative fuel visual screening and inspection protocols followed during Trial 1 and 2 allowed for trouble-shooting and adjustments to the alternative fuel blends. The alternative fuel blends developed and used during the demonstration generally met the fuel quality parameters identified by SMC. The exception was in relation to halogen content in the fuel for Trial 2, which on average had a total halogen content of 1.49 % based on variation in the plastic content in the industrial residual materials, compared to SMC's operational quality parameter of < 1%.

   In regards to fuel quality, SMC should apply a six-month fuel acceptance period for alternative fuel materials similar to the approach used for low carbon fuels. This will allow for inspections and testing of alternative fuel materials from new suppliers during the regular use of alternative fuels.

2. The alternative fuel feed system originally designed and constructed for the use of low carbon (woody) fuels and used for the Demonstration Project, was generally capable of supplying alternative fuel including a percentage of shredded plastic and paper residuals to the calciner system. Two challenges were identified:

- The presence of lower density materials (large amount of shredded plastic and paper) resulted in inefficiencies within the system including bridging of materials. Adjustment of the fuel blend to include a higher proportion of shredded woody materials to serve as a carrier material and the addition of a pneumatic assist to the fuel feed system was able to resolve this problem.
- The presence of oversized materials resulted in an increase in jams within the system at higher feed rates.

It is recommended that alternative fuel production equipment capabilities coupled with options to detect and remove oversized materials should be considered in the selection of processing equipment and/or alternative fuel suppliers.

3. The maximum feed rate possible for the fuel feed system was 12 tonnes per hour. The fuel feed rate achieved was an average of 3.72 tonnes per hour for Trial 1 and 8.3 tonnes per hour for Trial 2. A maximum feed rate of 5.48 tonnes per hour was achieved for Trial 1 and 11.97 tonnes per hour was achieved for Trial 2.

   While some adjustment was necessary to the shred on the fuel and the fuel blend, and while some operational and equipment adjustments were needed for the fuel feed system to ensure steady fuel supply to the calciner burner, on the whole the system performed very well.

   It is recommended that if SMC proceeds to use the existing low carbon fuel feed system for the regular use of alternative fuels, that the alternative fuel blends include sufficient woody carrier materials to allow for effective fuel feed.

4. The Bowmanville Cement Plant fully complied with Operational Limits, Performance Objectives and with O. Reg. 419 while firing any amount of alternative fuel. Data obtained from the source testing program demonstrated that with the exception of SO2 and HCl, there was no statistically significant difference in kiln stack emissions, and POI concentrations of all contaminants as a result of the use of alternative fuel relative to baseline conditions.

   With respect to SO2, since the sulphur content in the raw feed was consistent under all operating conditions and the sulphur content in the alternative fuel was significantly less than in the conventional fuel, the change in SO2 emissions and POI concentrations is expected to be a result of fluctuations in kiln operating conditions rather than a function of either raw feed or fuel (conventional and/or alternative fuel).

   With respect to HCl, an analysis of chlorine content in the raw feed, conventional fuel and alternative fuel indicates that the emission rate is more closely related to the chlorine content in raw feed than in fuel. A review of SMC's historical source testing data for HCl confirms that the emission rates for HCl under all operating conditions are within the normal range.

   Notably the maximum POI concentrations for SO2 and HCl for all operating conditions remained below and well below the POI limits, respectively.

   The data obtained from the ambient monitoring program demonstrated that there was no statistically significant difference in ambient air concentrations of any contaminant as a result of the use of alternative fuel, relative to baseline conditions.

5. No operational problems with the cement operations or environmental problems that could cause an adverse environmental impact were experienced during the course of the Demonstration Project. The design and operations of the alternative fuel demonstration successfully mitigated the risk of odour, dust and litter that could result from the handling and use of alternative fuels.

   It is recommended, that the design and operations applied to future full-time use of alternative fuels at the SMC Bowmanville Cement Plant, reflect the design and operations plans for the Demonstration Project with appropriate adjustments to reflect changes in the fuel feed system and including consideration of alternative fuel blend properties.

7 Closure

This report has been prepared for the benefit of St. Marys Cement. The report may not be used by any other person or entity without the express written consent of St. Marys Cement and HDR. Any use of this report by a third party, or any reliance on decisions made based on it, are the responsibility of such third parties. HDR accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions taken based on this report.

The information and conclusions contained in this report are based upon work undertaken by trained professional and technical staff in accordance with generally accepted engineering and scientific practices current at the time the work was performed. The conclusions and recommendations presented represent the best judgment of HDR based on the data obtained during the assessment. Conclusions and recommendations presented in this report should not be construed as legal advice.

Appendix A. Environmental Compliance Approval (Waste) 1255-7QVJ2N (Including Amendments)

Ontario

Ministry of the Environment
Ministère de l'Environnement

ENVIRONMENTAL COMPLIANCE APPROVAL
NUMBER 1255-7QVJ2N
Issue Date: March 11, 2015

St. Marys Cement Inc. (Canada)
55 Industrial St
Toronto, Ontario
M4G 3W9

Site Location: 410 Waverly Road, Bowmanville
410 Waverly Rd
Clarington Municipality, Regional Municipality of Durham

You have applied under section 20.2 of Part II.1 of the Environmental Protection Act, R.S.O. 1990, c. E. 19 (Environmental Protection Act) for approval of:

a waste disposal site

to be used for the temporary receipt, storage and burning of solid non-hazardous municipal waste, limited as per the conditions of this Certificate

for use as Alternative fuels in the existing cement kiln

Note: Use of the site for any other type of waste is not approved under this Certificate, and requires obtaining a separate approval amending this Certificate.

For the purpose of this environmental compliance approval, the following definitions apply:

1. a. "**Alternative fuels**" means residuals derived from industrial and/or post-consumer sources, including plastic polymers, paper fibres and woody materials, received as single streams or blends, classified as Municipal Solid Waste under Ontario Regulation 347, written under the Act, to be used as a substitute fuel source in the cement kiln;

b. "**Cement kiln**" means the cement kiln and associated control equipment and continuous emissions monitoring systems, firing Conventional fuel and Alternative fuel, described in the Owner's application, this Certificate and in the supporting documentation referred to herein, to the extent approved by this Certificate;

c. "**Certificate**" means this entire Provisional Certificate of Approval document, issued in accordance with section 39 of the EPA, and includes any schedules to it, the applications and the supporting documentation listed in Schedule "A";

d. "**Certificate of Approval (Air)**" means Certificate of Approval (Air) Number 4614-826K9W issued to St. Marys Cement Inc. (Canada), under Section 9 of the Environmental Protection Act;

e. "**Conventional fuel**" means solid fuels such as, petroleum coke and coal;

f. "**Demonstration project**" means the demonstration project where up to 30 % of Conventional Fuel is substituted with Alternative fuel in the Cement kiln, as described in the Owner's application, this Certificate and in the supporting documentation referred to herein, to the extent approved by this Certificate;

g. "**Director**" means any Ministry employee appointed in writing by the Minister pursuant to section 5 of the EPA as a Director for the purposes of Part V of the EPA;

h. "**District Manager**" means the District Manager of the local district office of the Ministry in which the Site is geographically located;

i. "**EPA**" means Environmental Protection Act, R.S.O. 1990, c. E. 19, as amended;

j. "**Facility**" means those operations associated with the Demonstration project, located on the property where the Cement kiln is located;

k. "**Ministry**" means Ontario Ministry of the Environment;

l. "**Municipal waste**" means municipal waste as defined in O.Reg 347;

m. "**Operator**" means any person, other than the Owner's employees, authorized by the Owner as having the charge, management or control of any aspect of the site and includes St. Marys Cement Inc. (Canada), its successors and assigns;

n. "**Owner**" means any person that is responsible for the establishment or operation of the site being approved by this Certificate, and includes St. Marys Cement Inc. (Canada)**,** its successors and assigns;

o. "**OWRA**" means the Ontario Water Resources Act, R.S.O. 1990, c. O-40, as amended from time to time;

p. "**PA**" means the Pesticides Act, R.S.O. 1990, c. P-11, as amended from time to time;

q. "**Provincial Officer**" means any person designated in writing by the Minister as a provincial officer pursuant to section 5 of the OWRA or section 5 of the EPA or section 17 of PA;

r. "**Regional Director**" means the Regional Director of the local Regional Office of the Ministry in which the Site is located;

s. "**Reg. 347**" means Regulation 347, R.R.O. 1990, made under the EPA, as amended from time to time;

t. "**Trained person**" means a person knowledgeable in the following through instruction and practice:

i. relevant waste management legislation, regulations and guidelines;
ii. major environmental concerns pertaining to the waste to be handled;
iii. occupational health and safety concerns pertaining to the processes and wastes to be handled;
iv. management procedures including the use and operation of equipment for the processes and wastes to be handled;
v. emergency response procedures;
vi. specific written procedures for the control of nuisance conditions;
vii. specific written procedures for refusal of unacceptable waste loads; and
viii. the requirements of this Certificate.

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

TERMS AND CONDITIONS

GENERAL

Compliance

2. Any person authorized to carry out work on or operate any aspect of the Facility shall be notified of this Certificate and the conditions herein and all reasonable measures shall be taken to ensure any such person complies with the same.

3. Any person authorized to carry out work on or operate any aspect of the Facility shall comply with the conditions of this Certificate.

Build, etc. in Accordance

4. Except as otherwise provided by this Certificate, the Facility shall be designed, developed, built, operated and maintained in accordance with the applications for this Certificate, the Design and Operating Manual as amended from time to time, and all other supporting documents listed in Schedule “A”.

Interpretation

5. Where there is a conflict between a provision of any document, including an application, referred to in this Certificate, and the conditions of this Certificate, the conditions in this Certificate shall take precedence.

6. Where there is a conflict between an application and a provision in any documents listed in Schedule "A", the application shall take precedence, unless it is clear that the purpose of the document was to amend the application and that this Certificate includes that change.

7. Where there is a conflict between any two documents listed in Schedule "A", other than an application, the document bearing the most recent date shall take precedence.

8. The requirements of this Certificate are severable. If any requirement of this Certificate, or the application of any requirement of this Certificate to any circumstance, is held invalid or unenforceable, the application of such requirement to other circumstances and the remainder of this Certificate shall not be affected thereby.

9. Unless otherwise specified, the obligations set out in this Certificate are those of both the Owner and Operator.

Other Legal Obligations

10. The issuance of, and compliance with the conditions of, this Certificate does not:

a. relieve any person of any obligation to comply with any provision of any applicable statute, regulation or other legal requirement; or

b. limit in any way the authority of the Ministry to require certain steps be taken or to require the Owner and Operator to furnish any further information related to compliance with this Certificate.

Adverse Effects

11. Steps shall be taken to minimize and ameliorate any adverse effect on the natural environment or impairment of water quality that results from their operations at the Facility, including such accelerated or additional monitoring as may be necessary to determine the nature and extent of the effect or impairment.

12. Despite an Owner, Operator or any other person fulfilling any obligations imposed by this Certificate the Owner, Operator or any other person remains responsible for any contravention of any other condition of this Certificate or any applicable statute, regulation, or other legal requirement resulting from any act or omission that caused the adverse effect to the natural environment or impairment of water quality.

Change of Owner

13. The Owner shall notify the Director in writing, and forward a copy of the notification to the District Manager, within thirty (30) days of the occurrence of any changes to:

a. the ownership of the Facility;

b. the Operator of the Facility;

c. the address of the Owner or Operator;

d. the partners, where the Owner is or at any time becomes a partnership and a copy of the most recent declaration filed under the Business Names Act, R.S.O. 1990, c. B-17 shall be included in the notification; or

e. the name of the corporation where the Owner is or at any time becomes a corporation, other than a municipal corporation, and a copy of the most current information filed under the Corporations Information Act, R.S.O. 1990, c. C-39 shall be included in the notification.

14. No portion of this Facility shall be transferred or encumbered prior to or after closing of the Facility unless the Director is notified in advance and sufficient financial assurance is deposited with the Ministry to ensure that these conditions will be carried out. In the event of any change in Ownership of the Facility the Owner shall notify the successor of and provide the successor with a copy of this Certificate, and the Owner shall provide a copy of the notification to the District Manager and the Director.

Financial Assurance

15. The Owner shall submit to the Director, Financial Assurance, as defined in Section 131 of the EPA, for the amount of $7,350 no less than thirty (30) days prior to any Alternative fuels being received at the Facility. This Financial Assurance shall be in a form and amount acceptable to the Director and shall provide sufficient funds for the analysis, transportation, Facility clean-up, monitoring and disposal of all quantities of Alternative fuels on-site at any one time.

16. No later than March 31, 2016 and on an annual basis thereafter, the Owner shall provide, to the Director, a written re-evaluation of the amount of the Financial Assurance required to carry out the matters specified in Condition 15. The re-evaluation shall be based on the Financial Assurance Guideline applicable at the time of any re-evaluation. The revised Financial Assurance amount must be submitted to the Director within ten (10) days of written acceptance of the re-evaluation by the Director.

17. If any Financial Assurance is scheduled to expire or notice is received, indicating Financial Assurance will not be renewed, and satisfactory methods have not been made to replace the Financial Assurance at least sixty (60) days before the Financial Assurance terminates, the Financial Assurance shall forthwith be replaced by cash.

Inspections

18. No person shall hinder or obstruct a Provincial Officer in the performance of their duties, including any and all inspections authorized by the OWRA, the EPA or the PA of any place to which this Certificate relates, and without limiting the foregoing to:

a. enter upon the premises where the Facility is located, or the location where the records required by the conditions of this Certificate are kept;

b. have access to, inspect, and copy any records required by the conditions of this Certificate;

c. inspect the practices, procedures, or operations required by the terms and conditions of this Certificate; and

d. sample and monitor for the purposes of assessing compliance with the conditions of this Certificate or the EPA, the OWRA or the PA.

Information and Record Retention

19. Any information requested, by the Ministry, concerning the Facility and its operation under this Certificate, including but not limited to any records required to be kept by this Certificate shall be provided to the Ministry, upon request**.** Records shall be retained for five (5) years except for as otherwise authorized in writing by the Director.

20. The receipt of any information by the Ministry or the failure of the Ministry to prosecute any person or to require any person to take any action, under this Certificate or under any statute, regulation or other legal requirement, in relation to the information, shall not be construed as:

a. an approval, waiver, or justification by the Ministry of any act or omission of any person that contravenes any term or

condition of this Certificate or any statute, regulation or other legal requirement; or

b. acceptance by the Ministry of the information's completeness or accuracy.

CONSTRUCTION

21. The Owner shall provide to the Director and District Manager copies of final layout drawings bearing the stamp of a Professional Engineer prior to the commencement of construction.

OPERATION AND MAINTENANCE

Operation

22. The Facility shall be operated and maintained at all times including management and disposal of all waste in accordance with the EPA, Regulation 347, the conditions of this Certificate, and the Conditions of the Certificate of Approval (Air). At no time shall the discharge of a contaminant that causes or is likely to cause an adverse effect be permitted.

23. A Procedures Manual specific to the Facility shall be prepared a minimum of ninety (90) days prior to the acceptance of any Alternative fuels at the Facility. The Procedures Manual shall contain detailed standard operating procedures relating to all aspects of the handling of Alternative fuels at the Facility and shall be maintained current at all times and kept at the Facility in central location that is accessible to Facility personnel. The information required in the Procedures Manual may be incorporated into the Design and Operating Manual required under Condition 51 below.

Approved Waste Types

24. a. The Owner may only accept the following categories of Municipal waste at the Facility for use as Alternative fuels:

i. residuals derived from industrial and/or post-consumer sources, including plastic polymers, paper fibres and woody materials, received as single streams or blends.

b. The Owner shall ensure that hazardous waste, liquid industrial waste, processed organic waste, or any waste other than those described in Condition 24a. are not accepted at the Facility.

Approved Limits

25. The Facility is approved to utilize Alternative fuels at a rate not to exceed 350 tonnes per day.

26. The amount of Alternative fuels present at the Facility at any one time shall not exceed 75 tonnes. All Alternative fuels shall be stored in covered trailers in the designated Alternative fuels handling area identified in Items 1 and 2 of Schedule "A".

27. A maximum of 350 tonnes of Alternative fuels may be received at the Facility per day.

Service Area

28. Only Alternative fuels generated in the province of Ontario shall be received at the Facility:

Hours of Operation

29. Alternative fuels may be accepted at the Facility 24 hours per day, 365 days of the year for the duration of the Demonstration project.

Facility Security and Signage

30. The Facility shall be operated and maintained in a secure manner, such that unauthorized persons cannot enter the Facility.

31. A sign shall be posted and maintained at the main entrance/exit to the Facility displaying in a manner that is clear and legible at a distance of twenty-five metres from the public roadway bordering the Facility. The sign shall contain the following information:

a. the name of the Facility, the Owner and the Operator;

b. the number of this Certificate;

c. the normal hours of operation;

d. the types of Alternative fuels that can be accepted;

e. a telephone number to which complaints may be directed;

f. a twenty-four (24) hour emergency telephone number (if different from above); and

g. a warning against dumping outside the Facility.

32. There shall be no queuing or parking of trucks along Waverly Road that are waiting to enter this Facility.

Receiving

33. All Alternative fuels arriving at the Facility shall be inspected by a Trained person prior to being received at the Facility to ensure that the Alternative fuels are being received, managed and utilized in accordance with this Certificate, the EPA and Reg. 347.

34. In the event that a load of waste is rejected, a record shall be maintained identifying the reason the waste was refused, the type of waste that was refused and the generator and/or the origin of the waste, if known.

Labelling

35. All on-site storage units containing Alternative Fuel shall be clearly labelled with the type of waste being stored.

No Processing

36. There shall be no preprocessing of Alternative fuels at the Facility.

Generated Waste

37. a. All waste generated at the Facility shall be disposed of in accordance with Reg. 347; and

b. Only haulers approved by the Ministry shall be used to transport waste from the Facility.

Facility Inspection

38. A Trained Person shall inspect the entire Facility each day the Facility is in operation to ensure that: the Facility is secure; that the operation of the Facility is not causing any nuisances; that the operation of the Facility is not causing any adverse effects on the environment and that the Facility is being operated in compliance with this Certificate. Any deficiencies discovered as a result of the inspection shall be remedied immediately, including temporarily ceasing operations at the Facility if needed. On each operating day, a visual inspection of the following areas shall be carried out:

a. loading/unloading area(s);

b. storage and staging area(s); and

c. delivery system area.

39. A record of the inspections shall be kept in the daily log book that includes the following information:

a. the name and signature of person that conducted the inspection;

b. the date and time of the inspection;

c. a list of any deficiencies discovered;

d. any recommendations for action; and

e. the date, time and description of actions taken.

Other approvals

40. No Alternative fuels shall be received at the Facility and no Facility processes and equipment shall be operated unless all approvals under Section 9 of the EPA, where applicable, have been obtained.

41. All direct discharges from this Facility including stormwater run-off shall be managed in accordance with applicable Municipal, Provincial and or Federal Legislation, Regulations and By-laws.

Training

42. a. A training plan shall be submitted to the District Manager a minimum of thirty (30) days prior to the acceptance of any Alternative fuels at the Facility. The training plan shall be developed, implemented and maintained for any persons that operate the Facility. Only a Trained Person may operate the Facility or carry out any activity required under this Certificate. The training plan shall require that all persons directly involved with activities relating to the Facility have been trained with respect to:

i. relevant waste management legislation, regulations and guidelines;
ii. major environmental concerns pertaining to the waste to be handled;
iii. occupational health and safety concerns pertaining to the processes and wastes to be handled;
iv. management procedures including the use and operation of equipment for the processes and wastes to be handled;
v. emergency response procedures;
vi. specific written procedures for the control of nuisance conditions;
vii specific written procedures for refusal of unacceptable waste loads;
viii. the requirements of this Certificate; and
ix. the requirements of the Certificate of Approval (Air).

b. A record showing that all persons directly involved with activities relating to the Facility have been trained in accordance with the requirements described in Condition 42.a shall be maintained at the Facility at all times.

43. A Trained Person shall be available at all times during the hours of operation of this Facility to supervise any activity required under this Certificate.

Public Information Meeting

44. The Owner shall hold a public information meeting to update the local community regarding the operation of the Facility no later than 7 months after the completion of the trial testing period for Alternative Fuel. At a minimum the Owner shall present the results of the trial testing carried out, and shall report on compliance issues relating to the use of Alternative fuels at the Facility. The Owner shall place notices in two local newspapers at least one week in advance advising the local community of the date, time and location of the meeting.

Complaint Response

45. If at any time a complaint is received regarding the operation of the Facility, the complaint shall be responded to in accordance with the procedures described in Certificate of Approval (Air).

Emergency Response Plan

46. The Owner shall ensure that the Emergency Response Plan for the Facility is reviewed annually and maintained current at all times. The Emergency Response Plan shall include, but not necessarily be limited to:

a. emergency response procedures to be undertaken in the event of a spill or process upset, including specific clean up methods for each different type of Alternative fuel the Facility is approved to accept;

b. a list of equipment and spill clean up materials available in case of an emergency; and

c. notification protocol with names and telephone numbers of persons to be contacted, including persons responsible for the Facility, the Ministry's District Office and Spills Action Centre, the local Fire Department, the local Municipality, the local Medical Officer of Health, and the Ministry of Labour, and the names and telephone numbers of waste management companies available for emergency response.

47. The Emergency Response Plan shall be retained in a central location on the Facility and shall be accessible to all staff at all times. The Owner shall ensure that the District Manager, the local Municipality and the Fire Department are notified of any changes to the Emergency Response Plan.

48. The equipment, materials and personnel requirements outlined in the Emergency Response Plan shall be immediately available on the Facility at all times. The equipment shall be kept in a good state of repair and in a fully operational condition.

49. All staff that operate the Facility shall be fully trained in the use of the Emergency Response Plan and in the procedures to be employed in the event of an emergency.

50. The Owner shall immediately take all measures necessary to contain and clean up any spill or leak which may result from the operation of this Facility and immediately implement the Emergency Response Plan if required.

Facility Design and Operating Manual

51. The Design and Operating Manual shall be retained at the Facility; kept up to date; and be available for inspection by Ministry staff. The Design and Operating Manual shall contain at a minimum the information specified for a waste processing site as described in the most recent version of the Ministry publication "Guide For Applying For Approval of Waste Disposal Site".

52. Changes to the Design and Operating Manual shall be submitted to the Director for approval.

Daily Log Book

53. A log book or electronic file shall be maintained at the Facility for a minimum of 5 years and shall include daily records of the following information. All amounts must be recorded in metric:

a. the date;

b. the types, amounts and sources of Alternative fuels received at the Facility under this Certificate;

c. the amount of each category of waste referred to in Condition 24.a used as Alternative fuels within the kiln;

d. a record of any waste refusals which shall include; amounts, reasons for refusal and actions taken;

e. the amounts, types and location of Alternative fuels that are stored at the Facility;

f. a record of daily inspections required by this Certificate;

g. a record of any spills or process upsets at the Facility, the nature of the spill or process upset and the action taken for the clean up or correction of the spill, the time and date of the spill or process upset, and for spills, the time that the Ministry and other persons were notified of the spill in fulfilment of the reporting requirements in the EPA; and

h. and the signature of the Trained Personnel conducting the inspection and completing the report.

Report

54. Within 6 months of the completion of the Demonstration project a report shall be submitted to the District Manager. The report shall include the following information:

a. a detailed daily summary of the information required by Condition 53 of this Certificate;

b. a summary of the reporting information required by the Certificate of Approval (Air);

c. any environmental and operational problems, that caused or was likely to cause an adverse effect, encountered during the operation of the Facility and during the facility inspections and any mitigative actions taken;

d. any recommendations to minimize environmental impacts from the operation of the Facility and to improve Facility operations and monitoring programs in this regard.

Closure Plan

55. When the Owner ceases to receive, process and transfer Alternative fuels at the Facility in accordance with this Certificate, the Owner shall promptly clean up the Facility in accordance with the approved Closure Plan included in Item 1 of Schedule "A".

56. Within ten (10) days after closure of the Facility, the Owner shall notify the Director, in writing, the status of the Facility and of the implementation of the approved Closure Plan.

SCHEDULE "A"

1. Application for a Provisional Certificate of Approval for a Waste Disposal Site, dated September 29, 2008, signed by Martin Vroegh, Environment Manager, St. Marys Cement Inc. (Canada), including the attached report entitled "Application for Approval Under Section 27 of the EPA - For the Purpose of Conducting an Alternative Fuels Demonstration: Bowmanville Cement Plant", and all supporting documentation.

2. Memorandum dated November 11, 2008 from Janine Ralph, Jacques Whitford, to Andrew Neill, MOE, describing updates to the application package, including the addendum dated November 11, 2008 prepared by Jacques Whitford, revising the application package.

3. Email dated June 6, 2014 from Janine Ralph, HDR, Inc., to Andrew Neill, MOE, with changes to the description of the alternative fuel stream.

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

1. The reason for Condition 1 is to simplify the wording of the subsequent conditions and define the specific meaning of terms as used in this Provisional Certificate of Approval.

3. The reason for Conditions 2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 19, and 20 is to clarify the legal rights and responsibilities of the Owner and Operator.

4. The reason for Condition 4 is to ensure that the Site is operated in accordance with the applications and supporting documentation submitted by the Owner, and not in a manner which the Director has not been asked to consider.

5. The reasons for Condition 13 are to ensure that the Site is operated under the corporate name which appears on the application form submitted for this approval, to ensure that the Director is informed of any changes and to ensure that the

former owners and/or operators of the Site are not involved in any aspect of the charge, management or control of the Site.

6. The reasons for Condition 14 are to restrict potential transfer or encumbrance of the Site without the approval of the Director and to ensure that any transfer of encumbrance can be made only on the basis that it will not compromise compliance with this Certificate of Approval.

7. The reason for Conditions 15, 16 and 17 is to ensure that sufficient funds are available to the Ministry to clean up the Site in the event that it appears the Owner is unable or unwilling to do so.

8. The reason for Condition 18 is to ensure that appropriate Ministry staff have ready access to the Site for inspection of facilities, equipment, practices and operations required by the conditions in this Certificate of Approval. This condition is supplementary to the powers of entry afforded a Provincial Officer pursuant to the EPA and OWRA.

9. The reason for Condition 21 is to ensure the availability of accurate record drawings for inspection and information purposes.

10. The reason for Conditions 22, 23, 32, 35, 36, 38, 40 and 41 is to ensure that the Site is operated in a manner which does not result in a nuisance or a hazard to the health and safety of the environment or people.

11. The reasons for Conditions 24, 25, 26, 27 and 28 are to specify the approved service area from which waste may be accepted at the Site, the types of waste that may be accepted at the Site, the amounts of waste that may be stored at the Site and the maximum rate at which the Site may receive and utilize waste, based on the applications and supporting documentation.

12. The reason for Condition 29 is to specify the hours of operation for the Site so that the Site is operated in a manner which does not result in a nuisance or a hazard to the health and safety of the environment or people.

13. The reason for Condition 30 is to ensure the controlled access and integrity of the Site by preventing unauthorized access when the Site is closed and no site attendant is on duty.

14. The reason for Condition 31 is to ensure that users of the Site are fully aware of important information and restrictions related to Site operations and access under this Certificate of Approval.

15. The reason for Conditions 33 and 34 is to ensure that all wastes are properly classified to ensure that they are managed, processed and disposed of in accordance with O. Reg. 347, R.R.O. 1990 and in a manner that protects the health and safety of the public and the environment.

16. The reason for Condition 39 is to ensure that detailed records of Site inspections are recorded and maintained for inspection and information purposes.

17. The reason for Conditions 42 and 43 is to ensure that the Site is operated by properly Trained staff in a manner which does not result in a hazard or nuisance to the natural environment or any person.

18. The reason for Condition 44 is to ensure that the public has full knowledge of the activities relating to operations at the Site and has a public forum to discuss any concerns it has with the operations .

19. The reason for Condition 45 is to ensure that any complaints regarding Site operations at the Site are responded to in a timely manner.

20. The reasons for Conditions 46, 47, 48, 49 and 50 are to ensure that an Emergency Response Plan is developed and maintained at the Site and that staff are properly trained in the operation of the equipment used at the Site and emergency response procedures.

21. The reasons for Condition 53 are to provide for the proper assessment of effectiveness and efficiency of site design and operation, their effect or relationship to any nuisance or environmental impacts, and the occurrence of any public complaints or concerns. Record keeping is necessary to determine compliance with this Certificate of Approval, the EPA

and its regulations.

22. The reasons for Condition 54 are to ensure that regular review of site development, operations and monitoring data is documented and any possible improvements to site design, operations or monitoring programs are identified. An annual report is an important tool used in reviewing site activities and for determining the effectiveness of site design.

23. The reasons for Condition 55 and 56 are to ensure that the Site is closed in accordance with Ministry standards and to protect the health and safety of the public and the environment.

In accordance with Section 139 of the Environmental Protection Act, you may by written Notice served upon me and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 142 of the Environmental Protection Act provides that the Notice requiring the hearing shall state:

1. The portions of the environmental compliance approval or each term or condition in the environmental compliance 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 environmental compliance approval number;
6. The date of the environmental compliance approval;
7. The name of the Director, and;
8. The municipality or municipalities within which the project is to be engaged in.

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

This Notice must be served upon:

The Secretary*
Environmental Review Tribunal
655 Bay Street, Suite 1500
Toronto, Ontario
M5G 1E5

AND

The Director appointed for the purposes of Part II.1 of the Environmental Protection Act
Ministry of the Environment
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) 212-6349, Fax: (416) 314-4506 or www.ert.gov.on.ca**

The above noted activity is approved under s.20.3 of Part II.1 of the Environmental Protection Act.

DATED AT TORONTO this 11th day of March, 2015

Dale Gable, P.Eng.
Director
appointed for the purposes of Part II.1 of the
Environmental Protection Act

AN/
c: District Manager, MOE York-Durham
Janine Ralph, Jacques Whitford Limited

Ministry of the Environment and Climate Change
Ministère de l'Environnement et de l'Action en matière de changement climatique

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AMENDMENT TO ENVIRONMENTAL COMPLIANCE APPROVAL
NUMBER 1255-7QVJ2N
Notice No. 1
Issue Date: March 17, 2017

St Marys Cement (Canada) Inc.
55 Industrial Street, 4th Floor
Toronto, Ontario
M4G 3M9

Site Location: 400 Waverley Road South
Clarington Municipality, Regional Municipality of Durham
L1C 3K3

You are hereby notified that I have amended Approval No. 1255-7QVJ2N issued on March 11, 2015 fora waste disposal site (utilization of alternative fuels), as follows:

I. Conditions 15 and 16 are hereby revoked and replaced by:

15. No later than **April 30, 2017**, and no less than thirty (30) days prior to any Alternative fuels being received at the Facility, the Owner shall submit to the Director, Financial Assurance, as defined in Section 131 of the EPA, in the amount of $8,820. This Financial Assurance shall be in a form and amount acceptable to the Director and shall provide sufficient funds for the analysis, transportation, Facility clean-up, monitoring and disposal of all quantities of Alternative fuels on-site at any one time.

16. No later than **March 31, 2020**, and on March 31 every three (3) years thereafter, the Owner shall provide, to the Director, a written re-evaluation of the amount of the Financial Assurance required to carry out the matters specified in Condition 15. The re-evaluation shall be based on the Financial Assurance Guideline applicable at the time of any re-evaluation. The revised Financial Assurance amount must be submitted to the Director within ten (10) days of written acceptance of the re-evaluation by the Director.

The reason for this amendment to the Approval is as follows:

1. To ensure that sufficient funds are available to the Ministry to clean up the Site in the event that it appears the Owner is unable or unwilling to do so.

This Notice shall constitute part of the approval issued under Approval No. 1255-7QVJ2N dated March 11, 2015

In accordance with Section 139 of the Environmental Protection Act, you may by written Notice served upon me and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 142 of the Environmental Protection Act provides that the Notice requiring the hearing shall state:

1. The portions of the environmental compliance approval or each term or condition in the environmental compliance 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.

Pursuant to subsection 139(3) of the Environmental Protection Act, a hearing may not be required with respect to any terms and conditions in this environmental compliance approval, if the terms and conditions are substantially the same as those contained in an approval that is amended or revoked by this environmental compliance approval.

The Notice should also include:

3. The name of the appellant;
4. The address of the appellant;
5. The environmental compliance approval number;
6. The date of the environmental compliance approval;
7. The name of the Director, and;
8. The municipality or municipalities within which the project is to be engaged in.

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

This Notice must be served upon:

The Secretary*****
Environmental Review Tribunal
655 Bay Street, Suite 1500
Toronto, Ontario
M5G 1E5

AND

The Director appointed for the purposes of Part II.1 of the Environmental Protection Act
Ministry of the Environment and Climate Change
135 St. Clair Avenue West, 1st Floor
Toronto, Ontario
M4V 1P5

*** Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 212-6349, Fax: (416) 326-5370 or www.ert.gov.on.ca**

The above noted activity is approved under s.20.3 of Part II.1 of the Environmental Protection Act.

DATED AT TORONTO this 17th day of March, 2017

Dale Gable, P.Eng.
Director
appointed for the purposes of Part II.1 of the
Environmental Protection Act

AN/
c: District Manager, MOECC York-Durham
Martin Vroegh, St. Marys Cement Inc. (Canada)

Ontario

Ministry of the Environment and Climate Change
Ministère de l'Environnement et de l'Action en matière de changement climatique

AMENDMENT TO ENVIRONMENTAL COMPLIANCE APPROVAL
NUMBER 1255-7QVJ2N
Notice No. 2
Issue Date: October 17, 2017

St. Marys Cement Inc. (Canada)
55 Industrial St 4th Floor
Toronto, Ontario
M4G 3W9

Site Location: St. Marys Cement Inc. (Canada)
400 Waverly Rd Bowmanville
Clarington Municipality, Regional Municipality of Durham
L1C 3K3

You are hereby notified that I have amended Approval No. 1255-7QVJ2N issued on March 11, 2015 for a waste disposal site (utilization of alternative fuels) , as follows:

I. This Approval has been amended to recognize the relocation of the Alternative fuel building and to recognize modifications to the fuel feed system including the installation of a conveyor system.

II. Condition 26 is hereby revoked and replaced by:

26. The amount of Alternative fuels present at the Facility at any one time shall not exceed 75 tonnes. All Alternative fuels shall be stored in the designated Alternative fuels handling area as described in Item 4 of Schedule "A".

III. The following Item is hereby added to Schedule "A":

4. Environmental Compliance Approval application dated April 6, 2017 signed by Marc Vermiere, Director of Engineering, including the attached report entitled "St. Marys Cement Bowmanville Cement Plant - Application for Amendment to Environmental Compliance Approval for the Alternative Fuel Demonstration ECA 1255-7QVJ2N" dated April 26, 2017.

The reason for this amendment to the Approval is as follows:

1. To recognize the change in building location and changes to on-site Alternative fuel handling equipment.

This Notice shall constitute part of the approval issued under Approval No. 1255-7QVJ2N dated March 11, 2015

In accordance with Section 139 of the Environmental Protection Act, you may by written Notice served upon me and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 142 of the Environmental Protection Act provides that the Notice requiring the hearing shall state:

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

Pursuant to subsection 139(3) of the Environmental Protection Act, a hearing may not be required with respect to any terms and conditions in this environmental compliance approval, if the terms and conditions are substantially the same as those contained in an approval that is amended or revoked by this environmental compliance approval.

The Notice should also include:

1. The name of the appellant;
2. The address of the appellant;
3. The environmental compliance approval number;
4. The date of the environmental compliance approval;
5. The name of the Director, and;
6. The municipality or municipalities within which the project is to be engaged in.

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

This Notice must be served upon:

The Secretary*
Environmental Review Tribunal
655 Bay Street, Suite 1500
Toronto, Ontario
M5G 1E5

AND

The Director appointed for the purposes of Part II.1 of the Environmental Protection Act
Ministry of the Environment and Climate Change
135 St. Clair Avenue West, 1st Floor
Toronto, Ontario
M4V 1P5

*** Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 212-6349, Fax: (416) 326-5370 or www.ert.gov.on.ca**

The above noted activity is approved under s.20.3 of Part II.1 of the Environmental Protection Act.

DATED AT TORONTO this 17th day of October, 2017

Dale Gable, P.Eng.
Director
appointed for the purposes of Part II.1 of the
Environmental Protection Act

AN/
c: District Manager, MOECC York-Durham
Janine Ralph, HDR Corporation

Appendix B. Environmental Compliance Approval (Air) 4614-826K9W

Ontario

Ministry of the Environment
Ministère de l'Environnement

ENVIRONMENTAL COMPLIANCE APPROVAL
NUMBER 4614-826K9W
Issue Date: November 5, 2014

St. Marys Cement Inc. (Canada)
410 Waverly Rd R.R. 2
Bowmanville, Ontario
L1C 3K3

Site Location: 400 Waverly Road South
Clarington, Ontario

You have applied under section 20.2 of Part II.1 of the Environmental Protection Act, R.S.O. 1990, c. E. 19 (Environmental Protection Act) for approval of:

A time-limited Demonstration Project to gather site specific air quality data, where up to 30% of the conventional fuel, based on total energy input, is substituted with the following Alternative Fuels:

Alternative Fuel	Description	Maximum Input Rate (tonnes/hour)
Post-composting plastic polymers and woody residuals.	Shredded and dried plastic film and other plastic materials and woody materials removed from finished compost.	5.5
Plastic polymers, paper fibres and woody residuals derived from industrial and/or post consumer sources.	Shredded plastic and other materials removed from post consumer recycling or from industrial manufacturing process.	6.5

all in accordance with the application for an Approval (Air & Noise), signed by Martin Vroegh and all supporting information, including Emission Summary and Dispersion Modelling Report dated September 29, 2008, prepared by Pottinger Gaherty Environmental Consultants.

For the purpose of this environmental compliance approval, the following definitions apply:

1. "Approval" means this Environmental Compliance Approval, including the application and all supporting documentation;

2. "Alternative Fuel" means plastic polymers, paper fibres and woody residuals derived from industrial and/or post consumer sources, received as single streams, or blends of these material types, classified as Municipal Solid Waste under Ontario Regulation 347, written under the EPA, to be used as a substitute fuel source in the Cement Kiln;

3. "Ambient Air Quality Monitoring Program" means the ambient air quality monitoring program outlined in the report titled "Ambient Air Sampling Program", prepared for St. Marys Cement Inc, by Pottinger Gaherty Environmental Consultants Ltd., July 2008 and Addendum dated December 10, 2008, signed by Bridget Mills;

4. "Baseline Conditions" means operating conditions where only Conventional Fuel is used in the Cement Kiln;

5. "CEM System" means the continuous monitoring and recording systems used to measure the emissions from the Cement Kiln, as described in the Company's application, this Approval and in the supporting documentation referred to herein, to the extent approved by this Approval;

6. "Company" means St. Marys Cement Inc. (Canada) that is responsible for the construction or operation of the Facility and includes any successors and assigns;

7. "Cement Kiln" means the Cement Kiln, the Calciner and associated control equipment and continuous emissions monitoring systems, firing Conventional Fuel and Alternative Fuel, described in the Company's application, this Approval and in the supporting documentation referred to herein, to the extent approved by this Approval;

8. "Conventional Fuel" means solid fuels such as, petroleum coke and coal;

9. "Demonstration Project" means the demonstration project where up to 30 % of Conventional Fuel is substituted with Alternative Fuel in the Cement Kiln, as described in the Company's application, this Approval and in the supporting documentation referred to herein, to the extent approved by this Approval;

10. "District Manager" means the District Manager of the appropriate local district office of the Ministry, where the Facility is geographically located;

11. "EPA" means the Environmental Protection Act, R.S.O. 1990, c.E.19, as amended;

12. "Equipment" means the equipment and operations associated with the Demonstration Project, located on the property where the Cement Kiln is located, as described in the Company's application, this Approval and in the supporting documentation referred to herein, to the extent approved by this Approval;

13. "Facility" means the entire operation located on the property where the Equipment is located;

14. "Manager" means the Manager, Technology Standards Section, Standards Development Branch, who has been appointed under Section 5 of the EPA for the purposes of Section 11(1)2 of O.Reg. 419, or any other person who represents and carries out the duties of the Manager, Technology Standards Section, Standards Development Branch, as those duties relate to the conditions of this Approval;

15. "Manual" means a document or a set of documents that provide written instructions to staff of the Company;

16. "Ministry" means the ministry of the government of Ontario responsible for the EPA and includes all officials, employees or other persons acting on its behalf;

17. "Point of Impingement" means any point in the natural environment. The point of impingement for the purposes of verifying compliance with the EPA with respect to the Demonstration Project, shall be chosen as the point located outside the Company's property boundaries at which the highest concentration is expected to occur, when that concentration is calculated in accordance with a method accepted by the Director;

18. "Pre-test Information" means the information outlined in Section 1.1 of the Source Testing Code;

19. "Source Testing" means sampling and testing to measure emissions resulting from operating the Cement Kiln at a level of typical maximum production within the approved operating range of the Cement Kiln which satisfies paragraph 1 of subsection 11(1) of O. Reg. 419;

20. "Source Testing Code" means the Source Testing Code, Version 2, Report No. ARB-66-80, dated November 1980, prepared by the Ministry, as amended;

21. "Test Contaminants" means those contaminants set out in Schedules "B1" and "B2" attached to this Approval;

22. "Publication NPC-205" means the Ministry Publication NPC-205, "Sound level Limits for Stationary Sources in Class 1 & 2 Areas (Urban)", October, 1995 as amended; and

23. "Publication NPC-232" means the Ministry Publication NPC-232, "Sound Level Limits for Stationary Sources in Class 3 Areas (Rural)", October, 1995 as amended.

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

TERMS AND CONDITIONS

OPERATION AND MAINTENANCE

1. (1) The Company shall ensure that the Facility is properly operated and maintained at all times while firing any amount of Alternative Fuel in the Cement Kiln during the Demonstration Project, so that operations of the Cement Kiln shall meet the operational limits set out in Schedule "A1". Alternative Fuel is to be stopped (following appropriate procedures) if one or more of Operational Limits is exceeded for more than one consecutive hour.

   (2) The Performance Objectives for emissions from the Cement Kiln Exhaust Stack are set out in Schedule "A2".

2. Unless otherwise approved in writing by the Director due to unforeseen delays in carrying out the Demonstration Project, the Company shall limit the combustion of Alternative Fuel in the Cement Kiln to the following:

   (1) Thirty (30) days for stack testing at the maximum fuel substitution (up to 30%);

   (2) Thirty (30) days for ramping up, stabilization, and ramping down.

3. The Company shall ensure that the Facility is properly operated and maintained at all times during the Demonstration Project. The Company shall:

   (1) prepare and update as necessary, prior to commencement of the Demonstration Project, a Design and Operations Manual specific to all aspects of the Facility, including the handling of Alternative Fuel and the use of Alternative Fuel in the Cement Kiln during the Demonstration Project, outlining the following:

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

      (c) emergency procedures;

      (d) procedures for any record keeping activities relating to the operations of the Facility;

      (e) all appropriate measures to minimize odour, noise and dust emissions from all potential sources from the Facility;

   (2) implement the recommendations of the Design and Operations Manual during the Demonstration Project.

4. The Company shall, at all times, ensure that the noise emissions from the Facility comply with the limits set out in Ministry Publication NPC-205 or Ministry Publication NPC-232, as applicable, during the Demonstration Project.

RAW FEED AND FUELS - ANALYSIS AND MONITORING

5. The Company shall prepare and implement, prior to the firing of Alternative Fuel in the Cement Kiln, a Raw Feed and Fuels Analysis and Monitoring Program to record the properties and quantities of the Raw Feed and Fuels used in the Cement Kiln during the Demonstration Project. The Raw Materials and Fuels Analysis and Monitoring Program shall specify as a minimum:

   (1) sampling methodology and frequency and chemical analysis of raw feed, Conventional Fuel and Alternative Fuel directed to the Cement Kiln;

   (2) hourly feed rate of the raw feed, Conventional Fuel and Alternative Fuel in the Cement Kiln during the Demonstration Project.

MONITORING

CONTINUOUS EMISSIONS MONITORING

6. The Company shall ensure that the existing Continuous Emissions Monitoring Systems, are fully operational during the Demonstration Project, to continuously monitor the following parameters in the exhaust gas stream of the Cement Kiln Exhaust Stack:

   (a) Nitrogen Oxides;
   (b) Sulphur Dioxide;
   (c) Opacity;

   The Continuous Emissions Monitoring Systems for Nitrogen Oxides and Sulphur Dioxide shall comply with the requirements of O. Reg. 194/05, EPA – "Industry Emissions – Nitrogen Oxides and Sulphur Dioxide" . The Continuous Emissions Monitoring System for Opacity shall comply with the requirements outlined in Schedule "D" attached to this Approval.

AMBIENT AIR QUALITY MONITORING

7. The Company shall conduct an Ambient Air Quality Monitoring Program during the Demonstration Project to determine the concentrations of the Test Contaminants listed in Schedule "B1", in accordance with the Ambient Air Quality Monitoring Program. Upwind and downwind sampling locations will be selected based on historical meteorological data and air dispersion modelling of the Cement Kiln stack. Ambient air sampling and monitoring will occur during both Baseline Conditions and with the use of Alternative Fuel in the Cement Kiln.

SOURCE TESTING

8. The Company shall conduct, a Source Testing Program, following the Source Testing Procedures listed in Schedule "C", during the Demonstration Project, to determine the rate of emission of the Test Contaminants listed in Schedule "B2" from the Cement Kiln Exhaust Stack. The Source Testing Program shall be designed to include both the Baseline Conditions and with the use of Alternative Fuel in the Cement Kiln.

REPORTING

9. The Company shall prepare and submit to the Director and District Manager, no later than six (6) months after the completion of the Demonstration Project, a Demonstration Project Summary Report. The Demonstration Project Summary Report shall include, as a minimum, but not limited to:

   (1) a summary of emission data and analysis obtained through the Source Testing Program, the Ambient Air Quality Monitoring Program and the Continuous Emissions Monitoring Program, conducted during the Demonstration Project, prepared in accordance with the requirements of the Reporting Procedures described in Schedule "C" attached to this Approval, as applicable;

   (2) a summary of all comments received by the Company during the Demonstration Project that pertain to the Demonstration Project from the public, the Ministry, or any other party.

10. The Company shall ensure that the above mentioned Demonstration Project Summary Report is made available and easily accessible for review by the public at the Facility and via an internet website, immediately after the document is submitted to the Ministry.

RECORD KEEPING REQUIREMENTS

11. The Company shall retain, for a minimum of five (5) years from the date of their creation and provide to the Ministry, upon request, in a timely manner, all reports, records and information required by this Approval and shall include but not be limited to:

   (1) time, date and duration of the Demonstration Project;

   (2) all records and reports produced from the Raw Feed and Fuels Analysis and Monitoring Program, the Source Testing Program, the Ambient Air Quality Monitoring Program and the Continuous Emissions Monitoring Program required under this Approval;

   (3) all records and reports produced as part of the assessments of emissions and impacts from the operation of the Cement Kiln, as a result of the utilization of Alternative Fuel for the Cement Kiln;

   (4) all records related to all environmental complaints made by the public during the Demonstration Project;

   (5) a copy of the Demonstration Project Summary Report required under Condition 8.

NOTIFICATION

12. The Company shall notify the District Manager, in writing, at least fifteen (15) business days prior to commencement of the Demonstration Project.

COMPLAINTS RESPONSE PROCEDURE

13. If at any time, the Company receives any environmental complaints from the public regarding the operation of the Facility during the Demonstration Project, the Company shall respond to these complaints according to the following procedure:

    (1) The District Manager shall be notified forthwith upon receipt of any complaint;

    (2) Each complaint shall be recorded and numbered, and shall include the following information, as a minimum:

        (a) nature of the complaint;
        (b) weather conditions and wind direction at the time of the complaint;
        (c) name and address of the complainant (if provided); and
        (d) time and date of the complaint;

    (3) Appropriate steps shall be taken forthwith to determine all possible causes of the complaint and to eliminate the cause of the complaint. A written reply shall be provided to the complainant, if known and if requested by the complainant, within 3 business days of receipt of the complaint by the Company.

SCHEDULE "A1"

OPERATIONAL LIMITS

Parameter	Limits	Comments
Quantity of Alternative Fuel	No more than 30% substitution (based on heating value).	Measured continuously.
Raw Material Feed Rate	>250 tonnes/hour	Measured continuously.
Temperature	>1000°C at a residence time of more than 6 seconds in the Kiln >850°C at a residence time of more than 3 seconds in the calciner	Measured by a continuous monitor Calculated as a rolling 1-hour arithmetic average measured by a continuous monitoring system that provides data at least once every 1 minute
Residual oxygen	>1% Residual oxygen at the backend of the kiln. >3% Residual oxygen at the calciner down comer duct.	Measured by a continuous monitor and calculated by volume on a dry basis in the undiluted gases leaving the Kiln. Calculated as a rolling 1-hour arithmetic average measured by a continuous monitoring system that provides data at least once every 1 minute
Pressure Control	Kiln must be operated under negative pressure at all times during the Demonstration Project.	Measured at the top of the preheater towers by continuous monitor.
Start-Up, Shut-down and Upset Operating conditions	No Alternative Fuel to be used.	-

SCHEDULE "A2"

PERFORMANCE OBJECTIVES

Parameter	Emission Limit	Comments
Particulate Matter (PM)	50 mg/Rm^3	calculated as the arithmetic average of three stack tests conducted in accordance with standard methods
Dioxins and Furans	80 pg/Rm^3 as ITEQ	calculated as the arithmetic average of three stack tests conducted in accordance with standard methods
Hydrochloric Acid (HCl)	27 mg/Rm^3	calculated as the arithmetic average of three stack tests conducted in accordance with standard methods
Cadmium	7 ug/Rm3	calculated as the arithmetic average of three stack tests conducted in accordance with standard methods
Lead	60 ug/Rm3	calculated as the arithmetic average of three stack tests conducted in accordance with standard methods
Mercury	20 ug/Rm3	calculated as the arithmetic average of three stack tests conducted in accordance with standard methods

Notes:

R - Reference flue gas conditions, defined as follows:

- Temperature 25 °C
- Pressure 101.3 kPa
- Oxygen content 11%
- Water content nil (dry conditions)

mg/Rm3 - milligrams per cubic metre of gas at Reference conditions.
ug/Rm3 - micrograms per cubic metre of gas at Reference conditions.
pg/Rm3 - picograms per cubic metre of gas at Reference conditions.
I-TEQ - a toxicity equivalent concentration calculated using the toxic equivalency factors (I-TEFs) derived for each dioxin and furan congener by comparing its toxicity to the toxicity of 2,3,7,8 tetrachloro dibenzo-p-dioxin, recommended by the North Atlantic Treaty Organizations's Committee on Challenges to Modern Society [NATO/CCMS] in 1989 and adopted by Canada in 1990.

SCHEDULE "B1"
TEST CONTAMINANTS
Ambient Air Quality Monitoring Program

Metals	Polycyclic Aromatic Hydrocarbons	Dioxins and Furans	Volatile Organic Compounds
Antimony (Sb)	1-Methyl naphthalene	2,3,7,8-Tetrachlorodibenzo-p-dioxin	acetone
Aluminum (Al)	1-Methyl phenanthrene	1,2,3,7,8-Pentachlorodibenzo-p-dioxin	benzene
Arsenic (As)	2-Chloronaphthalene	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	chloromethane
Barium (Ba)	2-Methylanthracene	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	bromomethane
Beryllium (Be)	2-Methylnaphthalene	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	chloroethane
Boron (B)	3-Methylcholanthrene	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	1,1- dichloroethylene (vinyl chloride)
Cadmium (Cd)	7,12-Dimethylbenzo(a)anthrace ne	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin	methylene chloride
Chromium (Cr)	9,10-Dimethylanthracene	2,3,7,8-Tetrachlorodibenzofuran	1,1- dichloroethane
Cobalt (Co)	Acenaphthene	2,3,4,7,8-Pentachlorodibenzofuran	trans - 1,2 -dichloroethylene
Copper (Cu)	Acenaphthylene	1,2,3,7,8-Pentachlorodibenzofuran	cis - 1,2 -dichloroethylene
Lead (Pb)	Anthracene	1,2,3,4,7,8-Hexachlorodibenzofuran	chloroform
Manganese (Mn)	Benzo(a)anthracene	1,2,3,6,7,8-Hexachlorodibenzofuran	1,2 -dichloroethane
Mercury (Hg)	Benzo(b)fluoranthene	1,2,3,7,8,9-Hexachlorodibenzofuran	2- butanone
Molybdenum (Mo)	Benzo(k)fluoranthene	2,3,4,6,7,8-Hexachlorodibenzofuran	1,1,1 –trichloroethane
Nickel (Ni)	Benzo(a)fluorene	1,2,3,4,6,7,8-Heptachlorodibenzofuran	carbon tetrachloride
Phosphorus (P)	Benzo(b)fluorene	1,2,3,4,7,8,9-Heptachlorodibenzofuran	1,1,2- trichloroethane
Potassium (K)	Benzo(g,h,i)perylene	1,2,3,4,6,7,8,9-Octachlorodibenzofuran	1,2- dichloropropane
Selenium (Se)	Benzo(a)pyrene		trichloroethylene
Silver (Ag)	Benzo(e)pyrene		bromodichloromethane
Strontium (Sr)	Chrysene		dibromochloromethane
Thalium (Tl)	Coronene		toluene
Tin (Sn)	Dibenzo(a,e)pyrene		tetrachloroethylene
Titanium (Ti)	Dibenzo(a,h)anthracene		chlorobenzene
Vanadium (V)	Fluoranthene		ethylbenzene
Zinc (Z)	Fluorene		m/p xylene
Calcium Oxide (CaO)	Indeno(1,2,3-cd)pyrene		o - xylene
Iron Oxide (FeO)	Naphthalene		styrene
	Perylene		bromoform
	Phenanthrene		1,1,1,2 -tetrachloroethane
	Pyrene		1,1,2,2 -tetrachloroethane
	Tetralin		cumene (isopropyl benzene)
	Dibenzo(a,c)anthracene + Picene (sum of 2)		1,2-dibromoethane (ethylene dibromide)

SCHEDULE "B2"

TEST CONTAMINANTS

Source Testing Program

Nitrogen Oxides
Sulphur Dioxide
Carbon Monoxide
Carbon Dioxide
Total Suspended Particulate Matter
PM 10
PM 2.5
Hydrogen Chloride
Ammonia
Calcium Oxide
Ferric Oxide

Metals		Volatile Organic Matter
Cd	Cadmium	acetone
Be	Beryllium	benzene
Pb	Lead	bromodichloromethane
Mo	Molybdenum	bromoform
Cr	Chromium	bromomethane
Ni	Nickel	butanone, 2 -
V	Vanadium	carbon tetrachloride
Al	Aluminum	chlorobenzene
Ti	Titanium	chloroethane
Mg	Magnesium	chloroform
B	Boron	chloromethane
Ba	Barium	cumene (isopropyl benzene)
P	Phosphorus	dibromochloromethane
K	Potassium	dichloroethane, 1,1 -
Hg	Mercury	dichloroethane, 1,2 -
As	Arsenic	dichloroethene, trans - 1,2 -
Zn	Zinc	dichloroethene, 1,1 – (vinyl chloride)
Sb	Antimony	dichloroethylene, cis - 1,2 -
Mn	Manganese	dichloropropane, 1,2 -
Co	Cobalt	ethylbenzene
Se	Selenium	ethylene dibromide (1,2-dibromoethane)
Cu	Copper	methylene chloride
Ag	Silver	styrene
Sn	Tin	tetrachloroethane, 1,1,1,2 -
Sr	Strontium	tetrachloroethane, 1,1,2,2 -
Tl	Thalium	tetrachloroethene
		toluene
		trichloroethane, 1,1,1 –
		trichloroethane, 1,1,2 -
		trichloroethene (trichloroethylene, 1,1,2 -)
		xylenes

Dioxins, Furans and Dioxin-like PCBs

2,3,7,8-Tetrachlorodibenzo-p-dioxin [2,3,7,8-TCDD]
1,2,3,7,8-Pentachlorodibenzo-p-dioxin [1,2,3,7,8-PeCDD]
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin [1,2,3,4,7,8-HxCDD]
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin [1,2,3,6,7,8-HxCDD]
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin [1,2,3,7,8,9-HxCDD]
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin [1,2,3,4,6,7,8-HpCDD]
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin [1,2,3,4,6,7,8,9-OCDD]
2,3,7,8-Tetrachlorodibenzofuran [2,3,7,8-TCDF]
2,3,4,7,8-Pentachlorodibenzofuran [2,3,4,7,8-PeCDF]
1,2,3,7,8-Pentachlorodibenzofuran [1,2,3,7,8-PeCDF]
1,2,3,4,7,8-Hexachlorodibenzofuran [1,2,3,4,7,8-HxCDF]
1,2,3,6,7,8-Hexachlorodibenzofuran [1,2,3,6,7,8-HxCDF]
1,2,3,7,8,9-Hexachlorodibenzofuran [1,2,3,7,8,9-HxCDF]
2,3,4,6,7,8-Hexachlorodibenzofuran [2,3,4,6,7,8-HxCDF]
1,2,3,4,6,7,8-Heptachlorodibenzofuran [1,2,3,4,6,7,8-HpCDF]
1,2,3,4,7,8,9-Heptachlorodibenzofuran [1,2,3,4,7,8,9-HpCDF]
1,2,3,4,6,7,8,9-Octachlorodibenzofuran [1,2,3,4,6,7,8,9-OCDF]

3,3',4,4'-Tetrachlorobiphenyl [3,3',4,4'-tetraCB (PCB 77)]
3,4,4',5- Tetrachlorobiphenyl [3,4,4',5-tetraCB (PCB 81)]
3,3',4,4',5- Pentachlorobiphenyl (PCB 126) [3,3',4,4',5-pentaCB (PCB 126)]
3,3',4,4',5,5'- Hexachlorobiphenyl [3,3',4,4',5,5'-hexaCB (PCB 169)]
2,3,3',4,4'- Pentachlorobiphenyl [2,3,3',4,4'-pentaCB (PCB 105)]
2,3,4,4',5- Pentachlorobiphenyl [2,3,4,4',5-pentaCB (PCB 114)]
2,3',4,4',5- Pentachlorobiphenyl [2,3',4,4',5-pentaCB (PCB 118)]
2',3,4,4',5- Pentachlorobiphenyl [2',3,4,4',5-pentaCB (PCB 123)]
2,3,3',4,4',5- Hexachlorobiphenyl [2,3,3',4,4',5-hexaCB (PCB 156)]
2,3,3',4,4',5'- Hexachlorobiphenyl [2,3,3',4,4',5'-hexaCB (PCB 157)]
2,3',4,4',5,5'- Hexachlorobiphenyl [2,3',4,4',5,5'-hexaCB (PCB 167)]
2,3,3',4,4',5,5'- Heptachlorobiphenyl [2,3,3',4,4',5,5'-heptaCB (PCB 189)]

Polycyclic Organic Matter:
Acenaphthylene
Acenaphthene
Anthracene
Benzo(a)anthracene
Benzo(b)fluoranthene
Benzo(k)fluoranthene
Benzo(a)fluorene
Benzo(b)fluorene
Benzo(ghi)perylene
Benzo(a)pyrene
Benzo(e)pyrene
2-Chloronaphthalene
Chrysene
Coronene
Dibenzo(a,c)anthracene
9,10-Dimethylanthracene
7,12-Dimethylbenzo(a)anthracene

Fluoranthene
Fluorene
Indeno(1,2,3-cd)pyrene
2-Methylanthracene
3-Methylcholanthrene
1-Methylnaphthalene
2-Methylnaphthalene
1-Methylphenanthrene
9-Methylphenanthrene
Naphthalene
Perylene
Phenanthrene
Picene
Pyrene
Tetralin
Triphenylene

Chlorinated Organics

total dichlorobenzenes
total trichlorobenzenes (1,3,5-; 1,2,3-; 1,2,4-)
total tetrachlorobenzenes (1,2,4,5-; 1,2,3,5-)
pentachlorobenzene
hexachlorobenzene
total dichlorophenols (2,3-; 2,4-; and 2,6-)
total trichlorophenols (2,3,4-; 2,4,5-; 2,4,6-; 3,4,5-)
total tetrachlorophenols (2,3,4,6-;2,3,5,6)
total pentachlorophenols

SCHEDULE "C"

MONITORING AND REPORTING PROCEDURES

A. SOURCE TESTING PROCEDURES

1. The Company shall submit, to the Manager a test protocol including the Pre-Test Information required by the Source Testing Code, at least thirty (30) days prior to the scheduled dates of the Source Testing Program.

2. The Company shall finalize the test protocol in consultation with the Manager.

3. The Company shall not commence the Source Testing until the Manager has accepted the test protocol.

4. The Company shall notify the District Manager and the Manager in writing of the location, date and time of any impending Source Testing required by this Approval, at least fifteen (15) days prior to the Source Testing.

5. The Director may not accept the results of the Source Testing Program if:
   (1) the Source Testing Code or the requirements of the Manager were not followed; or
   (2) the Company did not notify the District Manager and the Manager of the Source Testing; or
   (3) the Company failed to provide a complete report on the Source Testing.

B. REPORTING PROCEDURES

SOURCE TESTING PROGRAM

1. The Company shall submit a report on the Source Testing Program to the District Manager and the Manager not later than six (6) months after completing the Source Testing Program. The report shall be in the format described in the Source Testing Code, and shall also include, but not be limited to:

   (1) an executive summary;
   (2) records of operating conditions; including a summary of the results of the Raw Feed and Fuels Analysis and Monitoring Program as required by Condition 4 of this Approval;
   (3) all records produced by the continuous monitoring systems during the Demonstration Project;
   (4) assessment of compliance with the Cement Kiln Exhaust Stack Operating Limits for the parameters listed in Schedule "A1" attached to this Approval;
   (5) the results of source testing and air dispersion calculations in accordance with regulation 419/05, indicating the maximum concentration of the Test Contaminants emitted from the Cement Kiln Stack at the Point of Impingement and an assessment of compliance with Regulation 419/05 Schedule 3 standards; and
   (6) a description and explanation of any statistically significant changes in emissions from the Cement Kiln Exhaust Stack and Point of Impingement Concentrations of the Test Contaminants, if any, resulting from the use of Alternative Fuel, relative to the Baseline Conditions.

AMBIENT AIR MONITORING PROGRAM

2. The Company shall submit a report on the results of the Ambient Air Quality Monitoring Program, to the District Manager not later than six (6) months after completing the Demonstration Project . The report shall include, but not be limited to:

(1) an executive summary;
(2) records of operating conditions; including a summary of the results of the Raw Feed and Fuels Analysis and Monitoring Program;
(3) sample dates, frequency and duration;
(4) information on the exact location of samplers, including the analysis to site them. A map must be included, clearly showing where each monitoring station is located.
(5) a description of the specifications of the monitors used in the Ambient Air Quality Monitoring Program;
(6) a description of the specifications of the meteorological stations used to monitor and record meteorological conditions and analysis of wind direction
(7) results of the Ambient Air Monitoring Program for the Test Contaminants listed in Schedule B1;
(8) a description and explanation of any statistically significant changes in ambient air concentrations of the Test Contaminants, if any, resulting from the use of Alternative Fuel, relative to the Baseline Conditions.

SCHEDULE "D"

Continuous Monitoring System Requirements

PARAMETER: **Opacity**

INSTALLATION:
The Continuous Opacity Monitor shall be installed at an accessible location where the measurements are representative of the actual opacity of the gases leaving the *Cement Kiln Exhaust Stack* and shall meet the following design and installation specifications:

PARAMETERS	SPECIFICATION
1. Wavelength at Peak Spectral Response (nanometres, nm):	500 - 600
2. Wavelength at Mean Spectral Response (nm):	500 - 600
3. Detector Angle of View:	≤ 5 degrees
4. Angle of Projection:	≤ 5 degrees
5. Range (percent of opacity):	0 -100

PERFORMANCE:
The Continuous Opacity Monitor shall meet the following minimum performance specifications for the following parameters.

PARAMETERS	SPECIFICATION
1. Span Value (percent opacity):	80 percent
2. Calibration Error:	≤ 3 percent opacity
3. Attenuator Calibration:	≤ 2 percent opacity
4. Response Time (95 percent response to a step change):	≤ 10 seconds
5. Schedule for Zero and Calibration Checks:	daily minimum
6. Procedure for Zero and Calibration Checks:	all system components checked
7. Zero Calibration Drift (24-hours):	≤ 2 percent opacity
8. Span Calibration Drift (24-hours):	≤ 2 percent opacity
9. Conditioning Test Period:	≥ 168 hours without corrective maintenance
10. Operational Test Period:	≥ 168 hours without corrective maintenance

CALIBRATION:
The monitor shall be calibrated, to ensure that it meets the drift limits specified above, during the Demonstration Project . The results of all calibrations shall be recorded at the time of calibration.

DATA RECORDER:
The data recorder must be capable of registering continuously the measurement of the monitor with an accuracy of 0.5 percent of a full scale reading or better and with a time resolution of 30 seconds or better.

RELIABILITY:
The monitor shall be operated and maintained so that accurate data is obtained during a minimum of 90 percent of the time during the Demonstration Project.

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

1. Condition No. 1 is included to outline the minimum performance requirements considered necessary to prevent an adverse effect resulting from the utilization of any Alternative Fuel for the Cement Kiln during the Demonstration Project.

2. Condition Nos. 2, 3 and 4 are included to require the Company to operate and maintain the Facility in accordance with the terms and conditions of this Approval.

3. Condition Nos. 5, 6, 7 and 8 are included to require the Company to gather accurate information so that the environmental impact and subsequent compliance with the EPA, Regulation 419/05 and this Approval can be verified.

4. Condition Nos. 9, 10, 11 and 12 are included to require the Company to retain records of information gathered during the Demonstration Project and to provide easy public access to information related to the Demonstration Project, so that the environmental impact and subsequent compliance with the EPA, the regulations and this Approval can be verified.

5. Condition No. 13 is included to require the Company to respond to any environmental complaints related to the Demonstration Project, according to procedures that include methods for preventing recurrence of similar incidents.

In accordance with Section 139 of the Environmental Protection Act, you may by written Notice served upon me and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 142 of the Environmental Protection Act provides that the Notice requiring the hearing shall state:

1. The portions of the environmental compliance approval or each term or condition in the environmental compliance 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 environmental compliance approval number;
6. The date of the environmental compliance approval;
7. The name of the Director, and;
8. The municipality or municipalities within which the project is to be engaged in.

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

This Notice must be served upon:

The Secretary*
Environmental Review Tribunal
655 Bay Street, Suite 1500
Toronto, Ontario
M5G 1E5

AND

The Director appointed for the purposes of
Part II.1 of the Environmental Protection Act
Ministry of the Environment
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) 212-6349, Fax: (416) 314-4506 or www.ert.gov.on.ca**

The above noted activity is approved under s.20.3 of Part II.1 of the Environmental Protection Act.

DATED AT TORONTO this 5th day of November, 2014

Rudolf Wan, P.Eng.
Director
appointed for the purposes of Part II.1 of the
Environmental Protection Act

QN/
c: District Manager, MOE York-Durham
Bridget Mills, P.Eng., BCX Environmental Consulting.

Appendix C. Procedures Manual

Procedures Manual V2

St. Marys Cement (Canada) Inc.

Bowmanville Low Carbon Alternative Fuel (Woody Biomass) Project

ECA Number 7024-9XUK4C

and

Bowmanville Alternative Fuel Demonstration Project

ECA Number 1255-7QVJ2N

Bowmanville Cement Plant
September 20, 2018

Contents

Figures

Appendices

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1 Introduction and Background

This Procedures Manual (inclusive of Design and Operations Report requirements) has been prepared as required and in accordance with Condition 23 of the Environmental Compliance Approval Number 7024-9XUK4C issued on November 25, 2015 for the St. Mary's Cement Plant in Bowmanville, Ontario for the use of Alternative Fuels including woodwaste and Low Carbon Alternative Fuels(LCAF) (see **Appendix A – ECA 7024-9XUK4C** as amended) and Condition 23 of the Environmental Compliance Approval Number 1255-7QVJ2N issued on March 11, 2015 for the St. Mary's Cement Plant in Bowmanville, Ontario for the purpose of undertaking an alternative fuel demonstration using Alternative Fuels derived from industrial and/or post-consumer sources, including plastic, polymers, paper fibres and woody materials, received as single streams or blends (see **Appendix C – ECA 1255-7QVJ2N** as amended).

The Procedures Manual will be retained and kept up to date and current during the term of the Alternative Fuel demonstration program and the term of use of the LCAF, and will be kept at the Site in a central location that is accessible to Site personnel, and will be available for inspection, upon request.

2 Project Description

St. Marys Cement Inc. (Canada) (SMC) has received approvals from the Ontario Ministry of the Environment and Climate Change (MOECC) for an Environmental Compliance Approval for a Thermal Treatment Facility, in order to regularly use LCAF (woody biomass) and to perform a demonstration trial with the use of post-composting plastics polymers and woody materials and of plastics, polymers, paper fibers and woody material derived from industrial and/or post-consumer sources at its cement plant located in Bowmanville, Ontario.

2.1 Project Schedule

SMC commenced construction of the Alternative Fuel Building and subsequent installation of the alternative fuel feed equipment as of the week of April 24, 2017. Calibration and commissioning of the alternative fuel feed system took place early July 2017. Commencement of operations using woodwaste and LCAF took place December 2017.

Stack emissions testing for the LCAF and the Alternative Fuel demonstration is scheduled to begin September 30, 2018.

2.2 Site Description

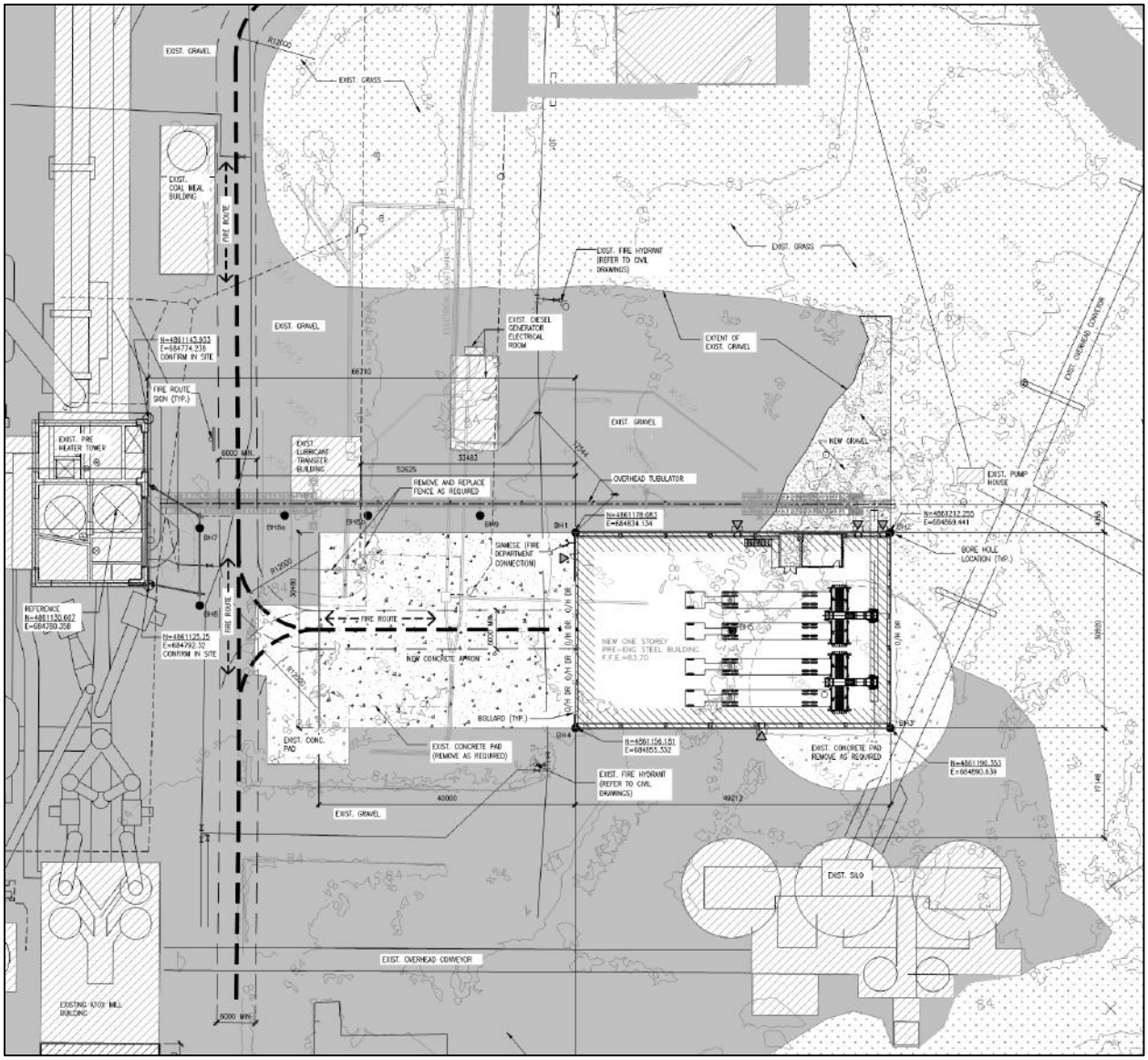
The Bowmanville Cement Plant is located on the north shore of Lake Ontario, south of Highway 401 at the south west corner of the South Service Road and Waverly Road in Bowmanville, Ontario. The total size of the property owned by St. Mary's Cement at its

Bowmanville location is approximately 331 hectares (including lands used by Cargo Dockers under lease to St. Mary's Cement).

Road access to the site is from Waverly Road. The principle road transportation route into the site is from Hwy. 401.

Figure 1 presents an overview of the layout of the principle features of the cement plant and the location of the Alternative Fuels building that would be used to receive, store and manage the LCAF and the alternative fuel feed system.

Figure 1. Principle Features of the Bowmanville Cement Plant



3 Alternative Fuels Operating Plan

3.1 Description of the Alternative Fuel

3.1.1 Alternative Fuel Sources and Characteristics

SMC has identified solid residual materials from industrial or post-consumer sources, consisting primarily of plastic, polymers, paper fibres and woody residuals (LCAF and alternative fuels identified for the demonstration) as sustainable, feasible and environmentally responsible alternative fuels for regular use at the Bowmanville cement plant. These materials are consistent with those that are in common use as alternative fuel in other jurisdictions around the globe.

The proposed alternative fuels:

- have a reasonable heat of combustion;
- will meet the requirements of the alternative fuel feed system;
- will not introduce parameters into the kiln system in quantities that would impact the quality of the cement product or emissions from the Facility to a statistically significant extent; and,
- Are available in a form that can be managed effectively at the site such that it does not increase the potential for emissions of dust, odour or litter from the Facility.

SMC initially intends to use these alternate fuels in the calciner burner and pending further fuel feed system approvals and modifications in the kiln main burner. The alternative fuel materials are produced as a result of processing construction and demolition materials (LCAF) and industrial and/or post-consumer material (demonstration) by facilities located in the province of Ontario.

The sources of the alternative fuel will be construction and demolition (LCAF) and industrial and/or post-consumer material (demonstration) processing facilities which will be responsible for preparing a woody biomass material; post-composting plastics polymers and woody materials; and post-consumer and/or industrial plastics/polymers/paper fibers/woody material streams suitable for use by SMC. Processing activities undertaken by the processing facilities will include: screening of incoming material and removal of unacceptable materials (copper or arsenic treated wood, asbestos, hazardous materials), removal of non-combustible materials (metals, stone etc.), size reduction (2 cm or less particle sizes for LCAF and 5 cm or less for demonstration).

The low-carbon woody biomass materials (LCAF) consist mainly of wood chips, with some fragments of plastic, shingles and other materials present in the construction and demolition material stream. The woody biomass materials include materials with laminate or surface coatings, glue etc. and thus are not defined as ‘clean wood’ under O.

Reg. 347 under the EPA. This material does not include materials containing asbestos or hazardous waste which must be identified and managed according to provincial regulations in a secure manner.

The cement manufacturing process is capable of processing creosote and PCP treated wood, and restricted amounts of other pressure treated wood (CCA, AZCA, ACQ and CA).[1] The C&D material will be screened to remove pressure treated wood materials containing copper or arsenic (CCA, AZCA, ACQ and CA wood treatments), such that less than 5% of the total woody biomass materials would consist of treated wood.

The residuals derived from industrial and/or post-consumer sources (demonstration), includes plastic polymers, paper fibres and woody materials, received as single streams or blends, classified as Municipal Solid Waste under Ontario Regulation 347, written under the Act, to be used as a substitute fuel source in the cement kiln. The post-composting plastics polymers and woody materials include mainly shredded and dried plastic film and other plastic materials and woody materials removed from finished compost. The plastics polymers, paper fibers and woody residuals derived from industrial and/or post-consumer sources are mainly shredded plastic and other materials removed from post-consumer recycling or from industrial manufacturing process.

Hazardous waste, liquid industrial waste, processed organic waste, or any waste other than those described above are not accepted at the Facility.

St. Marys has established specifications for the alternative fuel in order to meet both operational and environmental objectives. The following tables present an overview of these specifications.

Table 1: Alternative Fuel Specifications – Operating Parameters

Operational Specification	Parameter	Rationale
Moisture	≤ 25% by weight	▪ Fuel quality ▪ Prevention of run-off ▪ Consistent heating value
Total Halogen Content	≤ 1% by weight	▪ Fuel quality ▪ Similar to regulatory guideline in other jurisdictions for similar wood waste materials (as well as other materials including plastic, paper, and textiles) ▪ Testing undertaken in accordance with CSA C22.2 No. 0.3 or MIL-DTL-24643
Calorific Value	≥ 10 MJ/kg	▪ Similar to guidance provided by US EPA under CFR 241.3 (d)(1) for non-waste fuels ▪ Ease of operation

[1] Environment Canada, Industrial Treated Wood Users Guidance Document, September 2004

Table 2: Alternative Fuel Specifications – Environmental Parameters

Environmental Specification	Parameter	Rationale
Metals and Metal Hydrides	Testing for the following metals in accordance with current adjunct fuel requirements in the St. Marys Plant ECA (Air): ▪ Antimony ▪ Arsenic ▪ Barium ▪ Beryllium ▪ Cadmium ▪ Chromium ▪ Cobalt ▪ Iron ▪ Lead ▪ Manganese ▪ Mercury ▪ Nickel ▪ Selenium ▪ Silver ▪ Tin ▪ Vanadium	▪ Quarterly testing of the alternative fuel for metals currently listed on Schedule of D of the ECA (Air) Number 3779-9BMQW4 ▪ Results of POI concentration modeling based on determination of the proportion of the contribution of the alternative fuel to the mass of the material to the cement plant, should indicate that the POI would not be exceeded. ▪ Applies the current approach for testing of Fuel Adjunct Materials in the Bowmanville Plant ECA (Air) Condition 4. (1) (a)

Table 3: Additional LCAF Specifications

ECA 7024-9XUK4C Condition	
1. j.	• Less than 10% non-woody materials such as plastic, shingles, laminate, surface coatings and other material • Less than 5% treated wood

3.1.2 Alternative Fuel Quantity

Alternative fuels would initially be supplied to the calciner burner. The calciner burner assembly is dedicated to petcoke and/or coal or alternative fuels and is capable of consuming approximately 20 to 30 tonnes of pet coke and/or C=coal per hour, up to 5 tonnes per hour of low carbon alternative fuels (average alternative fuel feed rate of 4 tonnes per hour per day) and up to 12 tonnes per hour of industrial and/or post-consumer material (5.5 tonnes per hour of post-composting plastics polymers and woody materials and 6.5 tonnes per hour of plastics polymers, paper fibers and woody residuals derived from industrial and/or post-consumer sources). Section 7.4 provides details regarding the alternative fuel feed system.

SMC intends to seek approvals and to undertake further modifications to allow for supply of alternative fuels to the main burner assembly of the cement kiln. The main burner nozzle of the cement kiln has multiple fuel ports designed for the various types of fuels that can be fed to the process including pet-coke, coal or other pneumatically conveyed solid fuels. The main kiln burner assembly has a fuel supply rate of 10 to 15 tonnes per hour with two main fuel channels for pet coke or coal, and one channel for solid low

carbon alternative fuel capable of a fuel supply rate of 0 to 5 tonnes per hour (with an average alternative fuel feed rate of 4 tonnes per hour). Additional channels are used for the preheat gas flame for kiln start-up.

The LCAF feed rate would average 4 tonnes per hour and for the industrial and/or post-consumer material 12 tonnes per hour to the calciner burner.

Assuming a 24 hour per day operation at this maximum rate, the total quantity of low carbon alternative fuel consumed per day would be in the order of:

LCAF at 4 tonnes/hour x 24 hours/day = 96 tonnes per day

The maximum quantity of low carbon alternative fuel used would be 96 tonnes per day.

Assuming a 24 hour per day operation at this maximum rate, the total quantity of industrial and/or post-consumer alternative fuel (demonstration) consumed per day would be in the order of:

Post-composting plastics polymers and woody materials (demonstration)

5.5 tonnes /hour x 24 hours/day = 132 tonnes per day

Plastics polymers, paper fibers and woody residuals derived from industrial and/or post-consumer sources (demonstration)

6.5 tonnes /hour x 24 hours/day = 156 tonnes per day

Total industrial and/or post-consumer material (demonstration)

12 tonnes /hour x 24 hours/day = 288 tonnes per day

LCAF would be used 7 days per week under normal operations however; there could be periods of time such as long weekends or delays from the material suppliers, in which no fuels may be received at the site. In order to ensure that there is sufficient fuel in hand to sustain regular low carbon alternative fuel substitution, low carbon alternative fuel that is not utilized in a given operating day, would be stored. St. Mary's will require around five (5) days of low carbon alternative fuel supply on-site in storage, to sustain operations over periods in which fuels would not be received at the site. A week's material supply would be in the order of 500 tonnes.

In accordance with ECA (LCAF) Condition 27 the maximum quantity of LCAF materials that would be received/accepted at the site would be 100 tonnes per day.

In accordance with ECA (LCAF) Condition 26 the amount of alternative fuel present at the Facility at any one time will not exceed 500 tonnes. All alternative fuels will be stored in the Alternative Fuels building.

Industrial and/or post-consumer material (demonstration) would be used only during the demonstration period. Due to the varying energy content of the alternative fuels, different amounts of each fuel sources for the demonstration will be required to yield the same amount of energy to substitute for up to 30% of the conventional fuel for the facility. The maximum tonnage/day allowed for the demonstration would be 350 tonnes per day in accordance with the existing ECA for the demonstration project. The maximum quantity of alternative fuel that would be present at the facility at any one time would be 75 tonnes also in accordance with the existing ECA for the demonstration project. Alternative fuel

quantities beyond the 75 tonnes that would be present at any one time, would be provided using a 'just in time' delivery approach.

3.2 Alternative Fuel Reception, Storage and Management

3.2.1 Hours and Days of Operation

Alternative fuel will be accepted at the Site up to 24 hours per day, 7 days per week. The cement plant operates 12 months per year typically on a 24 hours per day, 7 days per week schedule, with a maximum production capacity of 6,500 tonnes of clinker per day. The hours and days of operation are subject to change depending on market demand as well as plant maintenance.

Alternative fuel will be used at the Site in accordance with the relevant ECA approvals, up to 24 hours per day, 7 days per week, subject to fuel availability and in accordance with the scheduled hours and days of operation.

3.2.2 Alternative Fuel Reception, Traffic and Site Access

SMC will accept alternative fuel from sources within the Province of Ontario, in accordance with Condition 28 of both the LCAF and demonstration ECAs.

The alternative fuel will be transported to the site in enclosed trailers. The nominal volumetric capacity of each trailer is approximately 30 cubic meters or about 20 to 25 tonnes depending upon the bulk density of the material. It is estimated that in the order of 4 to 5 trucks per day would deliver low carbon alternative fuel material and 12 to 15 trucks per day would deliver industrial and/or post-consumer material (demonstration) to the plant. The truck route used to access the Bowmanville cement plant would be Hwy 401 (eastbound), exiting onto Waverly Road south to the main access road to the cement plant. At all times the trucks will be travelling on routes that are designed for higher traffic volumes and/or heavy truck traffic.

Each truck will be weighed upon arrival at the Site and directed to the Alternative Fuel building for unloading. The figure below illustrates the route a truck will take upon entering the Site and illustrates the location of the Alternative Fuel building in relation to the rest of the Site.

Figure 2. Alternative Fuels truck delivery route

The following numbered list outlines the procedure trucks will follow as they deliver alternative fuel to the Site.

a) Trucks will exit from the 401 at Waverly Road, turning onto the Bowmanville Plant site access road;

b) Trucks will drive through the two piles yard;

c) Trucks will set position to permit reversing into the Alternative Fuels building;

d) Driver will follow the docking procedure (appendix Q)

e) After unloading is complete, trucks will exit via the same route they came in;

f) Trucks will exit the site onto Waverly Road.

In order to minimize the potential for fugitive emissions from the unloading of the alternative fuels once received at the Bowmanville Plant, material will be unloaded directly from the truck into the Alternative Fuel Building.

Because the fuel is not a subject waste as defined under the Generator Registration Regulation, the material will be accompanied by a straight bill of lading and weight scale ticket. Under the direct supervision of a St. Mary's Cement Ltd. operator (or other designated person) trailer unloading will proceed as follows:

a) The operator will review the information on the bill of lading to ensure that the correct material is being received.

b) The door to building will be opened. The Alternative Fuel Building is equipped with a high speed door, which will only be opened for materials receipt. Appropriate sensors/alarms are installed to notify the operator of the door being opened, and protocols will be in effect so that the door is opened only when required.

c) The truck will back into a designated area within the Alternative Fuel Building. Only appropriate transfer trailers would be received, that can be accommodated within the height and footprint restrictions of the receiving area in order to effectively receive low carbon alternative fuel materials.

d) The doors to the transfer trailer will be opened.

e) The truck will back in to position such that the opening of the transfer trailer aligns with the designated low carbon alternative fuel storage area, and the material will be unloaded.

f) The unloading process will be visually inspected with video surveillance / monitoring from the control room. As back-up, an operator will do a visual inspection in the Alternative Fuels building.

g) The driver will drop off LCAF samples in the designated coolers located outside the alternative fuel building office.

h) Upon completion of unloading, the driver will sweep out any residue remaining in the back of the trailer (especially the tail gate, doors and closure devices) so as to minimize material track out or generation of litter.

i) The driver will close and secure the trailer doors and drive out of the receiving building. A copy of the bill of lading and supplier weight scale ticket will be retained.

3.2.3 Incoming and Outgoing Alternative Fuel Truck Records

Each truck will drive to the alternative fuel building for unloading. A copy of the bill of lading and a weighted scaled ticked (from the supplier) will be retained as part of the record of the delivery. These documents are stored inside a mailbox inside the alternative fuel building. This information will be tracked in the logs retained for the alternative fuel handling.

The daily log book in provided in **Appendix J**.

3.2.4 Alternative Fuel Screening

St Mary's Cement intends to enter into formal agreements for LCAF (woody biomass) supply. It is anticipated that the woody biomass suppliers will be construction and demolition material processing facilities which generate a stream of woody biomass materials that cannot be marketed as 'clean' wood material. In addition, St Mary's Cement will also be sourcing clean wood materials for use as fuel.

The terms of agreement will reflect the requirement of the alternative fuel supplier to screen for and remove materials that would be unacceptable for St Mary's Cement, from

both the perspective of regulatory compliance and in regards to the suitability of the fuel for the cement making process. Screening would be required to ensure that materials containing asbestos, hazardous waste (as defined by O. Reg. 347) are excluded from the woody biomass, and that pressure treated wood containing arsenic and copper (including wood treated with CCA, AZCA, ACQ and CA) are removed (less than 5% of the materials by mass can be comprised of pressure treated wood). Inert materials including rock, concrete, dirt and metals would also be excluded.

Upon securing agreements with LCAF suppliers, St. Mary's will implement an initial fuel testing protocol over a six month 'acceptance period'. This approach will allow for St. Marys to determine if the material quality specifications are being met and will minimize the potential for disruption to stable operations.

The LCAF suppliers are required to provide a sample with each load of material over the initial acceptance period, in order to establish consistency of the material supply and thereafter would be required to randomly sample and test materials on a quarterly basis.

During the six month acceptance period, St. Marys will undertake random inspections at the point of supply performed by a trained operator who is familiar with the desired composition of the alternative fuel. The inspector will be in position so as to safely observe the material as it is being loaded to the transport trailers. If the inspector observes any material in the load which is deemed to be unsuitable for use as a low carbon alternate fuel, loading will cease immediately. Unacceptable materials or conditions could include:

- Excessively wet material. This would include any obvious material that has visible moisture and presence of pools or drips of moisture in or from the material being loaded.
- Oversized material.
- Non-combustible materials. This would include any glass items, metal items, rock or debris that is obviously non-combustible.
- Hazardous materials. This would include any batteries or materials of a potentially hazardous nature.
- Highly odorous materials. This would include any putrescible waste materials.

Once the initial acceptance period is complete and if the LCAF supplier has established that they can consistently meet St. Marys Cement's alternative fuel specifications, the frequency of sampling by St Marys Cement of the size reduced woody biomass fuel will be reduced to a quarterly sampling frequency similar to the sampling protocol for fuel adjunct materials as set out in condition 9.1 of ECA Number 0469-9YUNSK.

The alternative fuel unloading will be recorded, monitored and inspected by a trained operator via video surveillance from the operations control room. If the inspector observes any material in the load which is deemed to be unsuitable for use as an

alternative fuel, unloading will cease immediately and the material will be re-loaded onto the truck and returned to the fuel supplier.

In the event that a load of alternative fuel is rejected, a record will be maintained identifying the reason the load was refused. This record will form part of the daily log included in **Appendix J**.

Alternative fuels for the demonstration will either be visually inspected by SMC personnel or SMC representatives at the point of generation prior to the material being shipped to the Bowmanville site, or it will be inspected upon delivery and unloading at the alternative fuels building. If the inspector observes any material in the load which is deemed to be unsuitable for use as an alternative fuel, loading or unloading will cease immediately.

3.2.5 Alternative Fuel Sampling and Laboratory Testing

SMC has established specifications for the alternative fuel in order to meet both operational and environmental objectives as outlined in Section 3.1.1. Operationally, the plant must ensure that the materials meet specifications related to particle size and moisture content so that the materials are suitable for injection into the main kiln burner. From an environmental standpoint, the metals/metal hydrides scan will be completed in accordance with current adjunct fuel requirements in the Bowmanville Plant ECA (Air).

The alternative fuel feed will be sampled as outlined in the Standard Operating Procedure for Procedure for Alternative Fuel Sampling Methodology for Offsite Fuel Generator Locations Locations (**Appendix E**). Once the initial acceptance period is complete for LCAF, SMC will obtain a will obtain a metals/metal hydrides scan, including at a minimum the compounds listed in

Table 2 on a quarterly basis.

3.2.6 Alternative Fuel Storage

SMC has a dedicated Alternative Fuel Building on the site as the location for the reception, unloading, storage, fuel preparation and feeding of the alternative fuel to the calciner or kiln. This building will also be used to store and manage clean wood materials, also destined as fuel for the cement making process. The bulk unloading and conveying equipment for managing the alternative fuel (and clean wood) is installed within this building.

The Alternative Fuel Building is approximately 30 metres wide by 50 metres long. It is a clear-span metal structure, equipped with four high-speed roll-up doors at the west end of the structure for alternative fuel receipt.

In order to ensure the availability of alternative fuel on a 24/7 basis, a maximum quantity of 500 tonnes of LCAF material would be stored in the building at any one time. The maximum quantity of alternative fuel (demonstration) that would be present at the facility at any one time would be 75 tonnes.

It is expected that each load of alternative fuel will be used within no more than one month of receipt.

Appendix F provides general arrangements for the Alternative Fuel Building.

3.2.7 Alternative Fuel Preparation and Handling

The alternative fuel system will be designed to manage woody biomass with particle sizes in the range of 2 cm minus or demonstration material of 5 cm minus in dimension that has been processed by a licenced facility before shipment.

The fuel preparation and handling system at the Bowmanville cement plant includes the following:

1. A dock station to receive the live bottom trailer in which material will be delivered. The dock station will have a hydraulic system to which the live bottom trailer will be connected for unloading.
2. A hopper for the alternative fuel feeding system where the material will be received. A traffic light will indicate when the system is ready to run.
3. An alternative fuel metering system, consisting of a live bottom feed hopper, elevation drag chain, weigh hopper, and closed tube conveyor belt for transport will be employed. The system design will accommodate feed rates of 1 to 20 tonnes per hour depending on the bulk density of the materials. The system is electronically controlled and specifically designed to handle light and low bulk density materials. Further details are provided below.
4. The system can be adapted to a pneumatic transport system consisting of 15PSI high volume blower, and continuous pipeline to supply the main kiln burner.

Appendix F includes the general arrangements for the alternative fuel handling equipment and storage.

3.2.8 Litter Control

Alternative fuels (LCAF or demonstration material) will not be exposed to the elements and will at all times be contained within either closed trailers (delivery), the Alternative Fuel Building (fuel storage and preparation), or the closed fuel delivery system. The low carbon alternative fuel will be hauled to the site via an enclosed transfer trailer. Except for receipt of the transfer trailers, the doors to the fuel building will remain closed. The alternative fuel will not be exposed to the elements at any time during the storage or feed to the plant.

In the event that circumstances result in the accidental release of litter outside of the Alternative Fuel Building, plant staff will be instructed to immediately inform the Plant's Environmental Manager, who will direct the appropriate resources to remove and secure any litter for disposal.

3.2.9 Odour Control

The potential for odours to be generated / emitted from the use of low carbon alternative fuel will be addressed through the material quality specifications and design of the system. Alternative fuel must meet the moisture requirements set out in the specifications. At the specified moisture levels (<25%) the potential for microbial action and odour generation from the materials is reduced. The alternative fuel will be inspected prior to loading or during unloading to screen for unacceptable material, including material that is excessively wet or odorous.

Alternative fuel will not be exposed to the elements and will at all times be contained within closed trailers (delivery), the enclosed Alternative Fuel Building, or the closed fuel delivery system. Except for receipt of the transfer trailers, the doors to the Alternative Fuel Building will remain closed.

No discernible change in odour is anticipated from regular use of low carbon alternative fuel based on the above measures.

3.2.10 Dust Control

In accordance with Condition 6 of the existing ECA (Air) for the Bowmanville Cement Plant, SMC has developed and implemented a best management practice plan for fugitive particulate (**Appendix G**) that will be adhered to at all times including while utilizing alternative fuels. This plan includes control measures to mitigate fugitive dust emissions in order to minimize the impact on the environment, minimize potential nuisance to the community and ensure compliance with environmental requirements.

Receipt and management of alternative fuel is not anticipated to have any impact on dust at the site, as the alternative fuel will be fully enclosed on the transfer trailers received at the cement plant, and within the Alternative Fuels Building. Features such as the high speed door to the Alternative Fuel Building will assist in controlling dust emissions from

the building. The fuel preparation and fuel delivery system, including conveyors to move the fuel will be fully enclosed.

A dust collector connected to the alternative fuel calciner feeding system and the alternative fuel conveyor system will maintain a slight negative air pressure within the system. This feature is intended to minimize the potential for fugitive particulate emissions from the Facility.

3.2.11 Noise Control

No discernible change in noise is anticipated from regular use of alternative fuels (LCAF or demonstration). The large majority of all alternative fuel operations will take place indoors within the alternative fuel building. Measures such as the use of high speed doors to the alternative fuel building are also proposed to further limit the potential for off-site noise from the fuel handing equipment. As a result it is not expected that the noise associated with alternative fuel operations will have a significant impact on the neighbouring environment.

A detailed Acoustic Assessment Report (AAR) was previously prepared and submitted to the MOE as supporting documentation for SMC's existing approval. This AAR was previously updated to include the proposed changes to the Bowmanville Plant associated with the regular use of low carbon alternative fuel. The updated report presented within the ECA (Air) submission concluded that sound emissions from the Facility are currently within the applicable sound limits as set out in MOE publication NPC-300 and will remain so with the addition of the alternative fuel processing and feed system as previously proposed. With the relocation of the alternative fuel building, a review of the AAR was undertaken, which has determined that the change in location of the building would not change the facility-total sound levels predicted at the most potentially impacted offsite points, and that the change to the new location would be acoustically insignificant.

3.2.12 Bird and Non-bird Vector Control

It is not expected that any measures will be required to control bird and non-bird vectors. The alternative fuel materials will not contain any putrescible organic materials. Furthermore, the alternative fuel will not be exposed to the elements at any time during the storage or feed to the plant.

3.2.13 Site Security and Signage

The Site is operated and maintained in a secure manner to prevent unauthorized persons from entering the Site. The majority of the Site boundary by is fenced. The primary point of access runs west of Waverley Road to the south of the C.N.R. and is the point of access to the cement plant for truck traffic hauling materials to and from the facility as well as plant staff. The site can be accessed the majority of the time, given that the plant is operated 24/7 for the majority of the year. Closed circuit cameras are used to monitor the facility.

A sign is posted and maintained at the primary entrance to the Site, This sign will display the following information in a manner that is clear and legible at a distance of twenty-five metres from the public roadway bordering the Site:

- The name of the Site, the Owner and the Operator
- The number of the Environmental Compliance Approval
- The normal hours of operation
- A telephone number to which complaints could be directed;
- A twenty-four (24) hour emergency telephone number (if different from above); and
- A warning against dumping outside the Site.

3.3 Fuel Feed System

St. Mary's Cement has installed a solid feed system from a manufacturer who specializes in the design and manufacture of bulk solid conveying systems. **Appendix K** includes drawings of this equipment. A brief description of this solid feed system and its normal operation are as follows:

a) Material is loaded into a receiving hopper by live bottom trailer;

b) At the base of the feed hopper is a slowly rotating screw assembly which moves material from the hopper into a discharge chute;

c) From the discharge chute the material flows by gravity onto an incline conveyor;

d) The material discharges from the inclined conveyor onto a horizontal belt which in turn supplies a 120-meter long enclosed tube conveyor;

e) An enclosed hopper/weighfeeder accepts the incoming materials, and meters the material by mass and loss in weight methods to feed airlock and infeed chute to the firing location at the kiln pre calciner inlet;

f) The system can be adapted to also feed fuel pneumatically to the main kiln burner with the addition of a transport air blower and piping system.

The rate of feed of the low carbon alternative fuel to the burner location will be controlled by the control room operator via the system interlocks. A trained operator will be on-site in the Fuel Building and/or the kiln control room 24/7 in order to oversee the operation of the alternative fuel feed mechanism.

Control of the feed rate of the alternative fuel to the kiln will be adjusted by the control room operator according to a control strategy similar to that used for feeding conventional fuels. Specifically, the alternative fuel feed rate will be adjusted in concert with combustion air and clinker production so as to maintain the desired temperature profile and heat balance throughout the system while simultaneously ensuring that adequate residual oxygen is present for efficient combustion.

The system will be interlocked with the plant control systems, so that it will start/stop with the current fuel system, take feed-rate set-points and operating commands from the control room operator and the expert optimizer systems. The system will also have local emergency stop and test controls for clearing any blockages.

A copy of the specifications and manual(s) for the fuel feed equipment are included in **Appendix K**.

3.4 Process Control

There are three critical process control factors for the cement plant operation which can have a significant impact on its performance both from an operational and environmental point of view. These are:

- Management Systems (sometimes also referred to as “administrative controls”)
- Operator Training (development & application of personnel controls)
- Process Equipment

3.4.1 Management Systems

The overall site is under the management and control of the Plant Manager. Reporting to this position are Production Supervisors that are on-site 24 hours per day 365 days/year whose individual responsibilities cover the following areas:

- raw materials and fuel delivery, storage and preparation & product shipping
- kiln operations; and,
- facilitating maintenance activities that affect plant operations [there are also maintenance supervisors that oversee those tasks specifically].

Reporting to the Production Supervisors are workers and operators assigned to their respective areas. All workers and operators within a specific area are trained in the Standard Operating Procedures specific to their work area. In addition, operators are provided with training which is of a more general nature and would apply to workplace activities covered across the plant site. Examples of such general training would include the use of personal protective equipment, spill response and reporting, industrial hygiene practices and emergency response procedures.

In addition to the preceding, there are various non-operational support functions in place which include:

- laboratory
- engineering
- procurement; and,
- training & compliance.

The laboratory operates under the supervision of the plant chemist and is responsible for the routine analysis of all materials received at or shipped from the plant site. In addition, the on-site laboratory performs regular analyses of intermediate production materials (such as raw meal fed to the kiln) to assist in the ongoing plant operations.

Engineering, procurement and training & compliance functions report to corporate management but are continually available to plant management for assistance in the operation, safety and compliance of the site.

The regular use of alternative fuel will involve several different areas of the plant. Senior facility (and corporate) management are responsible for addressing compliance and permitting issues, physical plant and personnel resources and operator training. Engineering and procurement are tasked with equipment specification, design and installation such that the fuel can be received, processed and controlled as required for a successful continued use. These and other functions can all be managed effectively within the existing plant management structure.

SMC is one of only a few companies that have implemented an ISO 14000 compliant Environmental Management System (EMS) for all of its Canadian operations. This ISO 14000 system applies to the Bowmanville cement plant and would apply to all activities on the site including the use of alternative fuels.

The Bowmanville cement plant is IS0 9000 certified. ISO 9000 certification means that this plant conforms to an international standard primarily concerned with “quality management”. The Bowmanville plant adheres to these high standards with regard to fulfilling its customers’ quality requirements, following applicable regulatory requirements, while aiming to enhance customer satisfaction and achieve continual improvement of its performance in pursuit of these objectives.

3.4.2 Operator Training

For the purposes of the alternative fuel project, modifications to existing plant Standard Operating Procedures (SOPs) will be made and employees will be trained in their requirements.

New training requirements will predominantly be focused on the reception of the fuel and on the control equipment additions being made to accommodate the additional fuel feed source.

In accordance with ECA 7024-9XUK4C (LCAF) Condition 42 and ECA 1255-7QVJ2N (Demonstration) Condition 42, a training plan must be submitted to the MOE District Manager a minimum of thirty (30) days prior to the acceptance of any alternative fuel at the Site. The training plan was developed, submitted, implemented and is maintained for any persons that operate the Facility. Only a trained person operates the Facility or carry out any activity associated with the alternative fuel project. The training plan requires that all persons directly involved with activities relating to the Facility have been trained with respect to:

- Relevant waste management legislation, regulations, and guidelines;
- Major environmental concerns pertaining to the waste to be handled;
- Occupational health and safety concerns pertaining to the processes and wastes to be handled;

- Management procedures including the use and operation of equipment for the processes and wastes to be handled;
- Emergency response procedures;
- Specific written procedures for the control of nuisance conditions;
- Specific written procedures for the refusal of unacceptable waste loads;
- The requirements set out in ECA 7024-9XUK4C (waste) for the LCAF and ECA 1255-7QVJ2N (waste) for the demonstration; and,
- The requirements set out in ECA 0469-9YUNSK (Air) for the LCAF and ECA 4614-826K9W for the demonstration.

A record showing that all persons directly involved with activities relating to the Site have been trained, will be maintained at the Site at all times. A trained person will be available at all times during the hours of operation of the Site to supervise all activities related to the alternative fuels project.

A copy of the amended employee training manual for the facility, including the above noted items is included in **Appendix I.**

3.4.3 Process Equipment

The main pieces of process equipment used in the operation of the cement plant relevant to the use of the alternative fuels include the:

- main burner assembly;
- cement kiln;
- calciner;
- pre-heater; and,
- emission control system.

Subsequent sub-sections describe how the processing of alternative fuels may affect operations or environmental performance.

Cement Kiln

No modifications to the kiln are required to accommodate the alternative fuels.

The use of alternative fuels should not adversely impact the operation of the cement kiln because the fuel selected is chemically very similar to the conventional fuels already being used. The thermodynamic properties of the kiln will therefore not be changed.

Similar to conventional fuels, most (over 99.8%) of the inorganic elements and metals present in the alternative fuel will be incorporated into the crystalline matrix of the clinker product . It is of critical commercial importance to St. Mary's Cement that the chemistry of their product is not adversely affected by the use of alternative fuels. SMC

will continue to regularly sample the clinker product in accordance with normal QA/QC protocols.

Calciner

No modifications to the Calciner are required to accommodate the alternative fuels.

Although the low carbon alternative fuel does have a lower heat of combustion than the conventional fuels (30 to 40% of the heat value of conventional fuel), the rate of its introduction into the calciner can be controlled so as to minimize the impact on the flame temperature. The ash content of the alternative fuel should not adversely affect the calciner operation due to the vertical orientation of the calciner vessel and the high degree of turbulence achieved by the burner nozzles.

It is expected that the ash content of the alternative fuel will uniformly blend in with the very much higher mass flow of the conventional raw materials passing down through the pre-heater tower into the calciner.

Pre-Heater

No modifications of the pre-heater is required to accommodate the alternative fuels.

The chemical and thermodynamic properties of the low carbon alternative fuel are very similar to the properties of conventional fuels and will be beneficially absorbed into the raw meal feed (while simultaneously contributing net thermal energy inputs). The performance of the pre-heater assembly will not be affected by the use of alternative fuels.

3.4.4 Instrumentation

A wide array of instruments have been installed in the plant to facilitate the control of operations within the cement production facility. Although much of this instrumentation has indicators or read outs convenient for inspection of localized equipment operating conditions, virtually all of the instrumentation has been tied into a centralized data management system. The data management system has four levels or areas of functionality as follows:

A. Data Acquisition and Recording

Parameters specific to the kiln system are monitored and logged in an electronic data collection system (referred to as OSI PI). The data is compressed and archived for historical record keeping and analysis.

B. Data Display

In the central control room, the kiln operator can simultaneously view a number of video screens displaying a wide range of pre-selected collections of kiln system data. For ease of use and interpretation, all data screens use full colour displays augmented by pictographs representing various process systems (or sub-systems). Data from individual

instruments can be displayed in a full range of formats from simple (instantaneous) numerical values to streaming graphs showing trend lines and control points. In addition to viewing pre-selected collections of instrument data, the operator can “call up” specific instruments for more detailed inspection as system performance warrants it.

C. Computer Control

A high level supervisory Expert Optimizer system takes a range of instrumental inputs and performs repetitive calculations to monitor and model the kiln system performance. From these calculations, and based on historical kiln performance, this variable controller system makes fine adjustments to numerous controlled variables (flow of fuel, raw meal, combustion air, etcetera) designed to optimize overall system performance. The kiln operator can simultaneously view the computer control systems actions and can override changes based on his experience and knowledge of the prevailing plant conditions.

D. Interlocks & Alarms

Many of the operating sub-systems within the overall kiln system are equipped with protection devices designed to preclude select operations from occurring unless certain specified conditions are met. In general these protection devices are referred to as interlocks. An example would be that fuel flow cannot be initiated to a burner assembly until a specific instrument signals that sufficient combustion air flow (and pressure) is present.

In addition to interlocks, most of the systems are equipped with instruments and/or controllers that can generate an alarm if certain conditions are met. In some cases there are multiple alarm points set for a single process variable. An example would be that an alarm is triggered if the temperature of the exhaust gases reaches a certain value. The response to that alarm might be that the computer attempts to reduce the temperature by reducing the fuel flow. If the temperature continues to rise and a second alarm set point is triggered, the computer may make further (more aggressive) changes to one or more process parameters. If the temperature alarm persists beyond some pre-established duration, or rises to a third alarm set point, the computer may then initiate a very conservative action such as to trigger a complete system shut down. As outlined under the previous section of this report (Computer Control), the kiln operator may intervene at some point and override the computer systems intended actions.

The overall system of instrumentation, data acquisition and process controls (both automatic and human controlled) has been designed and refined over decades of cement manufacturing to provide a high level of protection for the employees, the environment, the plant’s capital equipment and the quality of product. The alternative fuel feed system will be interlocked with the existing operating systems at the Bowmanville Plant.

3.5 Emissions Control

All current emission control systems will be run as normal during the alternative fuels project. No modifications to these systems are required. No changes in the operation/performance of these systems is expected during the alternative fuels project because:

- The chemistry of the inorganic portion of the alternative fuel is very similar to that of the conventional fuel so it is reasonable to expect no significant change in the particulate emissions from the process.
- Trace metals (including those which are generally considered of the highest concern environmentally) are already present in the raw materials and fuel fed to the kiln at similar concentrations.

Therefore it is reasonable to expect that the fate of any inorganic compounds introduced into the process with the use of alternative fuel will be similar to that of the elements already being processed.

The following section describes how emissions specific to the alternative fuel delivery and handling system will be controlled.

3.5.1 Alternative Fuel Handling

As described in Section 3.2, alternative fuel will be delivered to the site in totally enclosed transport trailers. The trailers will only be opened once they have been backed into position for unloading into the alternative fuel building. Alternative fuel will be managed entirely within the alternative fuel building and the closed conveyor system to feed the fuel to the cement plant.

As a result of this simple and mechanically robust design, it is anticipated that there will be no emissions to the air from the unloading and transfer of the alternative fuel.

Since the receipt and transfer of the alternative fuel will be performed in an enclosed confined area within the existing operating plant surface water control area and since the fuels will be managed in an enclosed building and equipment, no surface water impacts are expected.

3.6 Site Inspection

A Trained Person (manager, supervisor or operator) will inspect the entire Alternative Fuel Building each day of operation to ensure that: it is secure; that the operation is not causing any nuisances; that the operation is not causing any adverse effects on the environment and that alternative fuel system is being operated in compliance with the ECA. On each operating day, a visual inspection of the following areas associated with the use of the low carbon alternative fuel will be carried out:

- Loading/unloading area;

- Storage area; and,
- Fuel Delivery system.

A record of any relevant observations of the inspections will be kept in the shift supervisor daily production log in electronic format.

For the Alternative Fuel demonstration a separate log book will be kept.

A copy of the daily log book of the shift supervisor and the alternative fuel demonstration are included in **Appendix J**.

3.7 Start Up and Shut Down Procedures

Before initiating the feed of alternative fuel, the plant will determine that the cement kiln and all associated equipment and systems are in good working order and are performing stably within their design specifications and operating ranges. When stable kiln conditions and the appropriate pre-heater temperatures are achieved, it will be confirmed that:

- the alternative fuel feed mechanism has been energized and tested according to the manufacturer's specifications;
- all interlocks and safeties are energized and operational; and,
- the feed hopper of the feeder contains sufficient alternative fuel

Upon receiving confirmation of all of the preceding, the control room operator will open the control valve admitting flow of alternative fuel into the selected burner assembly. As alternative fuel begins to flow into the burner, the control room operator will trim back the flow of conventional solid fuel while at the same time monitoring critical process and emission parameters for any significant changes. It is anticipated that the computer control system will be capable of adjusting most process flows and conditions in the usual fashion.

To terminate the use of alternative fuel, the control room operator will essentially follow a procedure which is the reverse of the start-up procedure. That is to say, the flow of alternative fuel will be progressively decreased and the flow of conventional solid fuels increased.

3.8 Emergency Measures

Based on decades of operating experience, the plant has a well-established emergency response protocol covering a range of potential unusual circumstances that may arise during the cement manufacturing process. Many of these procedures have been "hardwired" into networks of interlocks and automated control functions. However, for the purpose of the use of alternative fuel, it is appropriate to highlight some of the major emergency measures and the expected responses (both automated and human

initiated). Copies of relevant Standard Operating Procedures are included in **Appendix H**.

3.8.1 Emergency Response Plan

St. Mary's has an existing Emergency Response Plan (ERP) (Emergency Planning and Preparedness Procedure, see **Appendix L**) for the Bowmanville Facility. It is reviewed annually and maintained current at all times. The ERP includes, but is not necessarily limited to:

- Emergency Response Procedures to be undertaken in the event of a spill or process upset, including specific cleanup methods for each different type of alternative fuel or other materials the Site is approved to accept;
- A list of equipment and spill cleanup materials available in case of an emergency; and,
- Notification protocol with names and telephone numbers of persons to be contacted, including persons responsible for the Site, the Ministry's District Office and Spills Action Centre, the local Fire Department, the local Municipality, the local Medical Officer of Health, and the Ministry of Labour, and the names and telephone numbers of waste management companies available for emergency response.

Revisions to the ERP will be made to include appropriate measures for the use of alternative fuel.

Plant personnel will be advised as to the procedures to be employed specific to the operation of the alternative fuel building and feed equipment and training records will be amended to reflect these changes.

The alternative fuel building is located within 90 meters of a fire hydrant. Dry chemical fire extinguishers will be provided within this building and will be available on any vehicles operating within the building.

The ERP is retained in a central location at the Bowmanville Facility, and is accessible for all staff at all times. St. Mary's ensures that the District Manager, the local Municipality and the Fire Department are notified of any changes to the ERP.

The equipment, materials, and personnel requirements outlined in the ERP are immediately available on the Site at all times. The equipment is kept in a good state of repair and in a fully operational condition.

All staff that operate the Site are fully trained in the use of the ERP and in the procedures to be employed in the event of an emergency.

SMC takes appropriate measures to contain and clean up spills or leaks which may result from the operation of the Site and immediately implements the ERP if required.

3.8.2 Termination of Alternative Fuel Processing

If the use of alternative fuel is determined to be adversely affecting operability of the kiln or causing unacceptable environmental emissions, the control room operator has the ability to stop the flow of alternative fuel to the burner assembly by the activation of a stop command. This command is interlocked to the controls of the alternative fuel feed system so that when activated the feed system will be de-energized and alternative fuel flow will terminate. It is expected that the expert system will then make affect the necessary adjustments (such as increasing the flow of conventional solid fuel, decreasing the flow of raw meal, decreasing the flow of combustion air, etcetera) to compensate for the termination of alternative fuel flow.

When the feed system is de-energized, a local alarm will alert the alternative fuel operator. They will then render the system inoperable by closing the isolation valve between the alternative fuel feeder and the kiln process. The system will also cease loading alternative fuel into the feed hopper and advise the control room operator.

3.8.3 Cement Kiln Shut Down

The cement kiln system has an extensive array of interlocks and safety protocols which are designed to automatically engage should a situation arise necessitating a complete kiln shut down. By electing to have the alternative fuel feed system and storage in a separate building (but tied into the interlock system), any emergency which requires the rapid shut down of the cement kiln will not be affected by the alternative fuel system.

3.9 Complaint Response Procedure

SMC has a Standard Operating Procedure for the documentation and response to contacts from the community. The use of alternative fuel does not require any significant changes to be made to this procedure. If a complaint is received at any time including during the use of alternative fuel, the complaint will be responded to according to the following procedure:

- The contact number for complaints is (905) 623-3341; this number is also linked to the plant voicemail.
- The complaint will be recorded and numbered either electronically or in a separate log book along with the following information:
    - The nature of the complaint;
    - If the complaint is odour or nuisance related, the weather conditions and wind direction at the time of the complaint;
    - The name, address and telephone number of the complainant (if provided); and
    - The time and date of the complaint.
- The District MOE office is notified within two days that the complaint is received.

- Appropriate steps to determine the possible cause of the complaint and to eliminate the cause of the complaint will be undertaken; and,
- A report is written, listing the actions taken to resolve the complaint and any recommendations for remedial measures and operational changes to reasonably avoid the recurrence of similar incidents.

Any complaints received at any time including during the use of alternative fuel will be recorded and investigated and will be included in the annual report. This record will note the circumstances of the complaint and an explanation as to whether the complaint could be related to the use of alternative fuel.

3.10 Reporting

3.10.1 Data Collection

A comprehensive raw material and fuel data collection program is currently employed by SMC as part of current operating practice. This program will continue to be used during the use of low carbon alternative fuel to manage the environmental and operational effect of using both conventional fuels and alternative fuel at the cement plant.

3.10.2 Source Testing

Source testing will be required to confirm that the plant is operating according to O.Reg 419. The source testing program will be discussed with the MOE during review of the ECA application package to amend the existing ECA (Air).

The results of any required source testing will be included in the annual report for the regular use of LCAF, and in a final summary report for the demonstration.

3.10.3 Low Carbon Alternative Fuel Testing Protocol

Upon securing agreements with low carbon alternative fuel suppliers, SMC will implement an initial fuel testing protocol over a six month ‘acceptance period’ in which random samples will be taken of the size reduced fuels through a port/outlet in the fuel preparation and delivery system, and tested in the order of once per month. This approach will allow for SMC to determine that the material quality specifications are being met and will minimize the potential for the rejection/return of loads and disruption to stable operations.

The low carbon alternative fuel suppliers will also be required to take random samples and test materials on a bi-weekly basis over the acceptance period, in order to establish consistency of the material supply and thereafter would be required to randomly sample and test materials on a quarterly basis.

Once the initial acceptance period is complete and if the low carbon alternative fuel supplier has established that they can consistently meet SMC’s alternative fuel specifications, the frequency of sampling by SMC of the size reduced woody biomass

fuel will be reduced to a quarterly sampling frequency similar to the sampling of fuel adjunct materials as set out in condition 4. (1) (a) of ECA Number 3779-9BMQW4.

The low carbon alternative fuel feed will be sampled as outlined in the Standard Operating Procedure for Alternative Fuel Sampling (**Appendix E**).

The fuel demonstration material (residuals derived from industrial and/or post-consumer sources) will also be sampled as outlined in the Standard Operating Procedure for Alternative Fuel Sampling (**Appendix E**).

3.10.4 Daily Log

A log will be maintained at the site and will be kept by SMC for a minimum of five years. The log will include daily records of the following information:

- The date;
- The types, amounts and source of the alternative fuel received and used;
- The amount, type and location of any low carbon alternative fuel stored;
- A record of daily inspections related to the alternative fuel system;
- A record of any spills or process upsets related to the use of alternative fuel at the site, the nature of a spill or process upset and the action taken to clean up or correct the spill, the time and date of the spill or process upset and for spills the time that the Ministry and other persons were notified of the spill in fulfillment of the reporting requirements of the EPA; and,
- The signature of the trained personnel responsible for conducting the inspection and completing the report.

3.10.5 Annual Reporting

In accordance with ECA 7024-9XUK4C Condition 53 for the LCAF project, by March 31 on an annual basis SMC will submit an annual report to the Regional Director for the previous calendar year. Each report, at a minimum, will include the following information:

- A yearly summary of volumes of all incoming low carbon alternative fuel, transferred alternative fuel, and residual waste (e.g. rejected fuel);
- Detailed monthly summary of the type, and quantity of all low carbon alternative fuel received at site.
- Average daily amount of low carbon alternative fuel received.
- Maximum amount of low carbon alternative fuel that was received in one day in the past year.
- Amount of low carbon alternative fuel stored on-site as of date of preparation of Annual Report.

- A summary of any complaints, and actions/responses that were received regarding the facility operation related to use of alternative fuel.
- Any environmental and operational problems encountered during operations using alternative fuel and any mitigative actions taken;
- A statement as to compliance with all conditions of approval and with the inspection and reporting requirements of the conditions; and,
- Any recommendations to minimize impacts and improve operations and monitoring programs related to the use of alternative fuel.

In accordance with ECA 1255-7QVJ2N Condition 54 for the demonstration project, within 6 months of the trial SMC will submit an annual report to the Region Director and District manager of the results of the trial. The report, at a minimum, will include the following information:

- A detailed daily summary of the information collected on the daily log book
- A summary of emission data and analysis of the source testing program, Ambient Air Quality Monitoring Program and Continuous Emissions Monitoring Program
- A summary of all the comments received by the SMC from the public, Ministry and other parties during the Demonstration project related to the project
- any environmental and operational problems, that caused or was likely to cause an adverse effect, encountered during the operation of the Facility and during the facility inspections and any mitigative actions taken
- Any recommendations to minimize environmental impacts from the operation of the Facility and to improve Facility operations and monitoring programs in this regard.
- The report must be made available to the public at the site and via internet website

3.11 Decommissioning

Should it be deemed that LCAF will no longer be required at the site, the alternative fuel preparation and fuel handling system within the Alternative Fuel Building would be decommissioned and closed in accordance with an approved closure plan.

All unused alternative fuel would be returned to its point of origin, using a licensed hauler. The alternative fuel handling system would be dismantled and removed from the Site upon closure. SMC would notify the Director that the Site was closed and that the approved closure plan was implemented within ten (10) days after closure of the Site.

Appendix A

ECA (Waste) Number 7024-9XUK4C (including amendments) (LCAF)

Ontario

Ministry of the Environment and Climate Change
Ministère de l'Environnement et de l'Action en matière de changement climatique

ENVIRONMENTAL COMPLIANCE APPROVAL
NUMBER 7024-9XUK4C
Issue Date: November 25, 2015

St. Marys Cement Inc. (Canada)
55 Industrial St
Toronto, Ontario
M4G 3W9

Site Location: 400 Waverley Road
Lot 14 - 16, Concession Broken Front
Clarington Municipality, Regional Municipality of Durham

You have applied under section 20.2 of Part II.1 of the Environmental Protection Act, R.S.O. 1990, c. E. 19 (Environmental Protection Act) for approval of:

a waste disposal site

to be used for the incineration of the following types of waste:

solid non-hazardous waste, limited to woodwaste and woody materials as described in Condition 24 below

Note: Use of the site for any other type of waste is not approved under this environmental compliance approval, and requires obtaining a separate approval amending this environmental compliance approval.

For the purpose of this environmental compliance approval, the following definitions apply:

1. a. "**Approval**" means this entire Approval, issued in accordance with section 39 of the EPA, and includes any schedules to it, the applications and the supporting documentation listed in Schedule "A";

   b. "**Approval (Air)**" means Environmental Compliance Approval (Air) Number 0469-9YUNSK issued to St. Marys Cement Inc. (Canada), under Section 9 of the Environmental Protection Act;

   c. "**Alternative fuels**" includes woodwaste as defined in Reg. 347 and Low Carbon

Alternative Fuels;

d. "**Cement kiln**" means the cement kiln and associated control equipment and continuous emissions monitoring systems, firing Conventional fuels and Alternative fuel, described in the Owner's application, this Approval and in the supporting documentation referred to herein, to the extent approved by this Approval;

e. "**Conventional fuels**" means solid fuels such as, petroleum coke and coal;

f. "**Director**" means any Ministry employee appointed in writing by the Minister pursuant to section 5 of the EPA as a Director for the purposes of Part II.1 of the EPA;

g. "**District Manager**" means the District Manager of the local district office of the Ministry in which the Site is geographically located;

h. "**EPA**" means Environmental Protection Act, R.S.O. 1990, c. E-19, as amended;

i. "**Facility**" means those operations associated with the project, located on the property where the Cement kiln is located;

j. "**Low Carbon Alternative Fuels**" means woody biomass consisting mainly of wood chips with some fragments of plastic, shingles, laminate, surface coatings obtained from industrial and post-consumer sources such as construction and demolition waste, which does not contain asbestos and Hazardous Waste as defined under *O.Reg 347,* and contains:

   (a) less than 10% non-woody material such as plastic, shingles, laminate, surface coatings and other material;
   (b) less than 5% treated wood;
   (c) less than or equal to 1% total halogen content; and
   (d) less than 25% moisture by weight;

k. "**Ministry**" means the Ontario Ministry of the Environment and Climate Change;

l. "**Municipal waste**" means municipal waste as defined in Reg 347;

m. "**Operator**" means any person, other than the Owner's employees, authorized by the Owner as having the charge, management or control of any aspect of the site;

n. "**Owner**" means any person that is responsible for the establishment or operation of the site being approved by this Approval, and includes St. Marys Cement Inc. (Canada), its successors and assigns;

o. "**OWRA**" means the Ontario Water Resources Act, R.S.O. 1990, c. O-40, as amended from time to time;

p. "**PA**" means the Pesticides Act, R.S.O. 1990, c. P-11, as amended from time to time;

q. "**Provincial Officer**" means any person designated in writing by the Minister as a provincial officer pursuant to section 5 of the OWRA or section 5 of the EPA or section 17 of PA;

r. "**Reg. 347**" means Regulation 347, R.R.O. 1990, made under the EPA, as amended from time to time;

s. "**Site**" means the facility located at 400 Waverley Road, Lot 14 - 16, Concession Broken Front, Clarington Municipality, Regional Municipality of Durham;

t. "**Trained person**" means a person knowledgeable in the following through instruction and practice:

i. relevant waste management legislation, regulations and guidelines;
ii. major environmental concerns pertaining to the waste to be handled;
iii. occupational health and safety concerns pertaining to the processes and wastes to be handled;
iv. management procedures including the use and operation of equipment for the processes and wastes to be handled;
v. emergency response procedures;
vi. specific written procedures for the control of nuisance conditions;
vii. specific written procedures for refusal of unacceptable waste loads; and
viii. the requirements of this Approval.

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

TERMS AND CONDITIONS

GENERAL

Compliance

2. Any person authorized to carry out work on or operate any aspect of the Facility shall be notified of this Approval and the conditions herein and all reasonable measures shall be taken to ensure any such person complies with the same.

3. Any person authorized to carry out work on or operate any aspect of the Facility shall comply with the conditions of this Approval.

Build, etc. in Accordance

4. Except as otherwise provided by this Approval, the Facility shall be designed, developed, built, operated and maintained in accordance with the applications for this Approval, the Design and Operating Manual as amended from time to time, and all other supporting documents listed in Schedule "A".

Interpretation

5. Where there is a conflict between a provision of any document, including an application, referred to in this Approval, and the conditions of this Approval, the conditions in this Approval shall take precedence.

6. Where there is a conflict between an application and a provision in any documents listed in Schedule "A", the application shall take precedence, unless it is clear that the purpose of the document was to amend the application and that this Approval includes that change.

7. Where there is a conflict between any two documents listed in Schedule "A", other than an application, the document bearing the most recent date shall take precedence.

8. The requirements of this Approval are severable. If any requirement of this Approval, or the application of any requirement of this Approval to any circumstance, is held invalid or unenforceable, the application of such requirement to other circumstances and the remainder of this Approval shall not be affected thereby.

9. Unless otherwise specified, the obligations set out in this Approval are those of both the Owner and Operator.

Other Legal Obligations

10. The issuance of, and compliance with the conditions of, this Approval does not:

    a. relieve any person of any obligation to comply with any provision of any applicable statute, regulation or other legal requirement; or

    b. limit in any way the authority of the Ministry to require certain steps be taken or to require the Owner and Operator to furnish any further information related to compliance with this Approval.

Adverse Effects

11. Steps shall be taken to minimize and ameliorate any adverse effect on the natural environment or impairment of water quality that results from their operations at the Facility, including such accelerated or additional monitoring as may be necessary to determine the nature and extent of the effect or impairment.

12. Despite an Owner, Operator or any other person fulfilling any obligations imposed by this Approval the Owner, Operator or any other person remains responsible for any contravention of any other condition of this Approval or any applicable statute, regulation, or other legal requirement resulting from any act or omission that caused the adverse effect to the natural environment or impairment of water quality.

Change of Owner

13. The Owner shall notify the Director in writing, and forward a copy of the notification to the District Manager, within thirty (30) days of the occurrence of any changes to:

    a. the ownership of the Facility;

    b. the Operator of the Facility;

    c. the address of the Owner or Operator;

    d. the partners, where the Owner is or at any time becomes a partnership and a copy of the most recent declaration filed under the Business Names Act, R.S.O. 1990, c. B-17 shall be included in the notification; or

    e. the name of the corporation where the Owner is or at any time becomes a corporation, other than a municipal corporation, and a copy of the most current information filed under the Corporations Information Act, R.S.O. 1990, c. C-39 shall be included in the notification.

14. No portion of this Facility shall be transferred or encumbered prior to or after closing of the Facility unless the Director is notified in advance and sufficient financial assurance is deposited with the Ministry to ensure that these conditions will be carried out. In the event of any change in Ownership of the Facility the Owner shall notify the successor of and provide the successor with a copy of this Approval, and the Owner shall provide a copy of the notification to the District Manager and the Director.

Financial Assurance

15. a. No later than April 30, 2016 the Owner shall submit to the Director, Financial Assurance, as defined in Section 131 of the EPA, for the amount of $58,800 within twenty (20) days of the date of issuance of this Approval. This Financial Assurance shall be in a form and amount acceptable to the Director and shall provide sufficient funds for the analysis, transportation, Site clean-up, monitoring and disposal of all quantities of Alternative fuels on-site at any one time. The amount of financial assurance is subject to review at any time by the Director and may be amended at his/her discretion.

    b. No Alternative fuels may be received at the Site unless the Financial Assurance noted in Condition 15(a) above has been accepted by the Director in writing.

16. a. Commencing on March 31, 2020 and at intervals of four (4) years thereafter, the Owner shall submit to the Director, a re-evaluation of the amount of financial assurance to implement the actions required under Condition 15. The re-evaluation shall include an assessment based on any new information relating to the environmental conditions of the Site and shall include the costs of additional monitoring and/or implementation of contingency plans required by the Director upon review of the closure plan and annual reports. The financial assurance must be submitted to the Director within ten (10) days of written acceptance of the re-evaluation by the Director.

b. Commencing on March 31, 2017, the Owner shall prepare and maintain at the Site an updated re-evaluation of the amount of financial assurance required to implement the actions required under Condition 15 for each of the intervening years in which a re-evaluation is not required to be submitted to the Director under Condition 16(a). The re-evaluation shall be made available to the Ministry, upon request.

17. If any Financial Assurance is scheduled to expire or notice is received, indicating Financial Assurance will not be renewed, and satisfactory methods have not been made to replace the Financial Assurance at least sixty (60) days before the Financial Assurance terminates, the Financial Assurance shall forthwith be replaced by cash.

Inspections

18. No person shall hinder or obstruct a Provincial Officer in the performance of their duties, including any and all inspections authorized by the OWRA, the EPA or the PA of any place to which this Approval relates, and without limiting the foregoing to:

a. enter upon the premises where the Facility is located, or the location where the records required by the conditions of this Approval are kept;

b. have access to, inspect, and copy any records required by the conditions of this Approval;

c. inspect the practices, procedures, or operations required by the terms and conditions of this Approval; and

d. sample and monitor for the purposes of assessing compliance with the conditions of this Approval or the EPA, the OWRA or the PA.

Information and Record Retention

19. Any information requested, by the Ministry, concerning the Facility and its operation under this Approval, including but not limited to any records required to be kept by this Approval shall be provided to the Ministry, upon request. Records shall be retained for five (5) years except for as otherwise authorized in writing by the Director.

20. The receipt of any information by the Ministry or the failure of the Ministry to prosecute any person or to require any person to take any action, under this Approval or under any statute, regulation or other legal requirement, in relation to the information, shall not be construed as:

    a. an approval, waiver, or justification by the Ministry of any act or omission of any person that contravenes any term or condition of this Approval or any statute, regulation or other legal requirement; or

    b. acceptance by the Ministry of the information's completeness or accuracy.

CONSTRUCTION

21. The Owner shall provide to the Director and District Manager copies of final layout drawings bearing the stamp of a Professional Engineer prior to the commencement of construction.

OPERATION AND MAINTENANCE

Operation

22. The Facility shall be operated and maintained at all times including management and disposal of all waste in accordance with the EPA, Regulation 347, the conditions of this Approval, and the conditions of the Approval (Air). At no time shall the discharge of a contaminant that causes or is likely to cause an adverse effect be permitted.

23. A Procedures Manual specific to the Facility shall be prepared a minimum of ninety (90) days prior to the acceptance of any Alternative fuels at the Facility. The Procedures Manual shall contain detailed standard operating procedures relating to all aspects of the handling of Alternative fuels at the Facility and shall be maintained current at all times and kept at the Facility in central location that is accessible to Facility personnel. The information required in the Procedures Manual may be incorporated into the Design and Operating Manual required under Condition 51 below.

Approved Waste Types

24. a. The Owner may only accept the following categories of Municipal waste at the Facility for use as Alternative fuels:

        i. Low Carbon Alternative Fuels.

    b. The Owner shall ensure that hazardous waste, liquid industrial waste, processed organic waste, or any waste other than those described in Condition 24a. are not accepted at the Facility.

Approved Limits

25. The Facility is approved to utilize Alternative fuels at a rate not to exceed the restrictions set out in the Approval (Air).

26. The amount of Alternative fuels present at the Facility at any one time shall not exceed 500 tonnes. All Alternative fuels shall be stored in the Alternative fuels building identified in Item 1 of Schedule "A".

27. A maximum of 100 tonnes of Alternative fuels may be received at the Facility per day.

Service Area

28. Only Alternative fuels generated in the province of Ontario shall be received at the Facility:

Hours of Operation

29. Alternative fuels may be accepted at the Facility 24 hours per day, 365 days of the year.

Facility Security and Signage

30. The Facility shall be operated and maintained in a secure manner, such that unauthorized persons cannot enter the Facility.

31. A sign shall be posted and maintained at the main entrance/exit to the Facility displaying in a manner that is clear and legible at a distance of twenty-five metres from the public roadway bordering the Facility. The sign shall contain the following information:

    a. the name of the Facility, the Owner and the Operator;

    b. the number of this Approval;

    c. the normal hours of operation;

    d. the types of Alternative fuels that can be accepted;

    e. a telephone number to which complaints may be directed;

    f. a twenty-four (24) hour emergency telephone number (if different from above); and

    g. a warning against dumping outside the Facility.

32. There shall be no queuing or parking of trucks along Waverly Road that are waiting to enter this Facility.

Receiving

33. All Alternative fuels arriving at the Facility shall be inspected by a Trained person prior to being accepted at the Facility to ensure that the Alternative fuels are being received, managed and utilized in accordance with this Approval, the EPA and Reg. 347.

34. In the event that a load of waste is rejected, a record shall be maintained identifying the reason the waste was refused, the type of waste that was refused and the generator and/or the origin of the waste, if known.

Labelling

35. All on-site storage units containing Alternative Fuel shall be clearly labelled with the type of waste being stored.

Waste Processing

36. 1. No waste processing other than the following shall take place at the Facility:

a. waste sorting to remove incidental wastes;

b. waste screening, using drum and/or magnetic belt separators;

c. size reduction, using a low-speed rotary cutter.

2. All waste processing shall be carried out indoors.

Generated Waste

37. a. All waste generated at the Facility shall be disposed of in accordance with Reg. 347.

b. Only haulers approved by the Ministry shall be used to transport waste from the Facility.

Facility Inspection

38. A Trained Person shall inspect the entire Facility each day the Facility is in operation to ensure that: the Facility is secure; that the operation of the Facility is not causing any nuisances; that the operation of the Facility is not causing any adverse effects on the environment and that the Facility is being operated in compliance with this Approval. Any deficiencies discovered as a result of the inspection shall be remedied immediately, including temporarily ceasing operations at the Facility if needed. On each operating day, a visual inspection of the following areas shall be carried out:

a. loading/unloading area(s);

b. storage, processing and staging area(s); and

c. delivery system area.

39. A record of the inspections shall be kept in the daily log book that includes the following information:

a. the name and signature of person that conducted the inspection;

b. the date and time of the inspection;

c. a list of any deficiencies discovered;

d. any recommendations for action; and

e. the date, time and description of actions taken.

Other approvals

40. No Alternative fuels shall be received at the Facility and no Facility processes and equipment shall be operated unless all approvals under Section 9 of the EPA, where applicable, have been obtained.

41. All direct discharges from this Facility including stormwater run-off shall be managed in accordance with applicable Municipal, Provincial and or Federal Legislation, Regulations and By-laws.

Training

42. a. A training plan shall be submitted to the District Office a minimum of thirty (30) days prior to the acceptance of any Alternative fuels at the Facility. The training plan shall be developed, implemented and maintained for any persons that operate the Facility. Only a Trained Person may operate the Facility or carry out any activity required under this Approval. The training plan shall require that all persons directly involved with activities relating to the Facility have been trained with respect to:

i. relevant waste management legislation, regulations and guidelines;
ii. major environmental concerns pertaining to the waste to be handled;
iii. occupational health and safety concerns pertaining to the processes and wastes to be handled;
iv. management procedures including the use and operation of equipment for the processes and wastes to be handled;
v. emergency response procedures;
vi. specific written procedures for the control of nuisance conditions;
vii specific written procedures for refusal of unacceptable waste loads;
viii. the requirements of this Approval; and
ix. the requirements of the Approval (Air).

b. A record showing that all persons directly involved with activities relating to the Facility have been trained in accordance with the requirements described in Condition 42.a shall be maintained at the Facility at all times.

43. A Trained Person shall be available at all times during the hours of operation of this Facility to supervise any activity required under this Approval.

Complaint Response

44. If at any time a complaint is received regarding the operation of the Facility, the complaint shall be addressed in accordance with the procedures described in Approval (Air).

Emergency Response Plan

45. The Owner shall ensure that the Emergency Response Plan for the Facility is reviewed annually and maintained current at all times. The Emergency Response Plan shall include, but not necessarily be limited to:

a. emergency response procedures to be undertaken in the event of a spill or process upset, including specific clean up methods for each different type of Alternative fuel the Facility is approved to accept;

b. a list of equipment and spill clean up materials available in case of an emergency; and

c. notification protocol with names and telephone numbers of persons to be contacted, including persons responsible for the Facility, the Ministry's District Office and Spills Action Centre, the local Fire Department, the local Municipality, the local Medical Officer of Health, and the Ministry of Labour, and the names and telephone numbers of waste management companies available for emergency response.

46. The Emergency Response Plan shall be retained in a central location on the Facility and shall be accessible to all staff at all times. The Owner shall ensure that the District Office, the local Municipality and the Fire Department are notified of any changes to the Emergency Response Plan.

47. The equipment, materials and personnel requirements outlined in the Emergency Response Plan shall be immediately available on the Facility at all times. The equipment shall be kept in a good state of repair and in a fully operational condition.

48. All staff that operate the Facility shall be fully trained in the use of the Emergency Response Plan and in the procedures to be employed in the event of an emergency.

49. The Owner shall immediately take all measures necessary to contain and clean up any spill or leak which may result from the operation of this Facility and immediately implement the

Emergency Response Plan if required.

Facility Design and Operating Manual

50. The Design and Operating Manual shall be retained at the Facility, kept up to date, and be available for inspection by Ministry staff upon request. The Design and Operating Manual shall contain at a minimum the information specified for a waste processing site as described in the most recent Environmental Compliance Approval guidance material available.

51. Changes to the Design and Operating Manual shall be submitted to the Director for approval.

Daily Log Book

52. A log book or electronic file shall be maintained at the Facility for a minimum of 5 years and shall include daily records of the following information. All amounts must be recorded in metric:

    a. the date;

    b. the types, amounts and sources of Alternative fuels received at the Facility under this Approval;

    c. the amount of each category of waste referred to in Condition 24.a used as Alternative fuels within the kiln;

    d. a record of any waste refusals, including amounts, reasons for refusal and actions taken;

    e. the amounts, types and location of Alternative fuels that are stored at the Facility;

    f. a record of daily inspections required by this Approval;

    g. a record of any spills or process upsets at the Facility, the nature of the spill or process upset and the action taken for the clean up or correction of the spill, the time and date of the spill or process upset, and for spills, the time that the Ministry and other persons were notified of the spill in fulfilment of the reporting requirements in the EPA; and

    h. and the signature of the Trained Personnel conducting the inspection and completing the report.

Annual Report

53. On March 31, 2016, the Owner shall prepare and retain on Site a written report which covers the previous calendar year. Thereafter, by March 31 on an annual basis, the Owner shall prepare and retain on Site a written annual report for the previous calendar year. The report shall include, at a minimum, the following information:

a. a monthly summary of the information required by Condition 52 including an annualized reconciliation between all wastes received and processed at the Site and all residual wastes and processed materials transferred from the Site;

b. a summary of waste loads refused including the generator of the load, the licensed hauler of the load if the generator can not be determined, the date of refusal and reason for refusal of the load;

c. any environmental and operational problems encountered during facility operations and site inspections that were likely to negatively impact the environment, and a description of all mitigative actions taken;

d. a summary of complaints received and a description of all mitigative actions taken;

e. any recommendations to minimize environmental impacts from the operation of the Site and to improve Site operations and monitoring programs in this regard.

Closure Plan

54. When the Owner ceases to receive, process and transfer Alternative fuels at the Facility in accordance with this Approval, the Owner shall promptly clean up the Facility in accordance with the approved Closure Plan included in Item 1 of Schedule "A".

55. Within ten (10) days after closure of the Facility, the Owner shall notify the Director, in writing, the status of the Facility and of the implementation of the approved Closure Plan.

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

1. The reason for Condition 1 is to simplify the wording of the subsequent conditions and define the specific meaning of terms as used in this Approval.

3. The reason for Conditions 2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 19, and 20 is to clarify the legal rights and responsibilities of the Owner and Operator.

4. The reason for Condition 4 is to ensure that the Site is operated in accordance with the applications and supporting documentation submitted by the Owner, and not in a manner which the Director has not been asked to consider.

5. The reasons for Condition 13 are to ensure that the Site is operated under the corporate name which appears on the application form submitted for this approval, to ensure that the Director is informed of any changes and to ensure that the former owners and/or operators of the Site are not involved in any aspect of the charge, management or control of the Site.

6. The reasons for Condition 14 are to restrict potential transfer or encumbrance of the Site without the approval of the Director and to ensure that any transfer of encumbrance can be made only on the basis that it will not compromise compliance with this Approval.

7. The reason for Conditions 15, 16 and 17 is to ensure that sufficient funds are available to the Ministry to clean up the Site in the event that it appears the Owner is unable or unwilling to do so.

8. The reason for Condition 18 is to ensure that appropriate Ministry staff have ready access to the Site for inspection of facilities, equipment, practices and operations required by the conditions in this Approval. This condition is supplementary to the powers of entry afforded a Provincial Officer pursuant to the EPA and OWRA.

9. The reason for Condition 21 is to ensure the availability of accurate record drawings for inspection and information purposes.

10. The reason for Conditions 22, 23, 32, 35, 36, 38, 40 and 41 is to ensure that the Site is operated in a manner which does not result in a nuisance or a hazard to the health and safety of the environment or people.

11. The reasons for Conditions 24, 25, 26, 27 and 28 are to specify the approved service area from which waste may be accepted at the Site, the types of waste that may be accepted at the Site, the amounts of waste that may be stored at the Site and the maximum rate at which the Site may receive and utilize waste, based on the applications and supporting documentation.

12. The reason for Condition 29 is to specify the hours of operation for the Site so that the Site is

operated in a manner which does not result in a nuisance or a hazard to the health and safety of the environment or people.

13. The reason for Condition 30 is to ensure the controlled access and integrity of the Site by preventing unauthorized access when the Site is closed and no site attendant is on duty.

14. The reason for Condition 31 is to ensure that users of the Site are fully aware of important information and restrictions related to Site operations and access under this Approval.

15. The reason for Conditions 33 and 34 is to ensure that all wastes are properly classified to ensure that they are managed, processed and disposed of in accordance with O. Reg. 347, R.R.O. 1990 and in a manner that protects the health and safety of the public and the environment.

16. The reason for Condition 39 is to ensure that detailed records of Site inspections are recorded and maintained for inspection and information purposes.

17. The reason for Conditions 42 and 43 is to ensure that the Site is operated by properly Trained staff in a manner which does not result in a hazard or nuisance to the natural environment or any person.

18. The reason for Condition 44 is to ensure that any complaints regarding Site operations at the Site are responded to in a timely manner.

20. The reasons for Conditions 45, 46, 47, 48 and 49 are to ensure that an Emergency Response Plan is developed and maintained at the Site and that staff are properly trained in the operation of the equipment used at the Site and emergency response procedures.

21. The reasons for Condition 52 are to provide for the proper assessment of effectiveness and efficiency of site design and operation, their effect or relationship to any nuisance or environmental impacts, and the occurrence of any public complaints or concerns. Record keeping is necessary to determine compliance with this Approval, the EPA and its regulations.

22. The reasons for Condition 53 are to ensure that regular review of site development, operations and monitoring data is documented and any possible improvements to site design, operations or monitoring programs are identified. An annual report is an important tool used in reviewing site activities and for determining the effectiveness of site design.

23. The reasons for Condition 54 and 55 are to ensure that the Site is closed in accordance with Ministry standards and to protect the health and safety of the public and the environment.

In accordance with Section 139 of the Environmental Protection Act, you may by written Notice served upon me, the Environmental Review Tribunal and in accordance with Section 47 of the Environmental Bill of Rights, 1993, S.O. 1993, c. 28 (Environmental Bill of Rights), 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 environmental compliance approval or each term or condition in the environmental compliance 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 environmental compliance approval number;
6. The date of the environmental compliance approval;
7. The name of the Director, and;
8. The municipality or municipalities within which the project is to be engaged in.

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

This Notice must be served upon:

The Secretary*
Environmental Review Tribunal
655 Bay Street, Suite 1500
Toronto, Ontario
M5G 1E5

AND

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

AND

The Director appointed for the purposes of
Part II.1 of the Environmental Protection Act
Ministry of the Environment and
Climate Change
135 St. Clair Avenue West, 1st Floor
Toronto, Ontario
M4V 1P5

*** Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 212-6349, Fax: (416) 314-3717 or www.ert.gov.on.ca**

This instrument is subject to Section 38 of the Environmental Bill of Rights, 1993, 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.ebr.gov.on.ca , you can determine when the leave to appeal period ends.

The above noted activity is approved under s.20.3 of Part II.1 of the Environmental Protection Act.

DATED AT TORONTO this 25th day of November, 2015

THIS APPROVAL WAS MAILED
ON Dec. 16, 2015
(Signed)

Dale D. Gable

Dale Gable, P.Eng.
Director
appointed for the purposes of Part II.1 of the
Environmental Protection Act

AN/
c: District Manager, MOECC York-Durham

Janine Ralph, HDR √

Ministry of the Environment and Climate Change
Ministère de l'Environnement et de l'Action en matière de changement climatique

AMENDMENT TO ENVIRONMENTAL COMPLIANCE APPROVAL
NUMBER 7024-9XUK4C
Notice No. 1
Issue Date: March 17, 2017

St Marys Cement (Canada) Inc.
55 Industrial Street, 4th Floor
Toronto, Ontario
M4G 3M9

Site Location: 400 Waverley Road South
Clarington Municipality, Regional Municipality of Durham
L1C 3K3

You are hereby notified that I have amended Approval No. 7024-9XUK4C issued on November 25, 2015 fora waste disposal site (thermal treatment), as follows:

I. This Approval has been amended to recognize the relocation of the Alternative fuel building, to recognize modifications to the fuel feed system including the installation of a conveyor system, and to correct an administrative error.

II. Condition 26 is hereby revoked and replaced by:

26. The amount of Alternative fuels present at the Facility at any one time shall not exceed 500 tonnes. All Alternative fuels shall be stored in the Alternative fuels building identified in Item 3 of Schedule "A".

III. The following Schedule is hereby added:

Schedule "A"

This Schedule forms a part of this Environmental Compliance Approval:

1. Environmental Compliance Approval Application dated May 12, 2014 signed by Ruben Plaza, Environmental Manager, St. Marys Cement Inc. (Canada), including all supporting documentation.

2. Email dated June 6, 2014 from Janine Ralph, HDR Inc., to Andrew Neill, MOECC, providing a revised description of alternative fuels.

3. Environmental Compliance Approval Application dated January 18, 2017 signed by Marc Vermeire, Director of Engineering, Votorantim Cimentos, included the attached report dated January 18, 2017 prepared by Janine Ralph, HDR Corporation.

The reason for this amendment to the Approval is as follows:

1. To recognize the change in building location and changes to on-site Alternative fuel handling equipment, and to correct an administrative error.

This Notice shall constitute part of the approval issued under Approval No. 7024-9XUK4C dated November 25, 2015

In accordance with Section 139 of the Environmental Protection Act, you may by written Notice served upon me and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 142 of the Environmental Protection Act provides that the Notice requiring the hearing shall state:

1. The portions of the environmental compliance approval or each term or condition in the environmental compliance 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.

Pursuant to subsection 139(3) of the Environmental Protection Act, a hearing may not be required with respect to any terms and conditions in this environmental compliance approval, if the terms and conditions are substantially the same as those contained in an approval that is amended or revoked by this environmental compliance approval.

The Notice should also include:

3. The name of the appellant;
4. The address of the appellant;
5. The environmental compliance approval number;
6. The date of the environmental compliance approval;
7. The name of the Director, and;
8. The municipality or municipalities within which the project is to be engaged in.

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

This Notice must be served upon:

The Secretary*****
Environmental Review Tribunal
655 Bay Street, Suite 1500
Toronto, Ontario
M5G 1E5

AND

The Director appointed for the purposes of Part II.1 of the Environmental Protection Act
Ministry of the Environment and Climate Change
135 St. Clair Avenue West, 1st Floor
Toronto, Ontario
M4V 1P5

*** Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 212-6349, Fax: (416) 326-5370 or www.ert.gov.on.ca**

The above noted activity is approved under s.20.3 of Part II.1 of the Environmental Protection Act.

DATED AT TORONTO this 17th day of March, 2017

Dale Gable, P.Eng.
Director
appointed for the purposes of Part II.1 of the
Environmental Protection Act

AN/
c: District Manager, MOECC York-Durham
Janine Ralph, HDR Corporation

Appendix B

ECA (Air) Number 0469-9YUNSK (including amendments) (LCAF)

Ontario

Ministry of the Environment and Climate Change
Ministère de l'Environnement et de l'Action en matière de changement climatique

AMENDED ENVIRONMENTAL COMPLIANCE APPROVAL

NUMBER 0469-9YUNSK
Issue Date: November 25, 2015

St. Marys Cement Inc. (Canada)
55 Industrial Street, 4th Floor
Toronto, Ontario
M4G 3W9

Site Location: Bowmanville Plant
400 Waverley Road
Clarington Municipality, Regional Municipality of Durham

You have applied under section 20.2 of Part II.1 of the Environmental Protection Act, R.S.O. 1990, c. E. 19 (Environmental Protection Act) for approval of:

Description Section

A cement manufacturing facility, consisting of the following processes and support units:

- quarry operations - limestone extraction, processing and shipping;
- raw material and fuel processing, storage and handling;
- clinker production- kiln and calciner operations;
- cement production including ball mills, cement storage and shipping;

including the *Equipment* and any other ancillary and support processes and activities, operating at a *Facility Production Limit* of up to a **clinker production rate of 2.4 million tonnes per year,** discharging to the air as described in the *Original ESDM Report.*

For the purpose of this environmental compliance approval, the following definitions apply:

1. "*Acceptable Point of Impingement Concentration"* means a concentration accepted by the *Ministry* as not likely to cause an adverse effect for a *Compound of Concern* that,

   (a) has no *Ministry Point of Impingement Limit* and no *Jurisdictional Screening Level*, or

   (b) has a concentration at a *Point of Impingement* that exceeds the *Jurisdictional Screening Level*.

   With respect to the *Original ESDM Report*, the *Acceptable Point of Impingement Concentration* for a *Compound of Concern* mentioned above is the concentration set out in the *Original ESDM Report.*

2. "*Acoustic Assessment Report"* means the report, prepared in accordance with *Publication NPC-233* and Appendix A of the *Basic Comprehensive User Guide*, by Corey Kinart, P.Eng. / HGC Engineering, dated May 13, 2014 submitted in support of the application, that documents all sources of noise emissions and *Noise Control Measures* present at the *Facility*, as updated in accordance with Condition 5 of this *Approval.*

3. "*Acoustic Assessment Summary Table"* means a table prepared in accordance with the *Basic Comprehensive User Guide* summarising the results of the *Acoustic Assessment Report*, as updated in accordance with Condition 5 of this *Approval.*

4. "*Alternative Fuels"* means Woodwaste as defined in *O.Reg. 347* and *Low Carbon Alternative Fuels.*

5. "*Approval"* means this entire Environmental Compliance Approval and any *Schedules* to it.

6. "*Baseline Conditions"* means operating conditions which include the use of *Conventional Fuel, Fuel Adjunct Materials* and *Industrial By-Product Materials* in the *Cement Kiln.*

7. "*Basic Comprehensive User Guide"* means the *Ministry* document titled "Basic Comprehensive Certificates of Approval (Air) User Guide" dated March 2011, as amended.

8. "*Best Management Practices Plan"* means the document titled "St. Marys Cement Inc., Cement Plant Operations - Bowmanville Site, Best Management Practices Plan for the Control of Fugitive Dust Emissions" Revision 2, dated February, 2014, as amended.

9. "*CAEAL"* means the Canadian Association for Environmental Analytical Laboratories.

10. "*Cement Kiln"* means the cement kiln and the calciner, firing *Conventional Fuels, Alternative Fuels* and *Fuel Adjunct Materials*, described in the *Company's* application, this *Approval* and in the supporting documentation referred to herein, to the extent approved by this *Approval.*

11. "*CEM System"* means the continuous monitoring and recording system used to measure the emissions and operational parameters of the *Cement Kiln.*

12. "*Company"* means St. Marys Cement Inc. (Canada) that is responsible for the construction or operation of the *Facility* and includes any successors and assigns in accordance with section 19 of the *EPA.*

13. "*Compound of Concern"* means a contaminant described in paragraph 4 subsection 26 (1) of *O. Reg. 419/05;* namely, a contaminant that is discharged from the *Facility* in an amount that is not negligible.

14. "*Conventional Fuels"* means solid fuels including petroleum coke and coal for regular firing and also includes diesel, propane and natural gas for preheating during start-up.

15. "*Description Section"* means the section on page one of this *Approval* describing the *Company's* operations and the *Equipment* located at the *Facility* and specifying the *Facility Production Limit* for the *Facility*.

16. "*Director"* means a person appointed for the purpose of section 20.3 of the *EPA* by the *Minister* pursuant to section 5 of the *EPA.*

17. "*District Manager"* means the District Manager of the appropriate local district office of the *Ministry,* where the *Facility* is geographically located.

18. "*Emission Summary Table"* means a table described in paragraph 14 of subsection 26 (1) of *O. Reg. 419/05;* namely a table in the *ESDM Report* that compares the *Point of Impingement* concentration for each *Compound of Concern* to the corresponding *Ministry Point of Impingement Limit, Acceptable Point of Impingement Concentration,* or *Jurisdictional Screening Level.*

19. "*Environmental Assessment Act"* means the Environmental Assessment Act, R.S.O. 1990, c.E.18, as amended.

20. "*EPA"* means the Environmental Protection Act, R.S.O. 1990, c.E.19, as amended.

21. "*Equipment"* means equipment or processes described in the *ESDM Report,* this *Approval* and in the *Schedules* referred to herein and any other equipment or processes.

22. "*Equipment with Specific Operational Limits"* means the *Cement Kiln* and any *Equipment* directly involved in the thermal oxidation of waste or waste derived fuels, fume incinerators or any other *Equipment* that is specifically referenced in any published *Ministry* document that outlines specific operational guidance that must be considered by the *Director* in issuing an *Approval.*

23. "*ESDM Report"* means the most current Emission Summary and Dispersion Modelling Report that describes the *Facility.* The *ESDM Report* is based on the *Original ESDM Report* and is updated after the issuance of this *Approval* in accordance with section 26 of *O. Reg. 419/05* and the *Procedure Document.*

24. "*Facility"* means the entire operation located on the *Property* where the *Equipment* is located.

25. "*Facility Production Limit"* means the production limit placed by the *Director* on the main product(s) or raw materials used by the *Facility.*

26. "*Fuel Adjunct Materials"* means solid fuel, wholly used at the *Facility,* as supplementary fuels to coal and petroleum coke for firing the *Cement Kiln* , such as but not limited to carbon dust, metallurgical coke and carbon black, but which does not include *Alternative Fuels.*

27. "*Industrial By-Product Materials"* means industrial by-product materials such as but not limited to iron slag from smelting industry, fly ash from coal fired generating plants, ash from waste water treatment plants and foundry sand used in casting processes, wholly used at the *Facility* as substitute raw material sources of calcium oxide, silica, iron oxide and alumina required for the ongoing cement manufacturing process and which do not serve as fuel for the *Cement Kiln.*

28. "*Jurisdictional Screening Level"* means a screening level for a *Compound of Concern* that is listed in the *Ministry* publication titled "Jurisdictional Screening Level (JSL) List, A Screening Tool for Ontario Regulation 419: Air Pollution - Local Air Quality", dated February 2008, as amended.

29. "*Log"* means a document that contains a record of each change that is required to be made to the *ESDM Report* and *Acoustic Assessment Report,* including the date on which the change occurred. For example, a record would have to be made of a more accurate emission rate for a source of contaminant, more accurate meteorological data, a more accurate value of a parameter that is related to a source of contaminant, a change to a *Point of Impingement* and all changes to information associated with a *Modification* to the *Facility* that satisfies Condition 2.

30. "*Low Carbon Alternative Fuels"* means woody biomass consisting mainly of wood chips with some fragments of plastic, shingles, laminate, surface coatings obtained from industrial and post-consumer sources such as construction and demolition waste, which does not contain asbestos and hazardous waste as defined under *O.Reg 347,* and contains:

    (a) less than 10% non-woody material such as plastic, shingles, laminate, surface coatings and other material;
    (b) less than 5% treated wood;
    (c) less than or equal to 1% total halogen content; and
    (d) less than 25% moisture by weight;

31. "*Manager"* means the Manager, Technology Standards Section, Standards Development Branch, or any other person who represents and carries out the duties of the Manager, Technology Standards Section, Standards Development Branch, as those duties relate to the conditions of this *Approval.*

32. "*Maximum Emissions Scenario"* means maximum emissions scenario as outlined in the *Original ESDM Report.*

33. "*Minister"* means the Minister of the Environment and Climate Change or such other member of the Executive Council as may be assigned the administration of the *EPA* under the Executive Council Act.

34. "*Ministry* " means the ministry of the *Minister*.

35. "*Ministry Point of Impingement Limit"* means the applicable Standard set out in Schedule 2 or 3 of *O. Reg. 419/05* or a limit set out in the *Ministry* publication titled "Summary of Standards and Guidelines to support Ontario Regulation 419/05: Air Pollution - Local Air Quality (including Schedule 6 of *O. Reg. 419/05* on Upper Risk Thresholds", dated April 2012, as amended.

36. "*Modification"* means any construction, alteration, extension or replacement of any plant, structure, equipment, apparatus, mechanism or thing, or alteration of a process or rate of production at the *Facility* that may discharge or alter the rate or manner of discharge of a *Compound of Concern* to the air or discharge or alter noise or vibration emissions from the *Facility*.

37. "*Noise Control Measures"* means measures to reduce the noise emissions from the *Facility* and/or *Equipment* including, but not limited to, silencers, acoustic louvres, enclosures, absorptive treatment, plenums and barriers.

38. "*O. Reg. 347"* means Ontario Regulation 347, General - Waste Management, as amended.

39. "*O. Reg. 419/05"* means Ontario Regulation 419/05, Air Pollution – Local Air Quality, as amended.

40. "*Original ESDM Report"* means the Emission Summary and Dispersion Modelling Report which was prepared in accordance with section 26 of *O. Reg. 419/05* and the *Procedure Document* by BCX Environmental Consulting and dated May 10, 2014 submitted in support of the application, and includes any changes to the report made up to the date of issuance of this *Approval*.

41. "*Point of Impingement"* has the same meaning as in section 2 of *O. Reg. 419/05*.

42. "*Point of Reception"* means Point of Reception as defined by *Publication NPC-300*.

43. "*Pre-Test Plan"* means a plan for the *Source Testing* including the information required in Section 5 of the *Source Testing Code*.

44. "*Procedure Document"* means *Ministry* guidance document titled "Procedure for Preparing an Emission Summary and Dispersion Modelling Report" dated March 2009, as amended.

45. "*Processes with Significant Environmental Aspects"* means the *Equipment* which, during regular operation, would discharge one or more contaminants into the air in an amount which is not considered as negligible in accordance with section 26 (1) 4 of *O. Reg. 419/05* and the *Procedure Document*.

46. "*Property"* means the entire property excluding all operations in the dock area.

47. "*Publication NPC-207"* means the *Ministry* draft technical publication "Impulse Vibration in Residential Buildings", November 1983, supplementing the Model Municipal Noise Control By-Law, Final Report, published by the *Ministry*, August 1978, as amended.

48. "*Publication NPC-233"* means the *Ministry* Publication NPC-233, "Information to be Submitted for Approval of Stationary Sources of Sound", October, 1995, as amended.

49. "*Publication NPC-300"* means the *Ministry* Publication NPC-300, “Environmental Noise Guideline, Stationary and Transportation Sources – Approval and Planning, Publication NPC-300”, August 2013, as amended.

50. "*Schedules"* means the following schedules attached to this *Approval* and forming part of this *Approval* namely:

    Schedule A - Supporting Documentation
    Schedule B - Performance Requirements - In-Stack Emission Limits
    Schedule C - Process Dust Control Equipment Operational Requirements
    Schedule D - Material Analysis Contaminants
    Schedule E - *Alternative Fuels* Operational Requirements
    Schedule F - Procedure for *Source Testing*
    Schedule G - Test Sources and Test Contaminants - *Source Testing*
    Schedule H - *CEM System* Requirements - Opacity

51. "*Source Testing"* means sampling and testing to measure emissions resulting from operating the test sources under conditions which yield the worst case emissions within the approved operating range of the test sources which satisfies paragraph 1 of subsection 11(1) of O. Reg. 419/05.

52. "*Source Testing Code"* means the Ontario Source Testing Code, dated June 2010, prepared by the *Ministry*, as amended.

53. "*Toxicologist"* means a qualified professional currently active in the field of risk assessment and toxicology that has a combination of formal university education, training and experience necessary to assess contaminants.

54. "*Written Summary Form"* means the electronic questionnaire form, available on the *Ministry* website, and supporting documentation, that documents the activities undertaken at the *Facility* in the previous calendar year.

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

TERMS AND CONDITIONS

1. GENERAL

1.1 Except as otherwise provided by this *Approval*, the *Facility* shall be designed, developed, built, operated and maintained in accordance with the terms and conditions of this *Approval* and in accordance with the following *Schedules* attached hereto:

Schedule A - Supporting Documentation
Schedule B - Performance Requirements - In-Stack Emission Limits
Schedule C - Process Dust Control Equipment Operational Requirements
Schedule D - Material Analysis Contaminants
Schedule E - *Alternative Fuels* Operational Requirements
Schedule F - Procedure for *Source Testing*
Schedule G - Test Sources and Test Contaminants - *Source Testing*
Schedule H - *CEM System* Requirements - Opacity

2. LIMITED OPERATIONAL FLEXIBILITY

2.1 Pursuant to section 20.6 (1) of the *EPA* and subject to Conditions 2.2 and 2.3 of this *Approval*, future construction, alterations, extensions or replacements are approved in this *Approval* if the future construction, alterations, extensions or replacements are *Modifications* to the *Facility* that:

(a) are within the scope of the operations of the *Facility* as described in the *Description Section* of this *Approval;*

(b) do not result in an increase of the *Facility Production Limit* above the level specified in the *Description Section* of this *Approval;* and

(c) result in compliance with the performance limits as specified in Condition 4.

2.2 Condition 2.1 does not apply to,

(a) the addition of any new *Equipment with Specific Operational Limits* or to the *Modification* of any existing *Equipment with Specific Operational Limits* at the *Facility;*

(b) *Modifications* to the *Facility* that would be subject to the *Environmental Assessment Act;* and

(c) *Modifications* to the *Facility* that would alter the type of *Alternative Fuels* or increase the quantity of *Alternative Fuels* specified in **Schedule E** of this *Approval.*

2.3 Condition 2.1 of this *Approval* shall expire ten (10) years from the date of this *Approval*, unless this *Approval* is revoked prior to the expiry date. The *Company* may apply for renewal of Condition 2.1 of this *Approval* by including an *ESDM Report* and an *Acoustic Assessment Report* that describes the *Facility* as of the date of the renewal application.

3. REQUIREMENT TO REQUEST AN *ACCEPTABLE POINT OF IMPINGEMENT CONCENTRATION*

3.1 Prior to making a *Modification* to the *Facility* that satisfies Condition 2.1 (a) and (b), the *Company* shall prepare a proposed update to the *ESDM Report* to reflect the proposed *Modification*.

3.2 The *Company* shall request approval of an *Acceptable Point of Impingement Concentration* for a *Compound of Concern* if the *Compound of Concern* does not have a *Ministry Point of Impingement Limit* and a proposed update to an *ESDM Report* indicates that one of the following changes with respect to the concentration of the *Compound of Concern* may occur:

(a) The *Compound of Concern* was not a *Compound of Concern* in the previous version of the *ESDM Report* and

(i) the concentration of the *Compound of Concern* is higher than the *Jurisdictional Screening Level* for the contaminant; or

(ii) there is no *Jurisdictional Screening Level* for the contaminant.

(b) The concentration of the *Compound of Concern* in the updated *ESDM Report* is higher than:

(i) the most recent *Acceptable Point of Impingement Concentration*, and

(ii) the *Jurisdictional Screening Level* if a *Jurisdictional Screening Level* exists.

3.3 The request required by Condition 3.2 shall propose a concentration for the *Compound of Concern* and shall contain an assessment, performed by a *Toxicologist*, of the likelihood of the proposed concentration causing an adverse effect at *Points of Impingement*.

3.4 If the request required by Condition 3.2 is a result of a proposed *Modification* described in Condition 3.1, the *Company* shall submit the request, in writing, to the *Director* at least 30 days prior to commencing to make the *Modification*. The *Director* shall provide written confirmation of receipt of this request to the *Company*.

3.5 If a request is required to be made under Condition 3.2 in respect of a proposed *Modification* described in Condition 3.1, the *Company* shall not make the *Modification* mentioned in Condition 3.1 unless the request is approved in writing by the *Director*.

3.6 If the *Director* notifies the *Company* in writing that the *Director* does not approve the request, the *Company* shall,

(a) revise and resubmit the request; or

(b) notify the *Director* that it will not be making the *Modification*.

3.7 The re-submission mentioned in Condition 3.6 shall be deemed a new submission under Condition 3.2.

3.8 If the *Director* approves the request, the *Company* shall update the *ESDM Report* to reflect the *Modification.*

3.9 Condition 3 does not apply if Condition 2.1 has expired.

4. PERFORMANCE LIMITS

4.1. Subject to Condition 4.2, the *Company* shall not discharge or cause or permit the discharge of a *Compound of Concern* into the air if,

(a) the *Compound of Concern* has a *Ministry Point of Impingement Limit* and the discharge results in the concentration at a *Point of Impingement* exceeding the *Ministry Point of Impingement Limit;* or

(b) the *Compound of Concern* does not have a *Ministry Point of Impingement Limit* and the discharge results in the concentration at a *Point of Impingement* exceeding the higher of,

(i) if an *Acceptable Point of Impingement Concentration* exists the most recent *Acceptable Point of Impingement Concentration*, and

(ii) the *Jurisdictional Screening Level* if a *Jurisdictional Screening Level* exists.

4.2 Condition 4.1 does not apply if the *Ministry Point of Impingement Limit* has a 10-minute averaging period and no ambient monitor indicates an exceedance at a *Point of Impingement* where human activities regularly occur at a time when those activities regularly occur.

4.3 The *Company* shall, at all times, ensure that the noise emissions from the *Facility* comply with the limits set in *Ministry Publications NPC-300.*

4.4 The *Company* shall ensure that the vibration emissions from the *Facility* comply with the limits set out in *Ministry Publication NPC-207.*

4.5 The *Company* shall operate any *Equipment with Specific Operational Limits* approved by this *Approval* in accordance with the *Original ESDM Report.*

4.6 The *Company* shall ensure that at all times when *Alternative Fuels* are co-fired with *Conventional Fuels* in the *Cement Kiln,* the discharge from the *Cement Kiln* complies with the performance requirements specified in **Schedule B** of this *Approval.*

4.7 The *Company* shall ensure that there is no increase in the emissions of sulphur dioxide and oxides of nitrogen when *Alternative Fuels* are co-fired with *Conventional Fuels* in the *Cement Kiln,* as demonstrated by the *CEM System.*

5. DOCUMENTATION REQUIREMENTS

5.1. The *Company* shall maintain an up-to-date *Log.*

5.2. No later than April 30 in each year, the *Company* shall update the *Acoustic Assessment Report* and shall update the *ESDM Report* in accordance with section 26 of *O. Reg. 419/05* so that the information in the reports is accurate as of December 31 in the previous year.

5.3. The *Company* shall make the *Emission Summary Table* (see section 27 of *O. Reg. 419/05)* and *Acoustic Assessment Summary Table* available for examination by any person, without charge, by posting it on the Internet or by making it available during regular business hours at the *Facility*.

5.4 The *Company* shall, within three (3) months after the expiry of Condition 2.1 of this *Approval,* update the *ESDM Report* and the *Acoustic Assessment Report* such that the information in the reports is accurate as of the date that Condition 2.1 of this *Approval* expired.

5.5. Conditions 5.1 and 5.2 do not apply if Condition 2.1 has expired.

6. REPORTING REQUIREMENTS

6.1 Subject to Condition 6.2, the *Company* shall provide the *Director* no later than July 31 of each year, a *Written Summary Form* to be submitted through the *Ministry's* website that shall include the following:

(a) a declaration of whether the *Facility* was in compliance with section 9 of the *EPA, O. Reg. 419/05* and the conditions of this *Approval;*

(b) a summary of each *Modification* satisfying Condition 2.1 (a) and (b) that took place in the previous calendar year that resulted in a change in the previously calculated concentration at a *Point of Impingement* for any *Compound of Concern* or resulted in a change in the sound levels reported in the *Acoustic Assessment Summary Table* at any *Point of Reception.*

6.2 Condition 6.1 does not apply if Condition 2.1 has expired.

7. OPERATION AND MAINTENANCE

7.1 The *Company* shall prepare, update as necessary and implement, not later than six (6) months from the date of this *Approval,* operating procedures and maintenance programs for all *Processes with Significant Environmental Aspects*, which shall specify as a minimum:

(a) frequency of inspections and scheduled preventative maintenance;

(b) procedures to prevent upset conditions;

(c) procedures to minimize all fugitive emissions;

(d) procedures to prevent and/or minimize odorous emissions;

(e) procedures to prevent and/or minimize noise emissions;

(f) acceptable ranges of the static pressure drop for the process dust control equipment listed in **Schedule C** of this *Approval;*

(g) program to monitor and record the pressure differential across each of the primary dust collectors as specified in **Schedule C** of this *Approval,* including the frequency of measurement and procedures to investigate and correct the cause of any anomalous measurements of the static pressure drop;

(h) list of management and supervisory personnel responsible for the operation and maintenance of process dust control equipment specified in **Schedule C** of this *Approval;* and

(i) procedures for record keeping activities relating to the operation and maintenance programs.

7.2 The company shall maintain and update to keep current, a list of all process dust control equipment, including the following details:

Source identification; Production building/area served; Process/location served; Stack gas flow rate; Filter area; Stack diameter and Stack height above grade.

7.3 The *Company* shall ensure that all *Processes with Significant Environmental Aspects* are operated and maintained in accordance with this *Approval,* the operating procedures and maintenance programs.

8.0 START-UPS, SHUTDOWN AND UPSET PROCEDURES

8.1 The *Company* shall update as necessary, not later than six (6) months from the date of issue of this *Approval,* operating procedures which address kiln start-ups, shut down and any upset conditions.

9.0 MATERIAL ANALYSIS AND CRITERIA FOR ACCEPTANCE

The *Company* shall ensure that a material analysis program to measure and record the concentration of contaminants for the following material is implemented:

9.1 *Industrial By-Product Material* or *Fuel Adjunct Material*

(a) For each material used as *Fuel Adjunct Materials,* the *Company* shall obtain a metals/metal hydrides scan, including at a minimum the contaminants listed in **Schedule D** on a quarterly or Lot basis, as applicable. The *Company* shall ensure that the standard sampling methods outlined in the document "Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario, Ontario Ministry of the Environment and Energy, Standards Development Branch, December, 1996" are used, and that the samples are submitted to a *CAEAL* certified laboratory for analysis.

(b) For each material used as *Industrial By-Product Materials*, the *Company* shall obtain a metals/metal hydrides scan, including at a minimum the contaminants listed in **Schedule D**, on a quarterly or Lot basis, as applicable. The *Company* shall ensure that the standard sampling methods outlined in the document "Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario, Ontario Ministry of the Environment and Energy, Standards Development Branch, December, 1996" are used, and that the samples are submitted to a *CAEAL* certified laboratory for analysis.

(c) At any time, should the *Company* either independently or through other sources reasonably expect other metal/metal hydrides not outlined under **Schedule D** to be present in any material at greater than the trace concentrations, the *Company* shall obtain the appropriate analysis forthwith.

(d) Upon receipt of the analysis, the *Company* shall ensure that the *Point of Impingement* concentrations of metal/metal hydrides identified in (c) above do not exceed the respective limit based on the *Maximum Emissions Scenario.*

(e) The *Company* shall limit the accumulation of *Industrial By-Product Materials* and other raw materials in exterior storage piles to amounts which may reasonably be expected to be necessary for use in the cement manufacturing processes.

(f) The *Company* shall ensure that any *Industrial By-Product Material* stored at the *Facility* which the *Company* determines cannot be utilized in ongoing cement manufacturing processes, is managed in accordance with applicable waste management regulations, and, where an *Industrial By-Product Material* becomes unusable, the *Company* shall advise the *District Manager* in writing, of the type and quantity of such material, the reasons why it cannot be used and the specific manner in which the material is to be managed as a waste.

10.0 *ALTERNATIVE FUELS*

10.1 The *Company* shall ensure that the *Facility/Equipment* is properly designed and operated at all times while firing *Alternative Fuels* and comply with the operational requirements set out in **Schedule E** of this *Approval.*

10.2 The *Company* shall, in consultation with the *District Manager*, update as necessary and implement, not later than three (3) months from the date of first firing of *Alternative Fuels* in the *Cement Kiln,* operating procedures provided in section 8 of the Design and Operations Report specified in **Schedule A** of this *Approval,* which addresses *Alternate Fuels* start-up and shut-down, emergency and contingency measures and termination of *Alternative Fuel* processing. *Alternative Fuels* shall be fired in accordance with these operating procedures and shall only be fired once the *Cement Kiln* has achieved normal operation, temperatures and production and shall be introduced only in the high-temperature combustion zones of the kiln and the calciner.

10.3 The firing of *Alternative Fuels* shall be stopped (following appropriate procedures) if:

(a) the temperature, residual oxygen or pressure as measured by the specified measuring equipment do not meet the operational requirements outlined in **Schedule E** of this *Approval* for more than four (4) consecutive hours; or

(b) the measuring equipment such as the *CEM System* for one or more of the parameters specified in condition 10.3 (a) are down or malfunctioning for more than four (4) consecutive hours.

10.4 Analysis and Criteria for Acceptance

(a) A *Low Carbon Alternative Fuels* testing protocol over a minimum six (6) month period shall be implemented in accordance with sections 6.1.3 and 10.3 of the Design and Operations Report specified in **Schedule A** of this *Approval*, to establish consistency in the *Low Carbon Alternative Fuels* characteristics.

(b) After the successful completion of the testing protocol described in condition 10.4 (a), the *Company* shall update the procedure as necessary for sampling and analysis titled "Alternative Low-Carbon Fuel Sampling Methodology, Revision 1" provided as Appendix G of the Design and Operations Report. The updated procedure shall be provided to the *District Manager* not later than two (2) months before the planned first use of *Alternative Fuels* at the *Facility*.

(c) During the regular use of *Alternative Fuels*, the *Company* shall conduct sampling and analysis in accordance with the updated sampling and analysis procedure in condition 10.4 (b).

10.5 If the results of the analysis specified in condition 10.4 (c) indicate that emission rates of contaminants from the Kiln Stack are higher than the maximum emission rates identified in the *Maximum Emission Scenario*, the *Company* shall update the *ESDM Report* with the emission rates derived from this analysis.

10.6 The *Company* shall record the following data during *Cement Kiln* Operation:

(a) hourly combined raw feed;

(b) *Fuel Adjunct Material* and *Industrial By-Product Material* for relevant period;

(c) hourly *Alternative Fuels* and *Conventional Fuels* firing rates in the kiln and calciner;

(d) hourly clinker production; and

(e) records of incidents specified in condition 10.3 of this *Approval.*

11. SOURCE TESTING

11.1 The *Company* shall perform *Source Testing* in accordance with the procedure in **Schedule F** to determine the rate of emission of the test contaminants from the sources specified in **Schedule G**. The first *Source Testing* shall be conducted not later than six (6) months after the first use of any of the *Alternative Fuels* in the *Cement Kiln.*

11.2 Subsequent *Source Testing* shall be conducted once every calendar year in accordance with the procedure in **Schedule F** to determine the rate of emission of the test contaminants from the sources specified in **Schedule G**, for the use of *Low Carbon Alternative Fuels* and/or Woodwaste as defined under *O.Reg.347,* if any of these materials are used in the previous calendar year.

11.3 The *District Manager* may relax the frequency and/or scope of *Source Testing* if the results of the annual *Source Testing* indicate that the emissions and *Point of Impingement* concentrations of *Compounds of Concern* are insignificant when substituting a portion of *Conventional Fuel* with *Alternative Fuels.*

12. CONTINUOUS EMISSIONS MONITORING

12.1 Continuous Emissions Monitoring in the Kiln Stack

(a) The *Company* shall ensure that the existing *CEM System* is fully operational at all times to continuously monitor the following parameters in the exhaust gas stream from the Kiln Stack:

(i) Nitrogen Oxides
(ii) Sulphur Dioxide
(iii) Opacity

(b) The *CEM System* for nitrogen oxides and sulphur dioxide shall comply with the requirements of O.Reg. 194/05 – Industry Emissions – Nitrogen Oxides and Sulphur Dioxide, as amended from time to time.

(c) The *CEM System* for monitoring opacity shall comply with the requirements outlined in **Schedule H.**

12.2 Continuous Emissions Monitoring of Process Conditions

12.2.1 The *Company* shall install, operate and maintain a *CEM System* to continuously monitor:

(a) the concentration of residual oxygen and carbon monoxide in the backend of the kiln and calciner down comer duct;

(b) the temperatures of gases leaving the kiln at a point where the gas temperature reaches a minimum of 1000 Deg. C for a period of not less than 6 seconds;

(c) the temperatures of gases leaving the calciner at a point where the gas temperature reaches a minimum of 850 Deg. C for not less than 3 seconds; and

(d) Total Hydrocarbon (as methane) in the gases leaving the Kiln Stack.

12.2.2 The *Company* shall submit to the *Manager,* not later than ninety (90) days prior to the first use of *Alternative Fuels* in the *Cement Kiln,* a detailed continuous monitoring plan, complete with specifications for the *CEM System* for the parameters specified in condition 12.2.1 of this *Approval.* The *Company* shall finalize the continuous monitoring plan in consultation with the *Manager.*

12.2.3 The *Company* shall ensure that the *CEM System* specified in condition 12.2.1 are installed, commissioned, operated and maintained in accordance with the finalized monitoring plan referenced in condition 12.2.2 prior to the first use of *Alternative Fuels*.

12.3 Continuous Emissions Monitoring Documentation

12.3.1 The *Company* shall prepare and retain on site monthly reports of the data monitored during the preceding month by the *CEM System,* summarizing the following as a minimum:

(a) the daily minimum, maximum and average readings for the parameters specified in condition 12 of this *Approval;*

(b) the type and hourly firing rate of fuels used during the period the readings were taken;

(c) the percent availability of the *CEM System* for the parameters specified in condition 12 of this *Approval.*

(d) operational status (on/off) of the raw mill and the fuel mill.

12.3.2 The *Company* shall establish the normal operating total hydrocarbons range for *Baseline Conditions.* After the first use of any of the *Alternative Fuels,* the *Company* shall, at a minimum on a quarterly basis, review the *CEM System* monthly reports and identify and investigate any anomalous total hydrocarbons data. The investigations report shall be prepared and retained on site.

12.3.3 The *Company* shall retain on site, all raw data generated by the *CEM System.*

13. FUGITIVE EMISSIONS CONTROL

13.1 The *Company* shall update as necessary and implement the *Best Management Practices Plan* for the control of fugitive dust emissions.

Documentation Requirements - *Best Management Practices Plan*

13.2 The *Company* shall record and retain such records, each time a specific preventative and control measure described in the *Best Management Practices Plans* is implemented. The *Company* shall record, as a minimum:

(a) the date when each emission control measure is implemented, including a description of the control measure;

(b) the date when each new preventative measure or operating procedure to minimize emissions is implemented, including a description of the preventative measure or operating procedure; and

(c) the date, time of commencement, and time of completion of each periodic activity conducted to minimize emissions, including a description of the preventative measure/procedure and the name of the individual performing the periodic activity.

14. COMPLAINTS RECORDING AND REPORTING

14.1 If at any time, the *Company* receives an environmental complaint from the public regarding the operation of the *Equipment* approved by this *Approval,* the *Company* shall take the following steps:

(a) Record and number each complaint, either electronically or in a log book. The record shall include the following information: the time and date of the complaint and incident to which the complaint relates, the nature of the complaint, wind direction at the time and date of the incident to which the complaint relates and, if known, the address of the complainant.

(b) Notify the *District Manager* of the complaint within two (2) business days after the complaint is received, or in a manner acceptable to the *District Manager.*

(c) Initiate appropriate steps to determine all possible causes of the complaint and take the necessary actions to appropriately deal with the cause of the subject matter of the complaint attributable to the operations at the *Facility.*

(d) Complete and retain on-site a report written within one (1) week of the complaint date. The report shall list the actions taken to appropriately deal with the cause of the complaint and set out steps to be taken to avoid the recurrence of similar incidents.

15. RECORD KEEPING REQUIREMENTS

15.1 Any information pertaining to compliance with the *EPA, Regulation 419/05* and this *Approval* requested by any employee in or agent of the *Ministry,* concerning the *Facility* and its operation under this *Approval,* including, but not limited to, any records required to be kept by this *Approval,* shall be provided to the employee in or agent of the *Ministry,* upon request, in a timely manner.

15.2 Unless otherwise specified in this *Approval,* the *Company* shall retain, for a minimum of five (5) years from the date of their creation all reports, records and information described in this *Approval,* including,

(a) a copy of the *Original ESDM Report* and each updated version*;*

(b) a copy of each version of the *Acoustic Assessment Report;*

(c) supporting information used in the emission rate calculations performed in the *ESDM Reports* and *Acoustic Assessment Reports;*

(d) the records in the *Log;*

(e) copies of each *Written Summary Form* provided to the *Ministry* under Condition 6.1 of this *Approval;*

(f) records of maintenance, repair and inspection of *Equipment* related to all *Processes with Significant Environmental Aspects;*

(g) all records related to environmental complaints made by the public as required by Condition 14 of this *Approval;*

(h) records related to *Source Testing* events specified under section titled “Source Testing” of this *Approval;*

(i) records related to the operation of the *CEM System* specified under section titled “Continuous Emission Monitoring” of this *Approval;*

(j) records related to the preventative and control measures implemented as specified under section titled “Fugitive Emissions Control” of this *Approval;* and

(k) records related to sampling and analysis specified under sections titled “Material Analysis and Criteria of Acceptance” and “Alternative Fuels” of this *Approval.*

16. REVOCATION OF PREVIOUS APPROVALS

This *Approval* replaces and revokes all Certificates of Approval (Air) issued under section 9 *EPA* and Environmental Compliance Approvals issued under Part II.1 *EPA* to the *Facility* in regards to the activities mentioned in subsection 9(1) of the *EPA* and dated prior to the date of this *Approval,* except Environmental Compliance Approval No. 4614-826K9W dated November 5, 2014.

SCHEDULE A

Supporting Documentation

(a) Application for Environmental Compliance Approval (Air & Noise), dated May 9, 2014, signed by Ruben Plaza and submitted by the C*ompany.*

(b) Emission Summary and Dispersion Modelling Report, prepared by BCX Environmental Consulting and dated May 10, 2014.

(c) Additional air emissions and dispersion modelling related information provided by BCX Environmental Consulting dated April 1, 2015, May 26 & 27, 2015 and July 23, 2015.

(d) Report titled "Bowmanville Cement Plant - Design and Operations Report, Environmental Compliance Approval for Regular Use of Low Carbon Alternative fuel (Woody Biomass)", prepared by HDR Engineering and dated May 2014.

(e) Acoustic Assessment Report, prepared by Corey Kinart, P.Eng. / HGC Engineering, dated May 13, 2014.

SCHEDULE B

Performance Requirements- In-Stack Emission Limits

Parameter	Kiln Stack Emission Limit	Verification of Compliance
Particulate Matter (PM)	50 mg/Rm^3	Results from compliance source testing
Cadmium (Cd)	7 µg/Rm3	Results from compliance source testing
Lead (Pb)	60 µg/Rm3	Results from compliance source testing
Mercury (Hg)	20 µg/Rm3	Results from compliance source testing
Dioxins and Furans	80 pg/Rm^3 as ITEQ	Results from compliance source testing; results expressed as I-TEQ.
Hydrochloric Acid (HCl)	27 mg/Rm^3	Results from compliance source testing
Opacity	In accordance with s. 46 of *O.Reg 419/05*	Calculated as the rolling arithmetic average of 6 minutes of data measured by a *CEM System* that provides data at least once every minute.

Notes:

R - Reference flue gas conditions, defined as follows:
- Temperature 25 °C
- Pressure 101.3 kPa
- Oxygen content 11%
- Water content nil (dry conditions)

mg/Rm3 - milligrams per cubic metre of gas at Reference conditions.
µg/Rm3 - micrograms per cubic metre of gas at Reference conditions.
pg/Rm3 - picograms per cubic metre of gas at Reference conditions.
I-TEQ - a toxicity equivalent concentration calculated using the toxic equivalency factors (I-TEFs) derived for each dioxin and furan congener by comparing its toxicity to the toxicity of 2,3,7,8 tetrachloro dibenzo-p-dioxin, recommended by the World Health Organization (WHO) dioxin toxicity equivalence factors (TEFs) in 2005, and adopted by Ontario in April 2012.

SCHEDULE C

PROCESS DUST CONTROL EQUIPMENT OPERATIONAL REQUIREMENTS

Primary Dust Control Equipment

Primary dust control equipment includes the Kiln Baghouse; Bypass Baghouse, Fuel Mill Baghouse; Cooler Baghouse and Finish Mill Baghouses.

The static pressure drop across the primary dust control equipment filter bag compartments shall be measured and recorded continuously by the *Facility's* automated control system.

Secondary Dust Control Equipment

Secondary dust control equipment includes all other fabric filter dust collectors which are not primary dust control equipment.

The static pressure drop across the secondary dust control equipment filter bag compartments shall be measured and recorded at least quarterly.

Where applicable, the static pressure drop must be referenced to the value recorded during previous testing. In the absence of previous testing values, the parameter must be referenced to the value or normal range representing normal operation, recorded as soon as possible.

SCHEDULE D

MATERIAL ANALYSIS CONTAMINANTS

1. Antimony
2. Arsenic
3. Barium
4. Beryllium
5. Cadmium
6. Chromium
7. Cobalt
8. Iron
9. Lead
10. Manganese
11. Mercury
12. Nickel
13. Selenium
14. Silver
15. Tin
16. Vanadium
17. Total Halogens

SCHEDULE E

ALTERNATE FUELS OPERATIONAL REQUIREMENTS

Parameter	Limits	Measurement
Total Quantity of *Alternative Fuels* combusted in the *Cement Kiln.*	No more than the lesser of: (a) 4 tonnes per hour, or (b) 4% substitution of *Conventional fuels*, based on heating value.	Measured continuously.
Temperature in the *Cement Kiln*	Greater than 1000 Deg. C at a gas residence time of more than 6 seconds in the kiln. Greater than 850 Deg. C at a gas residence time of more than 3 seconds in the calciner.	Measured by the *CEM System.* Calculated as a rolling 1-hour arithmetic average measured by the *CEM System.*
Residual oxygen	>1% residual oxygen at the backend (raw material feed end) of the kiln. >3% residual oxygen at the calciner down comer duct (raw material feed end of the calciner)	Measured by the *CEM System* and calculated by volume on a dry basis in the undiluted gases leaving the kiln and calciner. Calculated as a rolling 1-hour arithmetic average measured by the *CEM System.*
Pressure Control	Kiln, Calciner, Preheater tower and Raw Mill must be operated under negative pressure at all times.	Measured at the top of the preheater towers and in Raw Mill by continuous monitor.
Start-Up, Shut-down and Upset Operating Conditions	No *Alternative Fuels* shall be used.	-

SCHEDULE F

Procedure for *Source Testing*

1. The *Company* shall submit, not later than three (3) months prior to the *Source Testing*, to the *Manager* a *Pre-Test Plan* for the *Source Testing* required under this *Approval*. The *Company* shall finalize the *Pre-Test Plan* in consultation with the *Manager*.

2. The first *Source Testing* shall be carried out for the following individual fuel firing scenarios at the maximum approved fuel firing rate in the kiln and the calciner. The characteristics of *Low Carbon Alternative Fuels* used during *Source Testing* shall be within the range established under Condition 10.4 - Analysis and Criteria for Acceptance of this *Approval:*

   (1) *Baseline Conditions;*
   (2) Approved substitution rate of *Conventional Fuels* with *Low Carbon Alternative Fuels;* and/or
   (3) Approved substitution rate of *Conventional Fuels* with Woodwaste as defined under *O.Reg.347*.

3. Subsequent annual *Source Testing* as described in condition 11.2 of this *Approval* shall be carried out for the maximum approved substitution rate of *Low Carbon Alternative Fuels* and/or Woodwaste as defined under *O.Reg.347*, as applicable.

4. The *Company* shall not commence the *Source Testing* required under this *Approval* until the *Manager* has approved the *Pre-Test Plan.*

5. The *Company* shall notify the *Manager*, the *District Manager* and the *Director* in writing of the location, date and time of any impending *Source Testing* required by this *Approval*, at least fifteen (15) days prior to the *Source Testing.*

6. The *Company* shall submit a report (hardcopy and electronic format) on the *Source Testing* to the *Manager and* the *District Manager* not later than four (4) months after completing the *Source Testing*, or not later than a time frame agreed in writing with the *Manager*. The report shall be in the format described in the *Source Testing Code*, and shall also include, but not be limited to:

   (1) an executive summary;
   (2) records of operating conditions at the time of *Source Testing* and other information including but not limited to:

      (i) clinker production rate in tonnes/hour;
      (ii) *Conventional fuel, Low Carbon Alternative Fuels* and/or Woodwaste firing rate in tonnes/hour separately in the kiln and calciner;
      (iii) quantity and type of *Fuel Adjunct Materials* and *Industrial By-Product Materials* used; and
      (iv) any other records that may affect the *Source Testing* results;

SCHEDULE F (Continued)

Procedure for *Source Testing*

(3) results of *Source Testing,* including the emission rate, emission concentration and relevant emission factor of the Test Contaminants;

(4) a summary of all records of the *CEM System* available for the parameters specified in condition 12 of this *Approval* at the time of *Source Testing;*

(5) a summary table that compares the *Source Testing* results to the emission estimates described in the *Company* 's application, the *ESDM Report* and the Performance Limits; and

(6) a comparison of stack analysis data between use of *Conventional fuel, Low Carbon Alternative Fuels* and Woodwaste for the first *Source Testing* of the relevant material; and a description and explanation of any statistically significant changes in emissions of the Test Contaminants, resulting from the use of *Alternative Fuel,* relative to *Baseline Conditions.*

7. The *Company* shall ensure that the *Source Testing* report is made available and easily accessible for review by the public at the *Facility,* immediately after the document is submitted to the *Ministry.*

8. The *Director* may not accept the results of the *Source Testing* if:

(1) the *Source Testing Code* or the requirements of the *Manager* were not followed;

(2) the *Company* did not notify the *District Manager,* the *Manager* and the *Director* of the *Source Testing;* or

(3) the *Company* failed to provide a complete report on the *Source Testing.*

9. If the *Director* does not accept the results of the *Source Testing,* the *Director* may require re-testing. If re-testing is required, the *Pre-Test Plan* strategies need to be revised and submitted to the *Manager* for approval. The actions taken to minimize the possibility of the *Source Testing* results not being accepted by the *Director* must be noted in the revision.

10. If the *Source Testing* results are higher than the emission estimates in the *Company's ESDM Report,* the *Company* shall update their *ESDM Report* in accordance with Section 26 of *O. Reg. 419/05* with the results from the *Source Testing* report and make these records available for review by staff of the *Ministry* upon request. The updated Emission Summary Table from the updated *ESDM Report* shall be submitted with the report on the *Source Testing.*

SCHEDULE G

Test Sources and Test Contaminants - *Source Testing*

Test Sources

Source ID	Description	Frequency
Kiln Stack	Main stack serving the *Cement Kiln*	In accordance with condition 11 of this *Approval.* The schedule between two consecutive tests should not be less than six (6) months

Test Contaminants

Total Suspended Particulate Matter
Ammonia
Hydrogen Chloride

Metals		Volatile Organic Matter
Cd	Cadmium	Acetone
Be	Beryllium	Acrolein
Pb	Lead	Benzene
Mo	Molybdenum	Bromodichloromethane
Cr	Chromium	Bromoform
Ni	Nickel	Bromomethane
V	Vanadium	Butadiene, 1,3 -
Al	Aluminum	Butanone, 2 -
Ti	Titanium	Carbon Tetrachloride
Mg	Magnesium	Chloroform
B	Boron	Cumene
Ba	Barium	Dibromochloromethane
P	Phosphorus	Dichlorodifluoromethane
K	Potassium	Dichloroethane, 1,2 -
Hg	Mercury	Dichloroethene, Trans - 1,2
As	Arsenic	Dichloroethene, 1,1 -
Zn	Zinc	Dichloropropane, 1,2 -
Sb	Antimony	Ethylbenzene
Mn	Manganese	Ethylene Dibromide
Co	Cobalt	Mesitylene
Se	Selenium	Methylene Chloride
Cu	Copper	Styrene
Ag	Silver	Tetrachloroethene
Sn	Tin	Toluene
Sr	Strontium	Trichloroethane, 1,1,1 -
Tl	Thalium	Trichloroethene
Fe	Iron	Trichloroethylene, 1,1,2 -
		Trichlorotrifluoroethane
		Trichlorofluoromethane
		Xylenes, M-, P- and O
		Vinyl Chloride

SCHEDULE G (Continued)

Polycyclic Organic Matter
Acenaphthylene
Acenaphthene
Anthracene
Benzo(a)anthracene
Benzo(b)fluoranthene
Benzo(k)fluoranthene
Benzo(a)fluorene
Benzo(b)fluorene
Benzo(ghi)perylene
Benzo(a)pyrene *
Benzo(e)pyrene
Biphenyl
2-Chloronaphthalene
Chrysene
Coronene
Dibenzo(a,c)anthracene
Dibenzo(a,h)anthracene
Dibenzo(a,e)pyrene
9,10-Dimethylanthracene
7,12-Dimethylbenzo(a)anthracene
Fluoranthene
Fluorene
Indeno(1,2,3-cd)pyrene
2-Methylanthracene
3-Methylcholanthrene
1-Methylnaphthalene
2-Methylnaphthalene
1-Methylphenanthrene
9-Methylphenanthrene
Naphthalene
Perylene
Phenanthrene
Picene
Pyrene
Tetralin
M-terphenyl
O-terphenyl
P-terphenyl
Triphenylene

* Benzo(a)Pyrene (B(a)P) standard and upper Risk Threshold (URT) are considered surrogate for all POMs that do not have their own standards or guidelines. For O.Reg.419/05 reporting, before July 2016, if the existing guideline is exceeded, B(a)P as a surrogate will be assessed against the URT. After July 1, 2016, it will be assessed against the new standard.

SCHEDULE G (Continued)
Dioxins, Furans and Dioxin-like PCBs (Polychlorinated Biphenyls)

Toxicity equivalency factors (TEFs) are applied to 29 isomers of dioxins, furans and dioxin-like PCBs to convert them into 2,3,7,8-CDD (tetrachlorodibenzo-p-dioxin) toxicity equivalents. The conversion involves multiplying the concentration of the isomer by the appropriate TEF to yield the TEQ for this isomer. Summing the individual TEQ values for each of the isomers provides the total toxicity equivalent level for the sample mixture.

A table listing the 29 isomers and their TEFs can be found in the MOE publication titled: Summary of Standards and Guidelines to Support Ontario Regulation 416-05 – Air Pollution - Local Air Quality, PIBS 6569e01 dated April 2012 and as noted below.

Example:

No.	Dioxins, Furans, and Dioxin-like PCBs	CASRN	WHO_{2005} Toxic Equivalency Factors [TEFs]
1	2,3,7,8-Tetrachlorodibenzo-p-dioxin [2,3,7,8-TCDD]	1746-01-6	1
2	1,2,3,7,8-Pentachlorodibenzo-p-dioxin [1,2,3,7,8-PeCDD]	40321-76-4	1
3	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin [1,2,3,4,7,8-HxCDD]	39227-28-6	0.1
4	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin [1,2,3,6,7,8-HxCDD]	57653-85-7	0.1
5	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin [1,2,3,7,8,9-HxCDD]	19408-74-3	0.1
6	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin [1,2,3,4,6,7,8-HpCDD]	35822-46-9	0.01
7	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin [1,2,3,4,6,7,8,9-OCDD]	3268-87-9	0.0003
8	2,3,7,8-Tetrachlorodibenzofuran [2,3,7,8-TCDF]	51207-31-9	0.1
9	1,2,3,7,8-Pentachlorodibenzofuran [1,2,3,7,8-PeCDF]	57117-41-6	0.03
10	2,3,4,7,8-Pentachlorodibenzofuran [2,3,4,7,8-PeCDF]	57117-31-4	0.3
11	1,2,3,4,7,8-Hexachlorodibenzofuran [1,2,3,4,7,8-HxCDF]	70648-26-9	0.1

12	1,2,3,6,7,8-Hexachlorodibenzofuran [1,2,3,6,7,8-HxCDF]	57117-44-9	0.1
13	1,2,3,7,8,9-Hexachlorodibenzofuran [1,2,3,7,8,9-HxCDF]	72918-21-9	0.1
14	2,3,4,6,7,8-Hexachlorodibenzofuran [2,3,4,6,7,8-HxCDF]	60851-34-5	0.1
15	1,2,3,4,6,7,8-Heptachlorodibenzofuran [1,2,3,4,6,7,8-HpCDF]	67562-39-4	0.01
16	1,2,3,4,7,8,9-Heptachlorodibenzofuran [1,2,3,4,7,8,9-HpCDF]	55673-89-7	0.01
17	1,2,3,4,6,7,8,9-Octachlorodibenzofuran [1,2,3,4,6,7,8,9-OCDF]	39001-02-0	0.0003
18	3,3',4,4'-Tetrachlorobiphenyl [3,3',4,4'-tetraCB (PCB 77)]	32598-13-3	0.0001
19	3,4,4',5- Tetrachlorobiphenyl [3,4,4',5-tetraCB (PCB 81)]	70362-50-4	0.0003
20	3,3',4,4',5- Pentachlorobiphenyl (PCB 126) [3,3',4,4',5-pentaCB (PCB 126)]	57465-28-8	0.1
21	3,3',4,4',5,5'- Hexachlorobiphenyl [3,3',4,4',5,5'-hexaCB (PCB 169)]	32774-16-6	0.03
22	2,3,3',4,4'- Pentachlorobiphenyl [2,3,3',4,4'-pentaCB (PCB 105)]	32598-14-4	0.00003
23	2,3,4,4',5- Pentachlorobiphenyl [2,3,4,4',5-pentaCB (PCB 114)]	74472-37-0	0.00003
24	2,3',4,4',5- Pentachlorobiphenyl [2,3',4,4',5-pentaCB (PCB 118)]	31508-00-6	0.00003
25	2',3,4,4',5- Pentachlorobiphenyl [2',3,4,4',5-pentaCB (PCB 123)]	65510-44-3	0.00003
26	2,3,3',4,4',5- Hexachlorobiphenyl [2,3,3',4,4',5-hexaCB (PCB 156)]	38380-08-4	0.00003

27	2,3,3',4,4',5'- Hexachlorobiphenyl [2,3,3',4,4',5'-hexaCB (PCB 157)]	69782-90-7	0.00003
28	2,3',4,4',5,5'- Hexachlorobiphenyl [2,3',4,4',5,5'-hexaCB (PCB 167)]	52663-72-6	0.00003
29	2,3,3',4,4',5,5'- Heptachlorobiphenyl [2,3,3',4,4',5,5'-heptaCB (PCB 189)]	39635-31-9	0.00003

NOTE:

* Sum of toxicity equivalents of individual isomers

The TEF scheme is intended to be used with isomer specific analytical results. In cases where results are reported by congener group only, staff at *Ministry's* Standards Development Branch shall be contacted for appropriate procedures to convert non-isomer specific data to TEQs.

SCHEDULE H
CEM System Requirements - Opacity

INSTALLATION: The *CEM System* shall be installed at an accessible location where the measurements are representative of the total emissions from the Kiln Main Stack, and shall meet the following installation specifications:

	PARAMETERS	SPECIFICATION
1	Wavelength at Peak Spectral Response (nanometres, nm):	500 - 600
2	Wavelength at Peak Spectral Response (nanometres, nm):	500 - 600
3	Detection angle of view:	≤ 5 degrees
4	Angle of projection:	≤ 5 degrees
5	Range (percent of opacity):	0 -100

PERFORMANCE: The *CEM System* for opacity monitoring shall meet the following minimum performance specifications for the following parameters.

	PARAMETERS	SPECIFICATION
1	Span Value (percent opacity):	2 times the average normal opacity of the source
2	Calibration Error:	≤ 3 percent opacity
3	Attenuation Calibration:	≤ 2 percent opacity
4	Response Time (95 percent response to a step change)	≤ 10 seconds
5	Schedule for Zero and Calibration Checks:	daily minimum
6	Procedure for Zero and Calibration Checks:	all system components checked
7	Zero Calibration Drift (24-hours):	≤ 2 percent opacity
8	Span Calibration Drift (24-hours):	≤ 2 percent opacity
9	Conditioning Test Period:	≥ 168 hours without corrective maintenance
10	Operational Test Period:	≥ 168 hours without corrective maintenance

CALIBRATION: The monitor shall be calibrated, to ensure that it meets the drift limits specified above, during the periods of the operation of the Equipment. The results of all calibrations shall be recorded at the time of calibration.

DATA RECORDER: The data recorder must be capable of registering continuously the measurement of the monitor with an accuracy of 0.5 percent of a full scale reading or better and with a time resolution of 30 seconds or better.

RELIABILITY: The monitor shall be operated and maintained so that accurate data is obtained during a minimum of 90 percent of the time for each calendar quarter during the first full year of operation, and 95 percent, thereafter.

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

GENERAL

1. Condition No. 1 is included to require the *Approval* holder to build, operate and maintain the *Facility* in accordance with the Supporting Documentation in Schedule A considered by the *Director* in issuing this *Approval.*

LIMITED OPERATIONAL FLEXIBILITY, REQUIREMENT TO REQUEST AN *ACCEPTABLE POINT OF IMPINGEMENT CONCENTRATION* AND *PERFORMANCE LIMITS*

2. Condition Nos. 2, 3 and 4 are included to limit and define the *Modifications* permitted by this *Approval,* and to set out the circumstances in which the *Company* shall request approval of an *Acceptable Point of Impingement Concentration* prior to making *Modifications.* The holder of the *Approval* is approved for operational flexibility for the *Facility* that is consistent with the description of the operations included with the application up to the *Facility Production Limit.* In return for the operational flexibility, the *Approval* places performance based limits that cannot be exceeded under the terms of this *Approval. Approval* holders will still have to obtain other relevant approvals required to operate the *Facility,* including requirements under other environmental legislation such as the *Environmental Assessment Act.*

DOCUMENTATION REQUIREMENTS

3. Condition No. 5 is included to require the *Company* to maintain ongoing documentation that demonstrates compliance with the *Performance Limits* of this *Approval* and allows the *Ministry* to monitor on-going compliance with these *Performance Limits.* The *Company* is required to have an up to date *ESDM Report* and *Acoustic Assessment Report* that describe the *Facility* at all times and make the *Emission Summary Table* and *Acoustic Assessment Summary Table* from these reports available to the public on an ongoing basis in order to maintain public communication with regard to the emissions from the *Facility.*

REPORTING REQUIREMENTS

4. Condition No. 6 is included to require the *Company* to provide a yearly *Written Summary Form* to the *Ministry,* to assist the *Ministry* with the review of the site's compliance with the *EPA,* the regulations and this *Approval.*

OPERATION AND MAINTENANCE

5. Condition Nos. 7, 8, 9 and 10 and are included to require the *Company* to properly operate and maintain the *Processes with Significant Environmental Aspects* to minimize the impact to the environment from these processes.

TESTING

6. Condition Nos. 11 and 12 are included to require the *Company* to gather and retain accurate information so that compliance with the *EPA, Regulation 419/05* and this *Approval* may be verified.

FUGITIVE EMISSIONS CONTROL

7. Condition No. 13 is included to emphasize that the *Equipment* and *Facility* must be maintained and operated in accordance with a procedure that will result in compliance with the *EPA, Regulation 419/05* and this *Approval* and to require the *Company* to keep records and to provide information to staff of the *Ministry* so that compliance with the *EPA, Regulation 419/05* and this *Approval* may be verified.

COMPLAINTS RECORDING AND REPORTING

9. Condition No. 14 is included to require the *Company* to respond to any environmental complaints regarding the operation of the *Equipment,* according to a procedure that includes methods for preventing recurrence of similar incidents and a requirement to prepare and retain a written report.

RECORD KEEPING REQUIREMENTS

10. Condition No. 15 is included to require the *Company* to retain all documentation related to this *Approval* and provide access to employees in or agents of the *Ministry,* upon request, so that the *Ministry* can determine if a more detailed review of compliance with the *Performance Limits* is necessary.

REVOCATION OF PREVIOUS APPROVALS

11. Condition No. 16 is included to identify that this *Approval* replaces all Section 9 Certificate(s) of Approval and Part II.1 Approvals in regards to the activities mentioned in subsection 9(1) of the *EPA* and dated prior to the date of this *Approval,* except Environmental Compliance Approval No. 4614-826K9W dated November 5, 2014.

Upon issuance of the environmental compliance approval, I hereby revoke Approval No(s). 3779-9BMQW4 issued on December 5, 2013.

In accordance with Section 139 of the Environmental Protection Act, you may by written Notice served upon me, the Environmental Review Tribunal and in accordance with Section 47 of the Environmental Bill of Rights, 1993, S.O. 1993, c. 28 (Environmental Bill of Rights), 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 environmental compliance approval or each term or condition in the environmental compliance 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.

Pursuant to subsection 139(3) of the Environmental Protection Act, a hearing may not be required with

respect to any terms and conditions in this environmental compliance approval, if the terms and conditions are substantially the same as those contained in an approval that is amended or revoked by this environmental compliance approval.

The Notice should also include:

3. The name of the appellant;
4. The address of the appellant;
5. The environmental compliance approval number;
6. The date of the environmental compliance approval;
7. The name of the Director, and;
8. The municipality or municipalities within which the project is to be engaged in.

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

This Notice must be served upon:

The Secretary*****
Environmental Review Tribunal
655 Bay Street, Suite 1500
Toronto, Ontario
M5G 1E5

AND

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

AND

The Director appointed for the purposes of
Part II.1 of the Environmental Protection Act
Ministry of the Environment and
Climate Change
135 St. Clair Avenue West, 1st Floor
Toronto, Ontario
M4V 1P5

*** Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 212-6349, Fax: (416) 326-5370 or www.ert.gov.on.ca**

This instrument is subject to Section 38 of the Environmental Bill of Rights, 1993, 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.ebr.gov.on.ca , you can determine when the leave to appeal period ends.

The above noted activity is approved under s.20.3 of Part II.1 of the Environmental Protection Act.

DATED AT TORONTO this 25th day of November, 2015

Rudolf Wan, P.Eng.
Director
appointed for the purposes of Part II.1 of the
Environmental Protection Act

SA/
c: District Manager, MOECC York-Durham
Xiaoxi (Winnie) Song, M. Sc., P.Eng., BCX Environmental Consulting

Ontario

Ministry of the Environment and Climate Change
Ministère de l'Environnement et de l'Action en matière de changement climatique

AMENDMENT TO ENVIRONMENTAL COMPLIANCE APPROVAL

NUMBER 0469-9YUNSK
Notice No. 1
Issue Date: June 21, 2017

St. Marys Cement Inc. (Canada)
400 Waverley Road South
Clarington, Ontario
L1C 3K3

Site Location: Bowmanville Cement Plant
400 Waverley Road South
Clarington Municipality, Regional Municipality of Durham
L1C 3K3

You are hereby notified that I have amended Approval No. 0469-9YUNSK issued on November 25, 2015 for a cement manufacturing facility , as follows:

Schedule E in Environmental Compliance Approval number 0469-9YUNSK issued on November 25, 2015:

SCHEDULE E

ALTERNATE FUELS OPERATIONAL REQUIREMENTS

Parameter	Limits	Measurement
Total Quantity of *Alternative Fuels* combusted in the *Cement Kiln.*	No more than the lesser of: (a) 4 tonnes per hour, or (b) 4% substitution of *Conventional fuels,* based on heating value.	Measured continuously.
Temperature in the *Cement Kiln*	Greater than 1000 Deg. C at a gas residence time of more than 6 seconds in the kiln. Greater than 850 Deg. C at a gas residence time of more than 3 seconds in the calciner.	Measured by the *CEM System.* Calculated as a rolling 1-hour arithmetic average measured by the *CEM System.*
Residual oxygen	>1% residual oxygen at the backend (raw material feed end) of the kiln. >3% residual oxygen at the calciner down comer duct (raw material feed end of the calciner)	Measured by the *CEM System* and calculated by volume on a dry basis in the undiluted gases leaving the kiln and calciner. Calculated as a rolling 1-hour arithmetic average measured by the *CEM System.*
Pressure Control	Kiln, Calciner, Preheater tower and Raw Mill must be operated under negative pressure at all times.	Measured at the top of the preheater towers and in Raw Mill by continuous monitor.
Start-Up, Shut-down and Upset Operating Conditions	No *Alternative Fuels* shall be used.	-

has been revoked and replaced by the following Schedule E:

SCHEDULE E

ALTERNATIVE FUELS OPERATIONAL REQUIREMENTS

Parameter	Limits	Measurement
Total Quantity of *Alternative Fuels* combusted in the *Cement Kiln.*	No more than 4 tonnes per hour.	Measured continuously.
Temperature in the *Cement Kiln*	Greater than 1000 Deg. C at a gas residence time of more than 6 seconds in the kiln. Greater than 850 Deg. C at a gas residence time of more than 3 seconds in the calciner.	Measured by the *CEM System* Calculated as a rolling 1-hour arithmetic average measured by the *CEM System.*
Residual oxygen	>1% residual oxygen at the backend (raw material feed end) of the kiln. >3% residual oxygen at the calciner down comer duct (raw material feed end of the calciner)	Measured by the *CEM System* and calculated by volume on a dry basis in the undiluted gases leaving the kiln and calciner. Calculated as a rolling 1-hour arithmetic average measured by the *CEM System.*
Pressure Control	Kiln, Calciner, Preheater tower and Raw Mill must be operated under negative pressure at all times.	Measured at the top of the preheater towers and in Raw Mill by continuous monitor.
Start-Up, Shut-down and Upset Operating Conditions	No *Alternative Fuels* shall be used.	N.A.

All in accordance with the Environmental Compliance Approval amendment application dated May 10, 2017 submitted by St. Marys Cement Inc. (Canada) and signed by Chris Richards, Environmental Manager.

All other terms and conditions in the Approval remain unchanged.

This Notice shall constitute part of the approval issued under Approval No. 0469-9YUNSK dated November 25, 2015.

In accordance with Section 139 of the Environmental Protection Act, you may by written Notice served upon me and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 142 of the Environmental Protection Act provides that the Notice requiring the hearing shall

state:

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

Pursuant to subsection 139(3) of the Environmental Protection Act, a hearing may not be required with respect to any terms and conditions in this environmental compliance approval, if the terms and conditions are substantially the same as those contained in an approval that is amended or revoked by this environmental compliance approval.

The Notice should also include:

1. The name of the appellant;
2. The address of the appellant;
3. The environmental compliance approval number;
4. The date of the environmental compliance approval;
5. The name of the Director, and;
6. The municipality or municipalities within which the project is to be engaged in.

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

This Notice must be served upon:

The Secretary*
Environmental Review Tribunal
655 Bay Street, Suite 1500
Toronto, Ontario
M5G 1E5

AND

The Director appointed for the purposes of Part II.1
of the Environmental Protection Act
Ministry of the Environment and Climate Change
135 St. Clair Avenue West, 1st Floor
Toronto, Ontario
M4V 1P5

*** Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 212-6349, Fax: (416) 326-5370 or www.ert.gov.on.ca**

The above noted activity is approved under s.20.3 of Part II.1 of the Environmental Protection Act.

DATED AT TORONTO this 21st day of June, 2017

Rudolf Wan, P.Eng.
Director
appointed for the purposes of Part II.1 of the
Environmental Protection Act

SA/
c: District Manager, MOECC York-Durham
Xiaoxi (Winnie) Song, BCX Environmental Consulting

Ontario

Ministry of the Environment and Climate Change
Ministère de l'Environnement et de l'Action en matière de changement climatique

AMENDMENT TO ENVIRONMENTAL COMPLIANCE APPROVAL

NUMBER 0469-9YUNSK
Notice No. 1
Issue Date: June 21, 2017

St. Marys Cement Inc. (Canada)
400 Waverley Road South
Clarington, Ontario
L1C 3K3

Site Location: Bowmanville Cement Plant
400 Waverley Road South
Clarington Municipality, Regional Municipality of Durham
L1C 3K3

You are hereby notified that I have amended Approval No. 0469-9YUNSK issued on November 25, 2015 for a cement manufacturing facility , as follows:

Schedule E in Environmental Compliance Approval number 0469-9YUNSK issued on November 25, 2015:

SCHEDULE E

ALTERNATE FUELS OPERATIONAL REQUIREMENTS

Parameter	Limits	Measurement
Total Quantity of *Alternative Fuels* combusted in the *Cement Kiln.*	No more than the lesser of: (a) 4 tonnes per hour, or (b) 4% substitution of *Conventional fuels,* based on heating value.	Measured continuously.
Temperature in the *Cement Kiln*	Greater than 1000 Deg. C at a gas residence time of more than 6 seconds in the kiln. Greater than 850 Deg. C at a gas residence time of more than 3 seconds in the calciner.	Measured by the *CEM System.* Calculated as a rolling 1-hour arithmetic average measured by the *CEM System.*
Residual oxygen	>1% residual oxygen at the backend (raw material feed end) of the kiln. >3% residual oxygen at the calciner down comer duct (raw material feed end of the calciner)	Measured by the *CEM System* and calculated by volume on a dry basis in the undiluted gases leaving the kiln and calciner. Calculated as a rolling 1-hour arithmetic average measured by the *CEM System.*
Pressure Control	Kiln, Calciner, Preheater tower and Raw Mill must be operated under negative pressure at all times.	Measured at the top of the preheater towers and in Raw Mill by continuous monitor.
Start-Up, Shut-down and Upset Operating Conditions	No *Alternative Fuels* shall be used.	-

has been revoked and replaced by the following Schedule E:

SCHEDULE E

ALTERNATIVE FUELS OPERATIONAL REQUIREMENTS

Parameter	Limits	Measurement
Total Quantity of *Alternative Fuels* combusted in the *Cement Kiln.*	No more than 4 tonnes per hour.	Measured continuously.
Temperature in the *Cement Kiln*	Greater than 1000 Deg. C at a gas residence time of more than 6 seconds in the kiln. Greater than 850 Deg. C at a gas residence time of more than 3 seconds in the calciner.	Measured by the *CEM System* Calculated as a rolling 1-hour arithmetic average measured by the *CEM System.*
Residual oxygen	>1% residual oxygen at the backend (raw material feed end) of the kiln. >3% residual oxygen at the calciner down comer duct (raw material feed end of the calciner)	Measured by the *CEM System* and calculated by volume on a dry basis in the undiluted gases leaving the kiln and calciner. Calculated as a rolling 1-hour arithmetic average measured by the *CEM System.*
Pressure Control	Kiln, Calciner, Preheater tower and Raw Mill must be operated under negative pressure at all times.	Measured at the top of the preheater towers and in Raw Mill by continuous monitor.
Start-Up, Shut-down and Upset Operating Conditions	No *Alternative Fuels* shall be used.	N.A.

All in accordance with the Environmental Compliance Approval amendment application dated May 10, 2017 submitted by St. Marys Cement Inc. (Canada) and signed by Chris Richards, Environmental Manager.

All other terms and conditions in the Approval remain unchanged.

This Notice shall constitute part of the approval issued under Approval No. 0469-9YUNSK dated November 25, 2015.

In accordance with Section 139 of the Environmental Protection Act, you may by written Notice served upon me and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 142 of the Environmental Protection Act provides that the Notice requiring the hearing shall

state:

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

Pursuant to subsection 139(3) of the Environmental Protection Act, a hearing may not be required with respect to any terms and conditions in this environmental compliance approval, if the terms and conditions are substantially the same as those contained in an approval that is amended or revoked by this environmental compliance approval.

The Notice should also include:

1. The name of the appellant;
2. The address of the appellant;
3. The environmental compliance approval number;
4. The date of the environmental compliance approval;
5. The name of the Director, and;
6. The municipality or municipalities within which the project is to be engaged in.

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

This Notice must be served upon:

The Secretary*
Environmental Review Tribunal
655 Bay Street, Suite 1500
Toronto, Ontario
M5G 1E5

AND

The Director appointed for the purposes of Part II.1
of the Environmental Protection Act
Ministry of the Environment and Climate Change
135 St. Clair Avenue West, 1st Floor
Toronto, Ontario
M4V 1P5

*** Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 212-6349, Fax: (416) 326-5370 or www.ert.gov.on.ca**

The above noted activity is approved under s.20.3 of Part II.1 of the Environmental Protection Act.

DATED AT TORONTO this 21st day of June, 2017

Rudolf Wan, P.Eng.
Director
appointed for the purposes of Part II.1 of the
Environmental Protection Act

SA/
c: District Manager, MOECC York-Durham
Xiaoxi (Winnie) Song, BCX Environmental Consulting

Ontario

Ministry of the Environment and Climate Change
Ministère de l'Environnement et de l'Action en matière de changement climatique

AMENDMENT TO ENVIRONMENTAL COMPLIANCE APPROVAL

NUMBER 0469-9YUNSK
Notice No. 2
Issue Date: May 8, 2018

St. Marys Cement Inc. (Canada)
55 Industrial St, 4th Floor
Toronto, Ontario
M4G 3W9

Site Location: Bowmanville Cement Plant
400 Waverley Road South
Clarington Municipality, Regional Municipality of Durham
L1C 3K3

You are hereby notified that I have amended Approval No. 0469-9YUNSK issued on November 25, 2015 for a cement manufacturing facility , as follows:

The following Conditions:

11.1 The *Company* shall perform *Source Testing* in accordance with the procedure in **Schedule F** to determine the rate of emission of the test contaminants from the sources specified in **Schedule G**. The first *Source Testing* shall be conducted not later than six (6) months after the first use of any of the *Alternative Fuels* in the *Cement Kiln.*

11.2 Subsequent *Source Testing* shall be conducted once every calendar year in accordance with the procedure in **Schedule F** to determine the rate of emission of the test contaminants from the sources specified in **Schedule G**, for the use of *Low Carbon Alternative Fuels* and/or Woodwaste as defined under *O.Reg.347,* if any of these materials are used in the previous calendar year.

are revoked and replaced by the following Conditions:

11.1 The *Company* shall perform *Source Testing* in accordance with the procedure in **Schedule F** to determine the rate of emission of the test contaminants from the sources specified in **Schedule G**. The first *Source Testing* shall be conducted not later than six (6) months after the first use of any of the *Alternative Fuels* in the *Cement Kiln,* or within a time frame as directed or agreed to in writing by the *District Manager*.

11.2 Subsequent *Source Testing* shall be conducted once every calendar year, or within a time frame as directed or agreed to in writing by the *District Manager,* in accordance with the procedure in **Schedule F** to determine the rate of emission of the test contaminants from the sources specified in **Schedule G**, for the use of *Low Carbon Alternative Fuels* and/or Woodwaste as defined under *O.Reg.347,* if any of these materials are used in that calendar year.

All in accordance with the Environmental Compliance Approval amendment application dated April 4, 2018 submitted by St. Marys Cement Inc. (Canada) and signed by Ruben Plaza, Environmental Manager.

All other terms and conditions in the Approval remain unchanged.

This Notice shall constitute part of the approval issued under Approval No. 0469-9YUNSK dated November 25, 2015

In accordance with Section 139 of the Environmental Protection Act, you may by written Notice served upon me and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 142 of the Environmental Protection Act provides that the Notice requiring the hearing shall state:

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

Pursuant to subsection 139(3) of the Environmental Protection Act, a hearing may not be required with respect to any terms and conditions in this environmental compliance approval, if the terms and conditions are substantially the same as those contained in an approval that is amended or revoked by this environmental compliance approval.

The Notice should also include:

1. The name of the appellant;
2. The address of the appellant;
3. The environmental compliance approval number;
4. The date of the environmental compliance approval;
5. The name of the Director, and;
6. The municipality or municipalities within which the project is to be engaged in.

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

This Notice must be served upon:

The Secretary*
Environmental Review Tribunal
655 Bay Street, Suite 1500
Toronto, Ontario
M5G 1E5

AND

The Director appointed for the purposes of Part II.1
of the Environmental Protection Act
Ministry of the Environment and Climate Change
135 St. Clair Avenue West, 1st Floor
Toronto, Ontario
M4V 1P5

*** Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 212-6349, Fax: (416) 326-5370 or www.ert.gov.on.ca**

The above noted activity is approved under s.20.3 of Part II.1 of the Environmental Protection Act.

DATED AT TORONTO this 8th day of May, 2018

Ian Greason, P.Eng.
Director
appointed for the purposes of Part II.1 of the
Environmental Protection Act

SA/
c: District Manager, MOECC York-Durham
Chris Sabaziotis, BCX Environmental Consulting

Ontario

Ministry of the Environment and Climate Change
Ministère de l'Environnement et de l'Action en matière de changement climatique

AMENDED ENVIRONMENTAL COMPLIANCE APPROVAL

NUMBER 0469-9YUNSK
Issue Date: November 25, 2015

St. Marys Cement Inc. (Canada)
55 Industrial Street, 4th Floor
Toronto, Ontario
M4G 3W9

Site Location: Bowmanville Plant
400 Waverley Road
Clarington Municipality, Regional Municipality of Durham

You have applied under section 20.2 of Part II.1 of the Environmental Protection Act, R.S.O. 1990, c. E. 19 (Environmental Protection Act) for approval of:

Description Section

A cement manufacturing facility, consisting of the following processes and support units:

- quarry operations - limestone extraction, processing and shipping;
- raw material and fuel processing, storage and handling;
- clinker production- kiln and calciner operations;
- cement production including ball mills, cement storage and shipping;

including the *Equipment* and any other ancillary and support processes and activities, operating at a *Facility Production Limit* of up to a **clinker production rate of 2.4 million tonnes per year,** discharging to the air as described in the *Original ESDM Report.*

For the purpose of this environmental compliance approval, the following definitions apply:

1. "*Acceptable Point of Impingement Concentration"* means a concentration accepted by the *Ministry* as not likely to cause an adverse effect for a *Compound of Concern* that,

   (a) has no *Ministry Point of Impingement Limit* and no *Jurisdictional Screening Level*, or

   (b) has a concentration at a *Point of Impingement* that exceeds the *Jurisdictional Screening Level*.

   With respect to the *Original ESDM Report*, the *Acceptable Point of Impingement Concentration* for a *Compound of Concern* mentioned above is the concentration set out in the *Original ESDM Report.*

2. "*Acoustic Assessment Report"* means the report, prepared in accordance with *Publication NPC-233* and Appendix A of the *Basic Comprehensive User Guide*, by Corey Kinart, P.Eng. / HGC Engineering, dated May 13, 2014 submitted in support of the application, that documents all sources of noise emissions and *Noise Control Measures* present at the *Facility*, as updated in accordance with Condition 5 of this *Approval.*

3. "*Acoustic Assessment Summary Table"* means a table prepared in accordance with the *Basic Comprehensive User Guide* summarising the results of the *Acoustic Assessment Report*, as updated in accordance with Condition 5 of this *Approval.*

4. "*Alternative Fuels"* means Woodwaste as defined in *O.Reg. 347* and *Low Carbon Alternative Fuels.*

5. "*Approval"* means this entire Environmental Compliance Approval and any *Schedules* to it.

6. "*Baseline Conditions"* means operating conditions which include the use of *Conventional Fuel, Fuel Adjunct Materials* and *Industrial By-Product Materials* in the *Cement Kiln.*

7. "*Basic Comprehensive User Guide"* means the *Ministry* document titled "Basic Comprehensive Certificates of Approval (Air) User Guide" dated March 2011, as amended.

8. "*Best Management Practices Plan"* means the document titled "St. Marys Cement Inc., Cement Plant Operations - Bowmanville Site, Best Management Practices Plan for the Control of Fugitive Dust Emissions" Revision 2, dated February, 2014, as amended.

9. "*CAEAL"* means the Canadian Association for Environmental Analytical Laboratories.

10. "*Cement Kiln"* means the cement kiln and the calciner, firing *Conventional Fuels, Alternative Fuels* and *Fuel Adjunct Materials*, described in the *Company's* application, this *Approval* and in the supporting documentation referred to herein, to the extent approved by this *Approval.*

11. "*CEM System"* means the continuous monitoring and recording system used to measure the emissions and operational parameters of the *Cement Kiln.*

12. "*Company"* means St. Marys Cement Inc. (Canada) that is responsible for the construction or operation of the *Facility* and includes any successors and assigns in accordance with section 19 of the *EPA.*

13. "*Compound of Concern"* means a contaminant described in paragraph 4 subsection 26 (1) of *O. Reg. 419/05;* namely, a contaminant that is discharged from the *Facility* in an amount that is not negligible.

14. "*Conventional Fuels"* means solid fuels including petroleum coke and coal for regular firing and also includes diesel, propane and natural gas for preheating during start-up.

15. "*Description Section"* means the section on page one of this *Approval* describing the *Company's* operations and the *Equipment* located at the *Facility* and specifying the *Facility Production Limit* for the *Facility*.

16. "*Director"* means a person appointed for the purpose of section 20.3 of the *EPA* by the *Minister* pursuant to section 5 of the *EPA.*

17. "*District Manager"* means the District Manager of the appropriate local district office of the *Ministry,* where the *Facility* is geographically located.

18. "*Emission Summary Table"* means a table described in paragraph 14 of subsection 26 (1) of *O. Reg. 419/05;* namely a table in the *ESDM Report* that compares the *Point of Impingement* concentration for each *Compound of Concern* to the corresponding *Ministry Point of Impingement Limit, Acceptable Point of Impingement Concentration,* or *Jurisdictional Screening Level.*

19. "*Environmental Assessment Act"* means the Environmental Assessment Act, R.S.O. 1990, c.E.18, as amended.

20. "*EPA"* means the Environmental Protection Act, R.S.O. 1990, c.E.19, as amended.

21. "*Equipment"* means equipment or processes described in the *ESDM Report,* this *Approval* and in the *Schedules* referred to herein and any other equipment or processes.

22. "*Equipment with Specific Operational Limits"* means the *Cement Kiln* and any *Equipment* directly involved in the thermal oxidation of waste or waste derived fuels, fume incinerators or any other *Equipment* that is specifically referenced in any published *Ministry* document that outlines specific operational guidance that must be considered by the *Director* in issuing an *Approval.*

23. "*ESDM Report"* means the most current Emission Summary and Dispersion Modelling Report that describes the *Facility.* The *ESDM Report* is based on the *Original ESDM Report* and is updated after the issuance of this *Approval* in accordance with section 26 of *O. Reg. 419/05* and the *Procedure Document.*

24. "*Facility"* means the entire operation located on the *Property* where the *Equipment* is located.

25. "*Facility Production Limit"* means the production limit placed by the *Director* on the main product(s) or raw materials used by the *Facility.*

26. "*Fuel Adjunct Materials"* means solid fuel, wholly used at the *Facility,* as supplementary fuels to coal and petroleum coke for firing the *Cement Kiln* , such as but not limited to carbon dust, metallurgical coke and carbon black, but which does not include *Alternative Fuels.*

27. "*Industrial By-Product Materials"* means industrial by-product materials such as but not limited to iron slag from smelting industry, fly ash from coal fired generating plants, ash from waste water treatment plants and foundry sand used in casting processes, wholly used at the *Facility* as substitute raw material sources of calcium oxide, silica, iron oxide and alumina required for the ongoing cement manufacturing process and which do not serve as fuel for the *Cement Kiln.*

28. "*Jurisdictional Screening Level"* means a screening level for a *Compound of Concern* that is listed in the *Ministry* publication titled "Jurisdictional Screening Level (JSL) List, A Screening Tool for Ontario Regulation 419: Air Pollution - Local Air Quality", dated February 2008, as amended.

29. "*Log"* means a document that contains a record of each change that is required to be made to the *ESDM Report* and *Acoustic Assessment Report,* including the date on which the change occurred. For example, a record would have to be made of a more accurate emission rate for a source of contaminant, more accurate meteorological data, a more accurate value of a parameter that is related to a source of contaminant, a change to a *Point of Impingement* and all changes to information associated with a *Modification* to the *Facility* that satisfies Condition 2.

30. "*Low Carbon Alternative Fuels"* means woody biomass consisting mainly of wood chips with some fragments of plastic, shingles, laminate, surface coatings obtained from industrial and post-consumer sources such as construction and demolition waste, which does not contain asbestos and hazardous waste as defined under *O.Reg 347,* and contains:

    (a) less than 10% non-woody material such as plastic, shingles, laminate, surface coatings and other material;
    (b) less than 5% treated wood;
    (c) less than or equal to 1% total halogen content; and
    (d) less than 25% moisture by weight;

31. "*Manager"* means the Manager, Technology Standards Section, Standards Development Branch, or any other person who represents and carries out the duties of the Manager, Technology Standards Section, Standards Development Branch, as those duties relate to the conditions of this *Approval.*

32. "*Maximum Emissions Scenario"* means maximum emissions scenario as outlined in the *Original ESDM Report.*

33. "*Minister"* means the Minister of the Environment and Climate Change or such other member of the Executive Council as may be assigned the administration of the *EPA* under the Executive Council Act.

34. "*Ministry* " means the ministry of the *Minister*.

35. "*Ministry Point of Impingement Limit"* means the applicable Standard set out in Schedule 2 or 3 of *O. Reg. 419/05* or a limit set out in the *Ministry* publication titled "Summary of Standards and Guidelines to support Ontario Regulation 419/05: Air Pollution - Local Air Quality (including Schedule 6 of *O. Reg. 419/05* on Upper Risk Thresholds", dated April 2012, as amended.

36. "*Modification"* means any construction, alteration, extension or replacement of any plant, structure, equipment, apparatus, mechanism or thing, or alteration of a process or rate of production at the *Facility* that may discharge or alter the rate or manner of discharge of a *Compound of Concern* to the air or discharge or alter noise or vibration emissions from the *Facility*.

37. "*Noise Control Measures"* means measures to reduce the noise emissions from the *Facility* and/or *Equipment* including, but not limited to, silencers, acoustic louvres, enclosures, absorptive treatment, plenums and barriers.

38. "*O. Reg. 347"* means Ontario Regulation 347, General - Waste Management, as amended.

39. "*O. Reg. 419/05"* means Ontario Regulation 419/05, Air Pollution – Local Air Quality, as amended.

40. "*Original ESDM Report"* means the Emission Summary and Dispersion Modelling Report which was prepared in accordance with section 26 of *O. Reg. 419/05* and the *Procedure Document* by BCX Environmental Consulting and dated May 10, 2014 submitted in support of the application, and includes any changes to the report made up to the date of issuance of this *Approval*.

41. "*Point of Impingement"* has the same meaning as in section 2 of *O. Reg. 419/05*.

42. "*Point of Reception"* means Point of Reception as defined by *Publication NPC-300*.

43. "*Pre-Test Plan"* means a plan for the *Source Testing* including the information required in Section 5 of the *Source Testing Code*.

44. "*Procedure Document"* means *Ministry* guidance document titled "Procedure for Preparing an Emission Summary and Dispersion Modelling Report" dated March 2009, as amended.

45. "*Processes with Significant Environmental Aspects"* means the *Equipment* which, during regular operation, would discharge one or more contaminants into the air in an amount which is not considered as negligible in accordance with section 26 (1) 4 of *O. Reg. 419/05* and the *Procedure Document*.

46. "*Property"* means the entire property excluding all operations in the dock area.

47. "*Publication NPC-207"* means the *Ministry* draft technical publication "Impulse Vibration in Residential Buildings", November 1983, supplementing the Model Municipal Noise Control By-Law, Final Report, published by the *Ministry*, August 1978, as amended.

48. "*Publication NPC-233"* means the *Ministry* Publication NPC-233, "Information to be Submitted for Approval of Stationary Sources of Sound", October, 1995, as amended.

49. "*Publication NPC-300"* means the *Ministry* Publication NPC-300, “Environmental Noise Guideline, Stationary and Transportation Sources – Approval and Planning, Publication NPC-300”, August 2013, as amended.

50. "*Schedules"* means the following schedules attached to this *Approval* and forming part of this *Approval* namely:

    Schedule A - Supporting Documentation
    Schedule B - Performance Requirements - In-Stack Emission Limits
    Schedule C - Process Dust Control Equipment Operational Requirements
    Schedule D - Material Analysis Contaminants
    Schedule E - *Alternative Fuels* Operational Requirements
    Schedule F - Procedure for *Source Testing*
    Schedule G - Test Sources and Test Contaminants - *Source Testing*
    Schedule H - *CEM System* Requirements - Opacity

51. "*Source Testing"* means sampling and testing to measure emissions resulting from operating the test sources under conditions which yield the worst case emissions within the approved operating range of the test sources which satisfies paragraph 1 of subsection 11(1) of O. Reg. 419/05.

52. "*Source Testing Code"* means the Ontario Source Testing Code, dated June 2010, prepared by the *Ministry*, as amended.

53. "*Toxicologist"* means a qualified professional currently active in the field of risk assessment and toxicology that has a combination of formal university education, training and experience necessary to assess contaminants.

54. "*Written Summary Form"* means the electronic questionnaire form, available on the *Ministry* website, and supporting documentation, that documents the activities undertaken at the *Facility* in the previous calendar year.

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

TERMS AND CONDITIONS

1. GENERAL

1.1 Except as otherwise provided by this *Approval*, the *Facility* shall be designed, developed, built, operated and maintained in accordance with the terms and conditions of this *Approval* and in accordance with the following *Schedules* attached hereto:

Schedule A - Supporting Documentation
Schedule B - Performance Requirements - In-Stack Emission Limits
Schedule C - Process Dust Control Equipment Operational Requirements
Schedule D - Material Analysis Contaminants
Schedule E - *Alternative Fuels* Operational Requirements
Schedule F - Procedure for *Source Testing*
Schedule G - Test Sources and Test Contaminants - *Source Testing*
Schedule H - *CEM System* Requirements - Opacity

2. LIMITED OPERATIONAL FLEXIBILITY

2.1 Pursuant to section 20.6 (1) of the *EPA* and subject to Conditions 2.2 and 2.3 of this *Approval*, future construction, alterations, extensions or replacements are approved in this *Approval* if the future construction, alterations, extensions or replacements are *Modifications* to the *Facility* that:

(a) are within the scope of the operations of the *Facility* as described in the *Description Section* of this *Approval;*

(b) do not result in an increase of the *Facility Production Limit* above the level specified in the *Description Section* of this *Approval;* and

(c) result in compliance with the performance limits as specified in Condition 4.

2.2 Condition 2.1 does not apply to,

(a) the addition of any new *Equipment with Specific Operational Limits* or to the *Modification* of any existing *Equipment with Specific Operational Limits* at the *Facility;*

(b) *Modifications* to the *Facility* that would be subject to the *Environmental Assessment Act;* and

(c) *Modifications* to the *Facility* that would alter the type of *Alternative Fuels* or increase the quantity of *Alternative Fuels* specified in **Schedule E** of this *Approval.*

2.3 Condition 2.1 of this *Approval* shall expire ten (10) years from the date of this *Approval*, unless this *Approval* is revoked prior to the expiry date. The *Company* may apply for renewal of Condition 2.1 of this *Approval* by including an *ESDM Report* and an *Acoustic Assessment Report* that describes the *Facility* as of the date of the renewal application.

3. REQUIREMENT TO REQUEST AN *ACCEPTABLE POINT OF IMPINGEMENT CONCENTRATION*

3.1 Prior to making a *Modification* to the *Facility* that satisfies Condition 2.1 (a) and (b), the *Company* shall prepare a proposed update to the *ESDM Report* to reflect the proposed *Modification*.

3.2 The *Company* shall request approval of an *Acceptable Point of Impingement Concentration* for a *Compound of Concern* if the *Compound of Concern* does not have a *Ministry Point of Impingement Limit* and a proposed update to an *ESDM Report* indicates that one of the following changes with respect to the concentration of the *Compound of Concern* may occur:

(a) The *Compound of Concern* was not a *Compound of Concern* in the previous version of the *ESDM Report* and

(i) the concentration of the *Compound of Concern* is higher than the *Jurisdictional Screening Level* for the contaminant; or

(ii) there is no *Jurisdictional Screening Level* for the contaminant.

(b) The concentration of the *Compound of Concern* in the updated *ESDM Report* is higher than:

(i) the most recent *Acceptable Point of Impingement Concentration*, and

(ii) the *Jurisdictional Screening Level* if a *Jurisdictional Screening Level* exists.

3.3 The request required by Condition 3.2 shall propose a concentration for the *Compound of Concern* and shall contain an assessment, performed by a *Toxicologist*, of the likelihood of the proposed concentration causing an adverse effect at *Points of Impingement*.

3.4 If the request required by Condition 3.2 is a result of a proposed *Modification* described in Condition 3.1, the *Company* shall submit the request, in writing, to the *Director* at least 30 days prior to commencing to make the *Modification*. The *Director* shall provide written confirmation of receipt of this request to the *Company*.

3.5 If a request is required to be made under Condition 3.2 in respect of a proposed *Modification* described in Condition 3.1, the *Company* shall not make the *Modification* mentioned in Condition 3.1 unless the request is approved in writing by the *Director*.

3.6 If the *Director* notifies the *Company* in writing that the *Director* does not approve the request, the *Company* shall,

(a) revise and resubmit the request; or

(b) notify the *Director* that it will not be making the *Modification*.

3.7 The re-submission mentioned in Condition 3.6 shall be deemed a new submission under Condition 3.2.

3.8 If the *Director* approves the request, the *Company* shall update the *ESDM Report* to reflect the *Modification.*

3.9 Condition 3 does not apply if Condition 2.1 has expired.

4. PERFORMANCE LIMITS

4.1. Subject to Condition 4.2, the *Company* shall not discharge or cause or permit the discharge of a *Compound of Concern* into the air if,

(a) the *Compound of Concern* has a *Ministry Point of Impingement Limit* and the discharge results in the concentration at a *Point of Impingement* exceeding the *Ministry Point of Impingement Limit;* or

(b) the *Compound of Concern* does not have a *Ministry Point of Impingement Limit* and the discharge results in the concentration at a *Point of Impingement* exceeding the higher of,

(i) if an *Acceptable Point of Impingement Concentration* exists the most recent *Acceptable Point of Impingement Concentration*, and

(ii) the *Jurisdictional Screening Level* if a *Jurisdictional Screening Level* exists.

4.2 Condition 4.1 does not apply if the *Ministry Point of Impingement Limit* has a 10-minute averaging period and no ambient monitor indicates an exceedance at a *Point of Impingement* where human activities regularly occur at a time when those activities regularly occur.

4.3 The *Company* shall, at all times, ensure that the noise emissions from the *Facility* comply with the limits set in *Ministry Publications NPC-300.*

4.4 The *Company* shall ensure that the vibration emissions from the *Facility* comply with the limits set out in *Ministry Publication NPC-207.*

4.5 The *Company* shall operate any *Equipment with Specific Operational Limits* approved by this *Approval* in accordance with the *Original ESDM Report.*

4.6 The *Company* shall ensure that at all times when *Alternative Fuels* are co-fired with *Conventional Fuels* in the *Cement Kiln,* the discharge from the *Cement Kiln* complies with the performance requirements specified in **Schedule B** of this *Approval.*

4.7 The *Company* shall ensure that there is no increase in the emissions of sulphur dioxide and oxides of nitrogen when *Alternative Fuels* are co-fired with *Conventional Fuels* in the *Cement Kiln,* as demonstrated by the *CEM System.*

5. DOCUMENTATION REQUIREMENTS

5.1. The *Company* shall maintain an up-to-date *Log.*

5.2. No later than April 30 in each year, the *Company* shall update the *Acoustic Assessment Report* and shall update the *ESDM Report* in accordance with section 26 of *O. Reg. 419/05* so that the information in the reports is accurate as of December 31 in the previous year.

5.3. The *Company* shall make the *Emission Summary Table* (see section 27 of *O. Reg. 419/05)* and *Acoustic Assessment Summary Table* available for examination by any person, without charge, by posting it on the Internet or by making it available during regular business hours at the *Facility*.

5.4 The *Company* shall, within three (3) months after the expiry of Condition 2.1 of this *Approval,* update the *ESDM Report* and the *Acoustic Assessment Report* such that the information in the reports is accurate as of the date that Condition 2.1 of this *Approval* expired.

5.5. Conditions 5.1 and 5.2 do not apply if Condition 2.1 has expired.

6. REPORTING REQUIREMENTS

6.1 Subject to Condition 6.2, the *Company* shall provide the *Director* no later than July 31 of each year, a *Written Summary Form* to be submitted through the *Ministry's* website that shall include the following:

(a) a declaration of whether the *Facility* was in compliance with section 9 of the *EPA, O. Reg. 419/05* and the conditions of this *Approval;*

(b) a summary of each *Modification* satisfying Condition 2.1 (a) and (b) that took place in the previous calendar year that resulted in a change in the previously calculated concentration at a *Point of Impingement* for any *Compound of Concern* or resulted in a change in the sound levels reported in the *Acoustic Assessment Summary Table* at any *Point of Reception.*

6.2 Condition 6.1 does not apply if Condition 2.1 has expired.

7. OPERATION AND MAINTENANCE

7.1 The *Company* shall prepare, update as necessary and implement, not later than six (6) months from the date of this *Approval,* operating procedures and maintenance programs for all *Processes with Significant Environmental Aspects*, which shall specify as a minimum:

(a) frequency of inspections and scheduled preventative maintenance;

(b) procedures to prevent upset conditions;

(c) procedures to minimize all fugitive emissions;

(d) procedures to prevent and/or minimize odorous emissions;

(e) procedures to prevent and/or minimize noise emissions;

(f) acceptable ranges of the static pressure drop for the process dust control equipment listed in **Schedule C** of this *Approval;*

(g) program to monitor and record the pressure differential across each of the primary dust collectors as specified in **Schedule C** of this *Approval,* including the frequency of measurement and procedures to investigate and correct the cause of any anomalous measurements of the static pressure drop;

(h) list of management and supervisory personnel responsible for the operation and maintenance of process dust control equipment specified in **Schedule C** of this *Approval;* and

(i) procedures for record keeping activities relating to the operation and maintenance programs.

7.2 The company shall maintain and update to keep current, a list of all process dust control equipment, including the following details:

Source identification; Production building/area served; Process/location served; Stack gas flow rate; Filter area; Stack diameter and Stack height above grade.

7.3 The *Company* shall ensure that all *Processes with Significant Environmental Aspects* are operated and maintained in accordance with this *Approval,* the operating procedures and maintenance programs.

8.0 START-UPS, SHUTDOWN AND UPSET PROCEDURES

8.1 The *Company* shall update as necessary, not later than six (6) months from the date of issue of this *Approval,* operating procedures which address kiln start-ups, shut down and any upset conditions.

9.0 MATERIAL ANALYSIS AND CRITERIA FOR ACCEPTANCE

The *Company* shall ensure that a material analysis program to measure and record the concentration of contaminants for the following material is implemented:

9.1 *Industrial By-Product Material* or *Fuel Adjunct Material*

(a) For each material used as *Fuel Adjunct Materials,* the *Company* shall obtain a metals/metal hydrides scan, including at a minimum the contaminants listed in **Schedule D** on a quarterly or Lot basis, as applicable. The *Company* shall ensure that the standard sampling methods outlined in the document "Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario, Ontario Ministry of the Environment and Energy, Standards Development Branch, December, 1996" are used, and that the samples are submitted to a *CAEAL* certified laboratory for analysis.

(b) For each material used as *Industrial By-Product Materials*, the *Company* shall obtain a metals/metal hydrides scan, including at a minimum the contaminants listed in **Schedule D**, on a quarterly or Lot basis, as applicable. The *Company* shall ensure that the standard sampling methods outlined in the document "Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario, Ontario Ministry of the Environment and Energy, Standards Development Branch, December, 1996" are used, and that the samples are submitted to a *CAEAL* certified laboratory for analysis.

(c) At any time, should the *Company* either independently or through other sources reasonably expect other metal/metal hydrides not outlined under **Schedule D** to be present in any material at greater than the trace concentrations, the *Company* shall obtain the appropriate analysis forthwith.

(d) Upon receipt of the analysis, the *Company* shall ensure that the *Point of Impingement* concentrations of metal/metal hydrides identified in (c) above do not exceed the respective limit based on the *Maximum Emissions Scenario.*

(e) The *Company* shall limit the accumulation of *Industrial By-Product Materials* and other raw materials in exterior storage piles to amounts which may reasonably be expected to be necessary for use in the cement manufacturing processes.

(f) The *Company* shall ensure that any *Industrial By-Product Material* stored at the *Facility* which the *Company* determines cannot be utilized in ongoing cement manufacturing processes, is managed in accordance with applicable waste management regulations, and, where an *Industrial By-Product Material* becomes unusable, the *Company* shall advise the *District Manager* in writing, of the type and quantity of such material, the reasons why it cannot be used and the specific manner in which the material is to be managed as a waste.

10.0 *ALTERNATIVE FUELS*

10.1 The *Company* shall ensure that the *Facility/Equipment* is properly designed and operated at all times while firing *Alternative Fuels* and comply with the operational requirements set out in **Schedule E** of this *Approval.*

10.2 The *Company* shall, in consultation with the *District Manager*, update as necessary and implement, not later than three (3) months from the date of first firing of *Alternative Fuels* in the *Cement Kiln,* operating procedures provided in section 8 of the Design and Operations Report specified in **Schedule A** of this *Approval,* which addresses *Alternate Fuels* start-up and shut-down, emergency and contingency measures and termination of *Alternative Fuel* processing. *Alternative Fuels* shall be fired in accordance with these operating procedures and shall only be fired once the *Cement Kiln* has achieved normal operation, temperatures and production and shall be introduced only in the high-temperature combustion zones of the kiln and the calciner.

10.3 The firing of *Alternative Fuels* shall be stopped (following appropriate procedures) if:

(a) the temperature, residual oxygen or pressure as measured by the specified measuring equipment do not meet the operational requirements outlined in **Schedule E** of this *Approval* for more than four (4) consecutive hours; or

(b) the measuring equipment such as the *CEM System* for one or more of the parameters specified in condition 10.3 (a) are down or malfunctioning for more than four (4) consecutive hours.

10.4 Analysis and Criteria for Acceptance

(a) A *Low Carbon Alternative Fuels* testing protocol over a minimum six (6) month period shall be implemented in accordance with sections 6.1.3 and 10.3 of the Design and Operations Report specified in **Schedule A** of this *Approval*, to establish consistency in the *Low Carbon Alternative Fuels* characteristics.

(b) After the successful completion of the testing protocol described in condition 10.4 (a), the *Company* shall update the procedure as necessary for sampling and analysis titled "Alternative Low-Carbon Fuel Sampling Methodology, Revision 1" provided as Appendix G of the Design and Operations Report. The updated procedure shall be provided to the *District Manager* not later than two (2) months before the planned first use of *Alternative Fuels* at the *Facility*.

(c) During the regular use of *Alternative Fuels*, the *Company* shall conduct sampling and analysis in accordance with the updated sampling and analysis procedure in condition 10.4 (b).

10.5 If the results of the analysis specified in condition 10.4 (c) indicate that emission rates of contaminants from the Kiln Stack are higher than the maximum emission rates identified in the *Maximum Emission Scenario*, the *Company* shall update the *ESDM Report* with the emission rates derived from this analysis.

10.6 The *Company* shall record the following data during *Cement Kiln* Operation:

(a) hourly combined raw feed;

(b) *Fuel Adjunct Material* and *Industrial By-Product Material* for relevant period;

(c) hourly *Alternative Fuels* and *Conventional Fuels* firing rates in the kiln and calciner;

(d) hourly clinker production; and

(e) records of incidents specified in condition 10.3 of this *Approval.*

11. SOURCE TESTING

11.1 The *Company* shall perform *Source Testing* in accordance with the procedure in **Schedule F** to determine the rate of emission of the test contaminants from the sources specified in **Schedule G**. The first *Source Testing* shall be conducted not later than six (6) months after the first use of any of the *Alternative Fuels* in the *Cement Kiln.*

11.2 Subsequent *Source Testing* shall be conducted once every calendar year in accordance with the procedure in **Schedule F** to determine the rate of emission of the test contaminants from the sources specified in **Schedule G**, for the use of *Low Carbon Alternative Fuels* and/or Woodwaste as defined under *O.Reg.347,* if any of these materials are used in the previous calendar year.

11.3 The *District Manager* may relax the frequency and/or scope of *Source Testing* if the results of the annual *Source Testing* indicate that the emissions and *Point of Impingement* concentrations of *Compounds of Concern* are insignificant when substituting a portion of *Conventional Fuel* with *Alternative Fuels.*

12. CONTINUOUS EMISSIONS MONITORING

12.1 Continuous Emissions Monitoring in the Kiln Stack

(a) The *Company* shall ensure that the existing *CEM System* is fully operational at all times to continuously monitor the following parameters in the exhaust gas stream from the Kiln Stack:

(i) Nitrogen Oxides
(ii) Sulphur Dioxide
(iii) Opacity

(b) The *CEM System* for nitrogen oxides and sulphur dioxide shall comply with the requirements of O.Reg. 194/05 – Industry Emissions – Nitrogen Oxides and Sulphur Dioxide, as amended from time to time.

(c) The *CEM System* for monitoring opacity shall comply with the requirements outlined in **Schedule H.**

12.2 Continuous Emissions Monitoring of Process Conditions

12.2.1 The *Company* shall install, operate and maintain a *CEM System* to continuously monitor:

(a) the concentration of residual oxygen and carbon monoxide in the backend of the kiln and calciner down comer duct;

(b) the temperatures of gases leaving the kiln at a point where the gas temperature reaches a minimum of 1000 Deg. C for a period of not less than 6 seconds;

(c) the temperatures of gases leaving the calciner at a point where the gas temperature reaches a minimum of 850 Deg. C for not less than 3 seconds; and

(d) Total Hydrocarbon (as methane) in the gases leaving the Kiln Stack.

12.2.2 The *Company* shall submit to the *Manager,* not later than ninety (90) days prior to the first use of *Alternative Fuels* in the *Cement Kiln,* a detailed continuous monitoring plan, complete with specifications for the *CEM System* for the parameters specified in condition 12.2.1 of this *Approval.* The *Company* shall finalize the continuous monitoring plan in consultation with the *Manager.*

12.2.3 The *Company* shall ensure that the *CEM System* specified in condition 12.2.1 are installed, commissioned, operated and maintained in accordance with the finalized monitoring plan referenced in condition 12.2.2 prior to the first use of *Alternative Fuels*.

12.3 Continuous Emissions Monitoring Documentation

12.3.1 The *Company* shall prepare and retain on site monthly reports of the data monitored during the preceding month by the *CEM System,* summarizing the following as a minimum:

(a) the daily minimum, maximum and average readings for the parameters specified in condition 12 of this *Approval;*

(b) the type and hourly firing rate of fuels used during the period the readings were taken;

(c) the percent availability of the *CEM System* for the parameters specified in condition 12 of this *Approval.*

(d) operational status (on/off) of the raw mill and the fuel mill.

12.3.2 The *Company* shall establish the normal operating total hydrocarbons range for *Baseline Conditions.* After the first use of any of the *Alternative Fuels,* the *Company* shall, at a minimum on a quarterly basis, review the *CEM System* monthly reports and identify and investigate any anomalous total hydrocarbons data. The investigations report shall be prepared and retained on site.

12.3.3 The *Company* shall retain on site, all raw data generated by the *CEM System.*

13. FUGITIVE EMISSIONS CONTROL

13.1 The *Company* shall update as necessary and implement the *Best Management Practices Plan* for the control of fugitive dust emissions.

Documentation Requirements - *Best Management Practices Plan*

13.2 The *Company* shall record and retain such records, each time a specific preventative and control measure described in the *Best Management Practices Plans* is implemented. The *Company* shall record, as a minimum:

(a) the date when each emission control measure is implemented, including a description of the control measure;

(b) the date when each new preventative measure or operating procedure to minimize emissions is implemented, including a description of the preventative measure or operating procedure; and

(c) the date, time of commencement, and time of completion of each periodic activity conducted to minimize emissions, including a description of the preventative measure/procedure and the name of the individual performing the periodic activity.

14. COMPLAINTS RECORDING AND REPORTING

14.1 If at any time, the *Company* receives an environmental complaint from the public regarding the operation of the *Equipment* approved by this *Approval,* the *Company* shall take the following steps:

(a) Record and number each complaint, either electronically or in a log book. The record shall include the following information: the time and date of the complaint and incident to which the complaint relates, the nature of the complaint, wind direction at the time and date of the incident to which the complaint relates and, if known, the address of the complainant.

(b) Notify the *District Manager* of the complaint within two (2) business days after the complaint is received, or in a manner acceptable to the *District Manager.*

(c) Initiate appropriate steps to determine all possible causes of the complaint and take the necessary actions to appropriately deal with the cause of the subject matter of the complaint attributable to the operations at the *Facility.*

(d) Complete and retain on-site a report written within one (1) week of the complaint date. The report shall list the actions taken to appropriately deal with the cause of the complaint and set out steps to be taken to avoid the recurrence of similar incidents.

15. RECORD KEEPING REQUIREMENTS

15.1 Any information pertaining to compliance with the *EPA, Regulation 419/05* and this *Approval* requested by any employee in or agent of the *Ministry,* concerning the *Facility* and its operation under this *Approval,* including, but not limited to, any records required to be kept by this *Approval,* shall be provided to the employee in or agent of the *Ministry,* upon request, in a timely manner.

15.2 Unless otherwise specified in this *Approval,* the *Company* shall retain, for a minimum of five (5) years from the date of their creation all reports, records and information described in this *Approval,* including,

(a) a copy of the *Original ESDM Report* and each updated version*;*

(b) a copy of each version of the *Acoustic Assessment Report;*

(c) supporting information used in the emission rate calculations performed in the *ESDM Reports* and *Acoustic Assessment Reports;*

(d) the records in the *Log;*

(e) copies of each *Written Summary Form* provided to the *Ministry* under Condition 6.1 of this *Approval;*

(f) records of maintenance, repair and inspection of *Equipment* related to all *Processes with Significant Environmental Aspects;*

(g) all records related to environmental complaints made by the public as required by Condition 14 of this *Approval;*

(h) records related to *Source Testing* events specified under section titled “Source Testing” of this *Approval;*

(i) records related to the operation of the *CEM System* specified under section titled “Continuous Emission Monitoring” of this *Approval;*

(j) records related to the preventative and control measures implemented as specified under section titled “Fugitive Emissions Control” of this *Approval;* and

(k) records related to sampling and analysis specified under sections titled “Material Analysis and Criteria of Acceptance” and “Alternative Fuels” of this *Approval.*

16. REVOCATION OF PREVIOUS APPROVALS

This *Approval* replaces and revokes all Certificates of Approval (Air) issued under section 9 *EPA* and Environmental Compliance Approvals issued under Part II.1 *EPA* to the *Facility* in regards to the activities mentioned in subsection 9(1) of the *EPA* and dated prior to the date of this *Approval,* except Environmental Compliance Approval No. 4614-826K9W dated November 5, 2014.

SCHEDULE A

Supporting Documentation

(a) Application for Environmental Compliance Approval (Air & Noise), dated May 9, 2014, signed by Ruben Plaza and submitted by the C*ompany.*

(b) Emission Summary and Dispersion Modelling Report, prepared by BCX Environmental Consulting and dated May 10, 2014.

(c) Additional air emissions and dispersion modelling related information provided by BCX Environmental Consulting dated April 1, 2015, May 26 & 27, 2015 and July 23, 2015.

(d) Report titled "Bowmanville Cement Plant - Design and Operations Report, Environmental Compliance Approval for Regular Use of Low Carbon Alternative fuel (Woody Biomass)", prepared by HDR Engineering and dated May 2014.

(e) Acoustic Assessment Report, prepared by Corey Kinart, P.Eng. / HGC Engineering, dated May 13, 2014.

SCHEDULE B

Performance Requirements- In-Stack Emission Limits

Parameter	Kiln Stack Emission Limit	Verification of Compliance
Particulate Matter (PM)	50 mg/Rm^3	Results from compliance source testing
Cadmium (Cd)	7 µg/Rm3	Results from compliance source testing
Lead (Pb)	60 µg/Rm3	Results from compliance source testing
Mercury (Hg)	20 µg/Rm3	Results from compliance source testing
Dioxins and Furans	80 pg/Rm^3 as ITEQ	Results from compliance source testing; results expressed as I-TEQ.
Hydrochloric Acid (HCl)	27 mg/Rm^3	Results from compliance source testing
Opacity	In accordance with s. 46 of *O.Reg 419/05*	Calculated as the rolling arithmetic average of 6 minutes of data measured by a *CEM System* that provides data at least once every minute.

Notes:

R - Reference flue gas conditions, defined as follows:
- Temperature 25 °C
- Pressure 101.3 kPa
- Oxygen content 11%
- Water content nil (dry conditions)

mg/Rm3 - milligrams per cubic metre of gas at Reference conditions.
µg/Rm3 - micrograms per cubic metre of gas at Reference conditions.
pg/Rm3 - picograms per cubic metre of gas at Reference conditions.
I-TEQ - a toxicity equivalent concentration calculated using the toxic equivalency factors (I-TEFs) derived for each dioxin and furan congener by comparing its toxicity to the toxicity of 2,3,7,8 tetrachloro dibenzo-p-dioxin, recommended by the World Health Organization (WHO) dioxin toxicity equivalence factors (TEFs) in 2005, and adopted by Ontario in April 2012.

SCHEDULE C

PROCESS DUST CONTROL EQUIPMENT OPERATIONAL REQUIREMENTS

Primary Dust Control Equipment

Primary dust control equipment includes the Kiln Baghouse; Bypass Baghouse, Fuel Mill Baghouse; Cooler Baghouse and Finish Mill Baghouses.

The static pressure drop across the primary dust control equipment filter bag compartments shall be measured and recorded continuously by the *Facility's* automated control system.

Secondary Dust Control Equipment

Secondary dust control equipment includes all other fabric filter dust collectors which are not primary dust control equipment.

The static pressure drop across the secondary dust control equipment filter bag compartments shall be measured and recorded at least quarterly.

Where applicable, the static pressure drop must be referenced to the value recorded during previous testing. In the absence of previous testing values, the parameter must be referenced to the value or normal range representing normal operation, recorded as soon as possible.

SCHEDULE D

MATERIAL ANALYSIS CONTAMINANTS

1. Antimony
2. Arsenic
3. Barium
4. Beryllium
5. Cadmium
6. Chromium
7. Cobalt
8. Iron
9. Lead
10. Manganese
11. Mercury
12. Nickel
13. Selenium
14. Silver
15. Tin
16. Vanadium
17. Total Halogens

SCHEDULE E

ALTERNATE FUELS OPERATIONAL REQUIREMENTS

Parameter	Limits	Measurement
Total Quantity of *Alternative Fuels* combusted in the *Cement Kiln.*	No more than the lesser of: (a) 4 tonnes per hour, or (b) 4% substitution of *Conventional fuels*, based on heating value.	Measured continuously.
Temperature in the *Cement Kiln*	Greater than 1000 Deg. C at a gas residence time of more than 6 seconds in the kiln. Greater than 850 Deg. C at a gas residence time of more than 3 seconds in the calciner.	Measured by the *CEM System.* Calculated as a rolling 1-hour arithmetic average measured by the *CEM System.*
Residual oxygen	>1% residual oxygen at the backend (raw material feed end) of the kiln. >3% residual oxygen at the calciner down comer duct (raw material feed end of the calciner)	Measured by the *CEM System* and calculated by volume on a dry basis in the undiluted gases leaving the kiln and calciner. Calculated as a rolling 1-hour arithmetic average measured by the *CEM System.*
Pressure Control	Kiln, Calciner, Preheater tower and Raw Mill must be operated under negative pressure at all times.	Measured at the top of the preheater towers and in Raw Mill by continuous monitor.
Start-Up, Shut-down and Upset Operating Conditions	No *Alternative Fuels* shall be used.	-

SCHEDULE F

Procedure for *Source Testing*

1. The *Company* shall submit, not later than three (3) months prior to the *Source Testing*, to the *Manager* a *Pre-Test Plan* for the *Source Testing* required under this *Approval*. The *Company* shall finalize the *Pre-Test Plan* in consultation with the *Manager*.

2. The first *Source Testing* shall be carried out for the following individual fuel firing scenarios at the maximum approved fuel firing rate in the kiln and the calciner. The characteristics of *Low Carbon Alternative Fuels* used during *Source Testing* shall be within the range established under Condition 10.4 - Analysis and Criteria for Acceptance of this *Approval:*

   (1) *Baseline Conditions;*
   (2) Approved substitution rate of *Conventional Fuels* with *Low Carbon Alternative Fuels;* and/or
   (3) Approved substitution rate of *Conventional Fuels* with Woodwaste as defined under *O.Reg.347*.

3. Subsequent annual *Source Testing* as described in condition 11.2 of this *Approval* shall be carried out for the maximum approved substitution rate of *Low Carbon Alternative Fuels* and/or Woodwaste as defined under *O.Reg.347*, as applicable.

4. The *Company* shall not commence the *Source Testing* required under this *Approval* until the *Manager* has approved the *Pre-Test Plan.*

5. The *Company* shall notify the *Manager*, the *District Manager* and the *Director* in writing of the location, date and time of any impending *Source Testing* required by this *Approval*, at least fifteen (15) days prior to the *Source Testing.*

6. The *Company* shall submit a report (hardcopy and electronic format) on the *Source Testing* to the *Manager and* the *District Manager* not later than four (4) months after completing the *Source Testing*, or not later than a time frame agreed in writing with the *Manager*. The report shall be in the format described in the *Source Testing Code*, and shall also include, but not be limited to:

   (1) an executive summary;
   (2) records of operating conditions at the time of *Source Testing* and other information including but not limited to:

      (i) clinker production rate in tonnes/hour;
      (ii) *Conventional fuel, Low Carbon Alternative Fuels* and/or Woodwaste firing rate in tonnes/hour separately in the kiln and calciner;
      (iii) quantity and type of *Fuel Adjunct Materials* and *Industrial By-Product Materials* used; and
      (iv) any other records that may affect the *Source Testing* results;

SCHEDULE F (Continued)

Procedure for *Source Testing*

(3) results of *Source Testing,* including the emission rate, emission concentration and relevant emission factor of the Test Contaminants;

(4) a summary of all records of the *CEM System* available for the parameters specified in condition 12 of this *Approval* at the time of *Source Testing;*

(5) a summary table that compares the *Source Testing* results to the emission estimates described in the *Company* 's application, the *ESDM Report* and the Performance Limits; and

(6) a comparison of stack analysis data between use of *Conventional fuel, Low Carbon Alternative Fuels* and Woodwaste for the first *Source Testing* of the relevant material; and a description and explanation of any statistically significant changes in emissions of the Test Contaminants, resulting from the use of *Alternative Fuel,* relative to *Baseline Conditions.*

7. The *Company* shall ensure that the *Source Testing* report is made available and easily accessible for review by the public at the *Facility,* immediately after the document is submitted to the *Ministry.*

8. The *Director* may not accept the results of the *Source Testing* if:

(1) the *Source Testing Code* or the requirements of the *Manager* were not followed;

(2) the *Company* did not notify the *District Manager,* the *Manager* and the *Director* of the *Source Testing;* or

(3) the *Company* failed to provide a complete report on the *Source Testing.*

9. If the *Director* does not accept the results of the *Source Testing,* the *Director* may require re-testing. If re-testing is required, the *Pre-Test Plan* strategies need to be revised and submitted to the *Manager* for approval. The actions taken to minimize the possibility of the *Source Testing* results not being accepted by the *Director* must be noted in the revision.

10. If the *Source Testing* results are higher than the emission estimates in the *Company's ESDM Report,* the *Company* shall update their *ESDM Report* in accordance with Section 26 of *O. Reg. 419/05* with the results from the *Source Testing* report and make these records available for review by staff of the *Ministry* upon request. The updated Emission Summary Table from the updated *ESDM Report* shall be submitted with the report on the *Source Testing.*

SCHEDULE G

Test Sources and Test Contaminants - *Source Testing*

Test Sources

Source ID	Description	Frequency
Kiln Stack	Main stack serving the *Cement Kiln*	In accordance with condition 11 of this *Approval.* The schedule between two consecutive tests should not be less than six (6) months

Test Contaminants

Total Suspended Particulate Matter
Ammonia
Hydrogen Chloride

Metals		Volatile Organic Matter
Cd	Cadmium	Acetone
Be	Beryllium	Acrolein
Pb	Lead	Benzene
Mo	Molybdenum	Bromodichloromethane
Cr	Chromium	Bromoform
Ni	Nickel	Bromomethane
V	Vanadium	Butadiene, 1,3 -
Al	Aluminum	Butanone, 2 -
Ti	Titanium	Carbon Tetrachloride
Mg	Magnesium	Chloroform
B	Boron	Cumene
Ba	Barium	Dibromochloromethane
P	Phosphorus	Dichlorodifluoromethane
K	Potassium	Dichloroethane, 1,2 -
Hg	Mercury	Dichloroethene, Trans - 1,2
As	Arsenic	Dichloroethene, 1,1 -
Zn	Zinc	Dichloropropane, 1,2 -
Sb	Antimony	Ethylbenzene
Mn	Manganese	Ethylene Dibromide
Co	Cobalt	Mesitylene
Se	Selenium	Methylene Chloride
Cu	Copper	Styrene
Ag	Silver	Tetrachloroethene
Sn	Tin	Toluene
Sr	Strontium	Trichloroethane, 1,1,1 -
Tl	Thalium	Trichloroethene
Fe	Iron	Trichloroethylene, 1,1,2 -
		Trichlorotrifluoroethane
		Trichlorofluoromethane
		Xylenes, M-, P- and O
		Vinyl Chloride

SCHEDULE G (Continued)

Polycyclic Organic Matter
Acenaphthylene
Acenaphthene
Anthracene
Benzo(a)anthracene
Benzo(b)fluoranthene
Benzo(k)fluoranthene
Benzo(a)fluorene
Benzo(b)fluorene
Benzo(ghi)perylene
Benzo(a)pyrene *
Benzo(e)pyrene
Biphenyl
2-Chloronaphthalene
Chrysene
Coronene
Dibenzo(a,c)anthracene
Dibenzo(a,h)anthracene
Dibenzo(a,e)pyrene
9,10-Dimethylanthracene
7,12-Dimethylbenzo(a)anthracene
Fluoranthene
Fluorene
Indeno(1,2,3-cd)pyrene
2-Methylanthracene
3-Methylcholanthrene
1-Methylnaphthalene
2-Methylnaphthalene
1-Methylphenanthrene
9-Methylphenanthrene
Naphthalene
Perylene
Phenanthrene
Picene
Pyrene
Tetralin
M-terphenyl
O-terphenyl
P-terphenyl
Triphenylene

* Benzo(a)Pyrene (B(a)P) standard and upper Risk Threshold (URT) are considered surrogate for all POMs that do not have their own standards or guidelines. For O.Reg.419/05 reporting, before July 2016, if the existing guideline is exceeded, B(a)P as a surrogate will be assessed against the URT. After July 1, 2016, it will be assessed against the new standard.

SCHEDULE G (Continued)
Dioxins, Furans and Dioxin-like PCBs (Polychlorinated Biphenyls)

Toxicity equivalency factors (TEFs) are applied to 29 isomers of dioxins, furans and dioxin-like PCBs to convert them into 2,3,7,8-CDD (tetrachlorodibenzo-p-dioxin) toxicity equivalents. The conversion involves multiplying the concentration of the isomer by the appropriate TEF to yield the TEQ for this isomer. Summing the individual TEQ values for each of the isomers provides the total toxicity equivalent level for the sample mixture.

A table listing the 29 isomers and their TEFs can be found in the MOE publication titled: Summary of Standards and Guidelines to Support Ontario Regulation 416-05 – Air Pollution - Local Air Quality, PIBS 6569e01 dated April 2012 and as noted below.

Example:

No.	Dioxins, Furans, and Dioxin-like PCBs	CASRN	WHO_{2005} Toxic Equivalency Factors [TEFs]
1	2,3,7,8-Tetrachlorodibenzo-p-dioxin [2,3,7,8-TCDD]	1746-01-6	1
2	1,2,3,7,8-Pentachlorodibenzo-p-dioxin [1,2,3,7,8-PeCDD]	40321-76-4	1
3	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin [1,2,3,4,7,8-HxCDD]	39227-28-6	0.1
4	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin [1,2,3,6,7,8-HxCDD]	57653-85-7	0.1
5	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin [1,2,3,7,8,9-HxCDD]	19408-74-3	0.1
6	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin [1,2,3,4,6,7,8-HpCDD]	35822-46-9	0.01
7	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin [1,2,3,4,6,7,8,9-OCDD]	3268-87-9	0.0003
8	2,3,7,8-Tetrachlorodibenzofuran [2,3,7,8-TCDF]	51207-31-9	0.1
9	1,2,3,7,8-Pentachlorodibenzofuran [1,2,3,7,8-PeCDF]	57117-41-6	0.03
10	2,3,4,7,8-Pentachlorodibenzofuran [2,3,4,7,8-PeCDF]	57117-31-4	0.3
11	1,2,3,4,7,8-Hexachlorodibenzofuran [1,2,3,4,7,8-HxCDF]	70648-26-9	0.1

12	1,2,3,6,7,8-Hexachlorodibenzofuran [1,2,3,6,7,8-HxCDF]	57117-44-9	0.1
13	1,2,3,7,8,9-Hexachlorodibenzofuran [1,2,3,7,8,9-HxCDF]	72918-21-9	0.1
14	2,3,4,6,7,8-Hexachlorodibenzofuran [2,3,4,6,7,8-HxCDF]	60851-34-5	0.1
15	1,2,3,4,6,7,8-Heptachlorodibenzofuran [1,2,3,4,6,7,8-HpCDF]	67562-39-4	0.01
16	1,2,3,4,7,8,9-Heptachlorodibenzofuran [1,2,3,4,7,8,9-HpCDF]	55673-89-7	0.01
17	1,2,3,4,6,7,8,9-Octachlorodibenzofuran [1,2,3,4,6,7,8,9-OCDF]	39001-02-0	0.0003
18	3,3',4,4'-Tetrachlorobiphenyl [3,3',4,4'-tetraCB (PCB 77)]	32598-13-3	0.0001
19	3,4,4',5- Tetrachlorobiphenyl [3,4,4',5-tetraCB (PCB 81)]	70362-50-4	0.0003
20	3,3',4,4',5- Pentachlorobiphenyl (PCB 126) [3,3',4,4',5-pentaCB (PCB 126)]	57465-28-8	0.1
21	3,3',4,4',5,5'- Hexachlorobiphenyl [3,3',4,4',5,5'-hexaCB (PCB 169)]	32774-16-6	0.03
22	2,3,3',4,4'- Pentachlorobiphenyl [2,3,3',4,4'-pentaCB (PCB 105)]	32598-14-4	0.00003
23	2,3,4,4',5- Pentachlorobiphenyl [2,3,4,4',5-pentaCB (PCB 114)]	74472-37-0	0.00003
24	2,3',4,4',5- Pentachlorobiphenyl [2,3',4,4',5-pentaCB (PCB 118)]	31508-00-6	0.00003
25	2',3,4,4',5- Pentachlorobiphenyl [2',3,4,4',5-pentaCB (PCB 123)]	65510-44-3	0.00003
26	2,3,3',4,4',5- Hexachlorobiphenyl [2,3,3',4,4',5-hexaCB (PCB 156)]	38380-08-4	0.00003

27	2,3,3',4,4',5'- Hexachlorobiphenyl [2,3,3',4,4',5'-hexaCB (PCB 157)]	69782-90-7	0.00003
28	2,3',4,4',5,5'- Hexachlorobiphenyl [2,3',4,4',5,5'-hexaCB (PCB 167)]	52663-72-6	0.00003
29	2,3,3',4,4',5,5'- Heptachlorobiphenyl [2,3,3',4,4',5,5'-heptaCB (PCB 189)]	39635-31-9	0.00003

NOTE:

* Sum of toxicity equivalents of individual isomers

The TEF scheme is intended to be used with isomer specific analytical results. In cases where results are reported by congener group only, staff at *Ministry's* Standards Development Branch shall be contacted for appropriate procedures to convert non-isomer specific data to TEQs.

SCHEDULE H
CEM System Requirements - Opacity

INSTALLATION: The *CEM System* shall be installed at an accessible location where the measurements are representative of the total emissions from the Kiln Main Stack, and shall meet the following installation specifications:

	PARAMETERS	SPECIFICATION
1	Wavelength at Peak Spectral Response (nanometres, nm):	500 - 600
2	Wavelength at Peak Spectral Response (nanometres, nm):	500 - 600
3	Detection angle of view:	≤ 5 degrees
4	Angle of projection:	≤ 5 degrees
5	Range (percent of opacity):	0 -100

PERFORMANCE: The *CEM System* for opacity monitoring shall meet the following minimum performance specifications for the following parameters.

	PARAMETERS	SPECIFICATION
1	Span Value (percent opacity):	2 times the average normal opacity of the source
2	Calibration Error:	≤ 3 percent opacity
3	Attenuation Calibration:	≤ 2 percent opacity
4	Response Time (95 percent response to a step change)	≤ 10 seconds
5	Schedule for Zero and Calibration Checks:	daily minimum
6	Procedure for Zero and Calibration Checks:	all system components checked
7	Zero Calibration Drift (24-hours):	≤ 2 percent opacity
8	Span Calibration Drift (24-hours):	≤ 2 percent opacity
9	Conditioning Test Period:	≥ 168 hours without corrective maintenance
10	Operational Test Period:	≥ 168 hours without corrective maintenance

CALIBRATION: The monitor shall be calibrated, to ensure that it meets the drift limits specified above, during the periods of the operation of the Equipment. The results of all calibrations shall be recorded at the time of calibration.

DATA RECORDER: The data recorder must be capable of registering continuously the measurement of the monitor with an accuracy of 0.5 percent of a full scale reading or better and with a time resolution of 30 seconds or better.

RELIABILITY: The monitor shall be operated and maintained so that accurate data is obtained during a minimum of 90 percent of the time for each calendar quarter during the first full year of operation, and 95 percent, thereafter.

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

GENERAL

1. Condition No. 1 is included to require the *Approval* holder to build, operate and maintain the *Facility* in accordance with the Supporting Documentation in Schedule A considered by the *Director* in issuing this *Approval.*

LIMITED OPERATIONAL FLEXIBILITY, REQUIREMENT TO REQUEST AN *ACCEPTABLE POINT OF IMPINGEMENT CONCENTRATION* AND *PERFORMANCE LIMITS*

2. Condition Nos. 2, 3 and 4 are included to limit and define the *Modifications* permitted by this *Approval,* and to set out the circumstances in which the *Company* shall request approval of an *Acceptable Point of Impingement Concentration* prior to making *Modifications.* The holder of the *Approval* is approved for operational flexibility for the *Facility* that is consistent with the description of the operations included with the application up to the *Facility Production Limit.* In return for the operational flexibility, the *Approval* places performance based limits that cannot be exceeded under the terms of this *Approval. Approval* holders will still have to obtain other relevant approvals required to operate the *Facility,* including requirements under other environmental legislation such as the *Environmental Assessment Act.*

DOCUMENTATION REQUIREMENTS

3. Condition No. 5 is included to require the *Company* to maintain ongoing documentation that demonstrates compliance with the *Performance Limits* of this *Approval* and allows the *Ministry* to monitor on-going compliance with these *Performance Limits.* The *Company* is required to have an up to date *ESDM Report* and *Acoustic Assessment Report* that describe the *Facility* at all times and make the *Emission Summary Table* and *Acoustic Assessment Summary Table* from these reports available to the public on an ongoing basis in order to maintain public communication with regard to the emissions from the *Facility.*

REPORTING REQUIREMENTS

4. Condition No. 6 is included to require the *Company* to provide a yearly *Written Summary Form* to the *Ministry,* to assist the *Ministry* with the review of the site's compliance with the *EPA,* the regulations and this *Approval.*

OPERATION AND MAINTENANCE

5. Condition Nos. 7, 8, 9 and 10 and are included to require the *Company* to properly operate and maintain the *Processes with Significant Environmental Aspects* to minimize the impact to the environment from these processes.

TESTING

6. Condition Nos. 11 and 12 are included to require the *Company* to gather and retain accurate information so that compliance with the *EPA, Regulation 419/05* and this *Approval* may be verified.

FUGITIVE EMISSIONS CONTROL

7. Condition No. 13 is included to emphasize that the *Equipment* and *Facility* must be maintained and operated in accordance with a procedure that will result in compliance with the *EPA, Regulation 419/05* and this *Approval* and to require the *Company* to keep records and to provide information to staff of the *Ministry* so that compliance with the *EPA, Regulation 419/05* and this *Approval* may be verified.

COMPLAINTS RECORDING AND REPORTING

9. Condition No. 14 is included to require the *Company* to respond to any environmental complaints regarding the operation of the *Equipment,* according to a procedure that includes methods for preventing recurrence of similar incidents and a requirement to prepare and retain a written report.

RECORD KEEPING REQUIREMENTS

10. Condition No. 15 is included to require the *Company* to retain all documentation related to this *Approval* and provide access to employees in or agents of the *Ministry,* upon request, so that the *Ministry* can determine if a more detailed review of compliance with the *Performance Limits* is necessary.

REVOCATION OF PREVIOUS APPROVALS

11. Condition No. 16 is included to identify that this *Approval* replaces all Section 9 Certificate(s) of Approval and Part II.1 Approvals in regards to the activities mentioned in subsection 9(1) of the *EPA* and dated prior to the date of this *Approval,* except Environmental Compliance Approval No. 4614-826K9W dated November 5, 2014.

Upon issuance of the environmental compliance approval, I hereby revoke Approval No(s). 3779-9BMQW4 issued on December 5, 2013.

In accordance with Section 139 of the Environmental Protection Act, you may by written Notice served upon me, the Environmental Review Tribunal and in accordance with Section 47 of the Environmental Bill of Rights, 1993, S.O. 1993, c. 28 (Environmental Bill of Rights), 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 environmental compliance approval or each term or condition in the environmental compliance 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.

Pursuant to subsection 139(3) of the Environmental Protection Act, a hearing may not be required with

respect to any terms and conditions in this environmental compliance approval, if the terms and conditions are substantially the same as those contained in an approval that is amended or revoked by this environmental compliance approval.

The Notice should also include:

3. The name of the appellant;
4. The address of the appellant;
5. The environmental compliance approval number;
6. The date of the environmental compliance approval;
7. The name of the Director, and;
8. The municipality or municipalities within which the project is to be engaged in.

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

This Notice must be served upon:

The Secretary*****
Environmental Review Tribunal
655 Bay Street, Suite 1500
Toronto, Ontario
M5G 1E5

AND

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

AND

The Director appointed for the purposes of
Part II.1 of the Environmental Protection Act
Ministry of the Environment and
Climate Change
135 St. Clair Avenue West, 1st Floor
Toronto, Ontario
M4V 1P5

*** Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 212-6349, Fax: (416) 326-5370 or www.ert.gov.on.ca**

This instrument is subject to Section 38 of the Environmental Bill of Rights, 1993, 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.ebr.gov.on.ca , you can determine when the leave to appeal period ends.

The above noted activity is approved under s.20.3 of Part II.1 of the Environmental Protection Act.

DATED AT TORONTO this 25th day of November, 2015

Rudolf Wan, P.Eng.
Director
appointed for the purposes of Part II.1 of the
Environmental Protection Act

SA/
c: District Manager, MOECC York-Durham
Xiaoxi (Winnie) Song, M. Sc., P.Eng., BCX Environmental Consulting

Ministry of the Environment, Conservation and Parks
Central Region
York Durham District Office
230 Westney Road South, 5th Floor
Ajax ON L1S 7J5
Toll-Free : 1-800-376-4547
Telephone.: 905-427-5600
Fax: 905-427-5602

Ministère de l'Environnement, de la Protection de la nature et des Parcs
Région du Centrel
Bureau de district de York Durham
230 route Westney sud, 5e étage
Ajax ON L1S 7J5
Sans frais : 1-800-376-4547
Téléphone : 905 427-5600
Télécopieur : 905 427-5602

Ontario

July 31, 2018

Dear Luis,

Thank you for your letter dated May 5, 2018 requesting an extension to the date by which source testing at St. Marys Cement Bowmanville of the combustion of alternative fuels was to be conducted.

You stated that the reason for the delay in being able to conduct the source testing is due to the inability to consistently burn alternative fuels due to problems with the wood supply. You've requested an extension until the end of September 2018, by which time your wood supplier is expected to be fully operational and thereby able to supply St. Marys with a consistent supply of wood.

Condition No. 11.1 of ECA No. 0469-9YUNSK reads as follows and affords me the authority to accommodate such a request:

> 11.1 The *Company* shall perform *Source Testing* in accordance with the procedure in **Schedule F** to determine the rate of emission of the test contaminants from the sources specified in **Schedule G**. The first *Source Testing* shall be conducted not later than six (6) months after the first use of any of the *Alternative Fuels* in the *Cement Kiln,* or within a time frame as directed or agreed to in writing by the *District Manager.*

Based on the above request and rationale provided, I hereby extend the date by which the first *Source Testing* shall be conducted to no later than October 31, 2018.

If you require any further information, please contact Provincial Officer Kim Lendvay directly at 905-427-5628 or kim.lendvay@ontario.ca.

Kind regards,

Celeste Dugas
Manager
York Durham District

Copy: Kim Lendvay

Appendix C

ECA (Waste) Number 1255-7QVJ2N (including amendments) (demonstration)

Ontario

Ministry of the Environment
Ministère de l'Environnement

ENVIRONMENTAL COMPLIANCE APPROVAL
NUMBER 1255-7QVJ2N
Issue Date: March 11, 2015

St. Marys Cement Inc. (Canada)
55 Industrial St
Toronto, Ontario
M4G 3W9

Site Location: 410 Waverly Road, Bowmanville
410 Waverly Rd
Clarington Municipality, Regional Municipality of Durham

You have applied under section 20.2 of Part II.1 of the Environmental Protection Act, R.S.O. 1990, c. E. 19 (Environmental Protection Act) for approval of:

a waste disposal site

to be used for the temporary receipt, storage and burning of solid non-hazardous municipal waste, limited as per the conditions of this Certificate

for use as Alternative fuels in the existing cement kiln

Note: Use of the site for any other type of waste is not approved under this Certificate, and requires obtaining a separate approval amending this Certificate.

For the purpose of this environmental compliance approval, the following definitions apply:

1. a. "**Alternative fuels**" means residuals derived from industrial and/or post-consumer sources, including plastic polymers, paper fibres and woody materials, received as single streams or blends, classified as Municipal Solid Waste under Ontario Regulation 347, written under the Act, to be used as a substitute fuel source in the cement kiln;

   b. "**Cement kiln**" means the cement kiln and associated control equipment and continuous emissions monitoring systems, firing Conventional fuel and Alternative fuel, described in the Owner's application, this Certificate and in the supporting documentation referred to herein, to the extent approved by this Certificate;

c. "**Certificate**" means this entire Provisional Certificate of Approval document, issued in accordance with section 39 of the EPA, and includes any schedules to it, the applications and the supporting documentation listed in Schedule "A";

d. "**Certificate of Approval (Air)**" means Certificate of Approval (Air) Number 4614-826K9W issued to St. Marys Cement Inc. (Canada), under Section 9 of the Environmental Protection Act;

e. "**Conventional fuel**" means solid fuels such as, petroleum coke and coal;

f. "**Demonstration project**" means the demonstration project where up to 30 % of Conventional Fuel is substituted with Alternative fuel in the Cement kiln, as described in the Owner's application, this Certificate and in the supporting documentation referred to herein, to the extent approved by this Certificate;

g. "**Director**" means any Ministry employee appointed in writing by the Minister pursuant to section 5 of the EPA as a Director for the purposes of Part V of the EPA;

h. "**District Manager**" means the District Manager of the local district office of the Ministry in which the Site is geographically located;

i. "**EPA**" means Environmental Protection Act, R.S.O. 1990, c. E. 19, as amended;

j. "**Facility**" means those operations associated with the Demonstration project, located on the property where the Cement kiln is located;

k. "**Ministry**" means Ontario Ministry of the Environment;

l. "**Municipal waste**" means municipal waste as defined in O.Reg 347;

m. "**Operator**" means any person, other than the Owner's employees, authorized by the Owner as having the charge, management or control of any aspect of the site and includes St. Marys Cement Inc. (Canada), its successors and assigns;

n. "**Owner**" means any person that is responsible for the establishment or operation of the site being approved by this Certificate, and includes St. Marys Cement Inc. (Canada)**,** its successors and assigns;

o. "**OWRA**" means the Ontario Water Resources Act, R.S.O. 1990, c. O-40, as amended from time to time;

p. "**PA**" means the Pesticides Act, R.S.O. 1990, c. P-11, as amended from time to time;

q. "**Provincial Officer**" means any person designated in writing by the Minister as a

provincial officer pursuant to section 5 of the OWRA or section 5 of the EPA or section 17 of PA;

r. "**Regional Director**" means the Regional Director of the local Regional Office of the Ministry in which the Site is located;

s. "**Reg. 347**" means Regulation 347, R.R.O. 1990, made under the EPA, as amended from time to time;

t. "**Trained person**" means a person knowledgeable in the following through instruction and practice:

i. relevant waste management legislation, regulations and guidelines;
ii. major environmental concerns pertaining to the waste to be handled;
iii. occupational health and safety concerns pertaining to the processes and wastes to be handled;
iv. management procedures including the use and operation of equipment for the processes and wastes to be handled;
v. emergency response procedures;
vi. specific written procedures for the control of nuisance conditions;
vii. specific written procedures for refusal of unacceptable waste loads; and
viii. the requirements of this Certificate.

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

TERMS AND CONDITIONS

GENERAL

Compliance

2. Any person authorized to carry out work on or operate any aspect of the Facility shall be notified of this Certificate and the conditions herein and all reasonable measures shall be taken to ensure any such person complies with the same.

3. Any person authorized to carry out work on or operate any aspect of the Facility shall comply with the conditions of this Certificate.

Build, etc. in Accordance

4. Except as otherwise provided by this Certificate, the Facility shall be designed, developed, built, operated and maintained in accordance with the applications for this Certificate, the Design and Operating Manual as amended from time to time, and all other supporting documents listed in Schedule “A”.

Interpretation

5. Where there is a conflict between a provision of any document, including an application, referred to in this Certificate, and the conditions of this Certificate, the conditions in this Certificate shall take precedence.

6. Where there is a conflict between an application and a provision in any documents listed in Schedule "A", the application shall take precedence, unless it is clear that the purpose of the document was to amend the application and that this Certificate includes that change.

7. Where there is a conflict between any two documents listed in Schedule "A", other than an application, the document bearing the most recent date shall take precedence.

8. The requirements of this Certificate are severable. If any requirement of this Certificate, or the application of any requirement of this Certificate to any circumstance, is held invalid or unenforceable, the application of such requirement to other circumstances and the remainder of this Certificate shall not be affected thereby.

9. Unless otherwise specified, the obligations set out in this Certificate are those of both the Owner and Operator.

Other Legal Obligations

10. The issuance of, and compliance with the conditions of, this Certificate does not:

    a. relieve any person of any obligation to comply with any provision of any applicable statute, regulation or other legal requirement; or

    b. limit in any way the authority of the Ministry to require certain steps be taken or to require the Owner and Operator to furnish any further information related to compliance with this Certificate.

Adverse Effects

11. Steps shall be taken to minimize and ameliorate any adverse effect on the natural environment or impairment of water quality that results from their operations at the Facility, including such accelerated or additional monitoring as may be necessary to determine the nature and extent of the effect or impairment.

12. Despite an Owner, Operator or any other person fulfilling any obligations imposed by this Certificate the Owner, Operator or any other person remains responsible for any contravention of any other condition of this Certificate or any applicable statute, regulation, or other legal requirement resulting from any act or omission that caused the adverse effect to the natural environment or impairment of water quality.

Change of Owner

13. The Owner shall notify the Director in writing, and forward a copy of the notification to the District Manager, within thirty (30) days of the occurrence of any changes to:

    a. the ownership of the Facility;

    b. the Operator of the Facility;

    c. the address of the Owner or Operator;

    d. the partners, where the Owner is or at any time becomes a partnership and a copy of the most recent declaration filed under the Business Names Act, R.S.O. 1990, c. B-17 shall be included in the notification; or

    e. the name of the corporation where the Owner is or at any time becomes a corporation, other than a municipal corporation, and a copy of the most current information filed under the Corporations Information Act, R.S.O. 1990, c. C-39 shall be included in the notification.

14. No portion of this Facility shall be transferred or encumbered prior to or after closing of the Facility unless the Director is notified in advance and sufficient financial assurance is deposited with the Ministry to ensure that these conditions will be carried out. In the event of any change in Ownership of the Facility the Owner shall notify the successor of and provide the successor with a copy of this Certificate, and the Owner shall provide a copy of the notification to the District Manager and the Director.

Financial Assurance

15. The Owner shall submit to the Director, Financial Assurance, as defined in Section 131 of the EPA, for the amount of $7,350 no less than thirty (30) days prior to any Alternative fuels being received at the Facility. This Financial Assurance shall be in a form and amount acceptable to the Director and shall provide sufficient funds for the analysis, transportation, Facility clean-up, monitoring and disposal of all quantities of Alternative fuels on-site at any one time.

16. No later than March 31, 2016 and on an annual basis thereafter, the Owner shall provide, to the Director, a written re-evaluation of the amount of the Financial Assurance required to carry out the matters specified in Condition 15. The re-evaluation shall be based on the Financial Assurance Guideline applicable at the time of any re-evaluation. The revised Financial Assurance amount must be submitted to the Director within ten (10) days of written acceptance of the re-evaluation by the Director.

17. If any Financial Assurance is scheduled to expire or notice is received, indicating Financial Assurance will not be renewed, and satisfactory methods have not been made to replace the

Financial Assurance at least sixty (60) days before the Financial Assurance terminates, the Financial Assurance shall forthwith be replaced by cash.

Inspections

18. No person shall hinder or obstruct a Provincial Officer in the performance of their duties, including any and all inspections authorized by the OWRA, the EPA or the PA of any place to which this Certificate relates, and without limiting the foregoing to:

    a. enter upon the premises where the Facility is located, or the location where the records required by the conditions of this Certificate are kept;

    b. have access to, inspect, and copy any records required by the conditions of this Certificate;

    c. inspect the practices, procedures, or operations required by the terms and conditions of this Certificate; and

    d. sample and monitor for the purposes of assessing compliance with the conditions of this Certificate or the EPA, the OWRA or the PA.

Information and Record Retention

19. Any information requested, by the Ministry, concerning the Facility and its operation under this Certificate, including but not limited to any records required to be kept by this Certificate shall be provided to the Ministry, upon request**.** Records shall be retained for five (5) years except for as otherwise authorized in writing by the Director.

20. The receipt of any information by the Ministry or the failure of the Ministry to prosecute any person or to require any person to take any action, under this Certificate or under any statute, regulation or other legal requirement, in relation to the information, shall not be construed as:

    a. an approval, waiver, or justification by the Ministry of any act or omission of any person that contravenes any term or condition of this Certificate or any statute, regulation or other legal requirement; or

    b. acceptance by the Ministry of the information's completeness or accuracy.

CONSTRUCTION

21. The Owner shall provide to the Director and District Manager copies of final layout drawings bearing the stamp of a Professional Engineer prior to the commencement of construction.

OPERATION AND MAINTENANCE

Operation

22. The Facility shall be operated and maintained at all times including management and disposal of all waste in accordance with the EPA, Regulation 347, the conditions of this Certificate, and the Conditions of the Certificate of Approval (Air). At no time shall the discharge of a contaminant that causes or is likely to cause an adverse effect be permitted.

23. A Procedures Manual specific to the Facility shall be prepared a minimum of ninety (90) days prior to the acceptance of any Alternative fuels at the Facility. The Procedures Manual shall contain detailed standard operating procedures relating to all aspects of the handling of Alternative fuels at the Facility and shall be maintained current at all times and kept at the Facility in central location that is accessible to Facility personnel. The information required in the Procedures Manual may be incorporated into the Design and Operating Manual required under Condition 51 below.

Approved Waste Types

24. a. The Owner may only accept the following categories of Municipal waste at the Facility for use as Alternative fuels:

    i. residuals derived from industrial and/or post-consumer sources, including plastic polymers, paper fibres and woody materials, received as single streams or blends.

    b. The Owner shall ensure that hazardous waste, liquid industrial waste, processed organic waste, or any waste other than those described in Condition 24a. are not accepted at the Facility.

Approved Limits

25. The Facility is approved to utilize Alternative fuels at a rate not to exceed 350 tonnes per day.

26. The amount of Alternative fuels present at the Facility at any one time shall not exceed 75 tonnes. All Alternative fuels shall be stored in covered trailers in the designated Alternative fuels handling area identified in Items 1 and 2 of Schedule "A".

27. A maximum of 350 tonnes of Alternative fuels may be received at the Facility per day.

Service Area

28. Only Alternative fuels generated in the province of Ontario shall be received at the Facility:

Hours of Operation

29. Alternative fuels may be accepted at the Facility 24 hours per day, 365 days of the year for the duration of the Demonstration project.

Facility Security and Signage

30. The Facility shall be operated and maintained in a secure manner, such that unauthorized persons cannot enter the Facility.

31. A sign shall be posted and maintained at the main entrance/exit to the Facility displaying in a manner that is clear and legible at a distance of twenty-five metres from the public roadway bordering the Facility. The sign shall contain the following information:

    a. the name of the Facility, the Owner and the Operator;

    b. the number of this Certificate;

    c. the normal hours of operation;

    d. the types of Alternative fuels that can be accepted;

    e. a telephone number to which complaints may be directed;

    f. a twenty-four (24) hour emergency telephone number (if different from above); and

    g. a warning against dumping outside the Facility.

32. There shall be no queuing or parking of trucks along Waverly Road that are waiting to enter this Facility.

Receiving

33. All Alternative fuels arriving at the Facility shall be inspected by a Trained person prior to being received at the Facility to ensure that the Alternative fuels are being received, managed and utilized in accordance with this Certificate, the EPA and Reg. 347.

34. In the event that a load of waste is rejected, a record shall be maintained identifying the reason the waste was refused, the type of waste that was refused and the generator and/or the origin of the waste, if known.

Labelling

35. All on-site storage units containing Alternative Fuel shall be clearly labelled with the type of waste being stored.

No Processing

36. There shall be no preprocessing of Alternative fuels at the Facility.

Generated Waste

37. a. All waste generated at the Facility shall be disposed of in accordance with Reg. 347; and

b. Only haulers approved by the Ministry shall be used to transport waste from the Facility.

Facility Inspection

38. A Trained Person shall inspect the entire Facility each day the Facility is in operation to ensure that: the Facility is secure; that the operation of the Facility is not causing any nuisances; that the operation of the Facility is not causing any adverse effects on the environment and that the Facility is being operated in compliance with this Certificate. Any deficiencies discovered as a result of the inspection shall be remedied immediately, including temporarily ceasing operations at the Facility if needed. On each operating day, a visual inspection of the following areas shall be carried out:

a. loading/unloading area(s);

b. storage and staging area(s); and

c. delivery system area.

39. A record of the inspections shall be kept in the daily log book that includes the following information:

a. the name and signature of person that conducted the inspection;

b. the date and time of the inspection;

c. a list of any deficiencies discovered;

d. any recommendations for action; and

e. the date, time and description of actions taken.

Other approvals

40. No Alternative fuels shall be received at the Facility and no Facility processes and equipment shall be operated unless all approvals under Section 9 of the EPA, where applicable, have been obtained.

41. All direct discharges from this Facility including stormwater run-off shall be managed in

accordance with applicable Municipal, Provincial and or Federal Legislation, Regulations and By-laws.

Training

42. a. A training plan shall be submitted to the District Manager a minimum of thirty (30) days prior to the acceptance of any Alternative fuels at the Facility. The training plan shall be developed, implemented and maintained for any persons that operate the Facility. Only a Trained Person may operate the Facility or carry out any activity required under this Certificate. The training plan shall require that all persons directly involved with activities relating to the Facility have been trained with respect to:

    i. relevant waste management legislation, regulations and guidelines;
    ii. major environmental concerns pertaining to the waste to be handled;
    iii. occupational health and safety concerns pertaining to the processes and wastes to be handled;
    iv. management procedures including the use and operation of equipment for the processes and wastes to be handled;
    v. emergency response procedures;
    vi. specific written procedures for the control of nuisance conditions;
    vii specific written procedures for refusal of unacceptable waste loads;
    viii. the requirements of this Certificate; and
    ix. the requirements of the Certificate of Approval (Air).

    b. A record showing that all persons directly involved with activities relating to the Facility have been trained in accordance with the requirements described in Condition 42.a shall be maintained at the Facility at all times.

43. A Trained Person shall be available at all times during the hours of operation of this Facility to supervise any activity required under this Certificate.

Public Information Meeting

44. The Owner shall hold a public information meeting to update the local community regarding the operation of the Facility no later than 7 months after the completion of the trial testing period for Alternative Fuel. At a minimum the Owner shall present the results of the trial testing carried out, and shall report on compliance issues relating to the use of Alternative fuels at the Facility. The Owner shall place notices in two local newspapers at least one week in advance advising the local community of the date, time and location of the meeting.

Complaint Response

45. If at any time a complaint is received regarding the operation of the Facility, the complaint shall be responded to in accordance with the procedures described in Certificate of Approval (Air).

Emergency Response Plan

46. The Owner shall ensure that the Emergency Response Plan for the Facility is reviewed annually and maintained current at all times. The Emergency Response Plan shall include, but not necessarily be limited to:

    a. emergency response procedures to be undertaken in the event of a spill or process upset, including specific clean up methods for each different type of Alternative fuel the Facility is approved to accept;

    b. a list of equipment and spill clean up materials available in case of an emergency; and

    c. notification protocol with names and telephone numbers of persons to be contacted, including persons responsible for the Facility, the Ministry's District Office and Spills Action Centre, the local Fire Department, the local Municipality, the local Medical Officer of Health, and the Ministry of Labour, and the names and telephone numbers of waste management companies available for emergency response.

47. The Emergency Response Plan shall be retained in a central location on the Facility and shall be accessible to all staff at all times. The Owner shall ensure that the District Manager, the local Municipality and the Fire Department are notified of any changes to the Emergency Response Plan.

48. The equipment, materials and personnel requirements outlined in the Emergency Response Plan shall be immediately available on the Facility at all times. The equipment shall be kept in a good state of repair and in a fully operational condition.

49. All staff that operate the Facility shall be fully trained in the use of the Emergency Response Plan and in the procedures to be employed in the event of an emergency.

50. The Owner shall immediately take all measures necessary to contain and clean up any spill or leak which may result from the operation of this Facility and immediately implement the Emergency Response Plan if required.

Facility Design and Operating Manual

51. The Design and Operating Manual shall be retained at the Facility; kept up to date; and be available for inspection by Ministry staff. The Design and Operating Manual shall contain at a minimum the information specified for a waste processing site as described in the most recent version of the Ministry publication "Guide For Applying For Approval of Waste Disposal Site".

52. Changes to the Design and Operating Manual shall be submitted to the Director for approval.

Daily Log Book

53. A log book or electronic file shall be maintained at the Facility for a minimum of 5 years and shall include daily records of the following information. All amounts must be recorded in metric:

a. the date;

b. the types, amounts and sources of Alternative fuels received at the Facility under this Certificate;

c. the amount of each category of waste referred to in Condition 24.a used as Alternative fuels within the kiln;

d. a record of any waste refusals which shall include; amounts, reasons for refusal and actions taken;

e. the amounts, types and location of Alternative fuels that are stored at the Facility;

f. a record of daily inspections required by this Certificate;

g. a record of any spills or process upsets at the Facility, the nature of the spill or process upset and the action taken for the clean up or correction of the spill, the time and date of the spill or process upset, and for spills, the time that the Ministry and other persons were notified of the spill in fulfilment of the reporting requirements in the EPA; and

h. and the signature of the Trained Personnel conducting the inspection and completing the report.

Report

54. Within 6 months of the completion of the Demonstration project a report shall be submitted to the District Manager. The report shall include the following information:

a. a detailed daily summary of the information required by Condition 53 of this Certificate;

b. a summary of the reporting information required by the Certificate of Approval (Air);

c. any environmental and operational problems, that caused or was likely to cause an adverse effect, encountered during the operation of the Facility and during the facility inspections and any mitigative actions taken;

d. any recommendations to minimize environmental impacts from the operation of the Facility and to improve Facility operations and monitoring programs in this regard.

Closure Plan

55. When the Owner ceases to receive, process and transfer Alternative fuels at the Facility in accordance with this Certificate, the Owner shall promptly clean up the Facility in accordance with the approved Closure Plan included in Item 1 of Schedule "A".

56. Within ten (10) days after closure of the Facility, the Owner shall notify the Director, in writing, the status of the Facility and of the implementation of the approved Closure Plan.

SCHEDULE "A"

1. Application for a Provisional Certificate of Approval for a Waste Disposal Site, dated September 29, 2008, signed by Martin Vroegh, Environment Manager, St. Marys Cement Inc. (Canada), including the attached report entitled "Application for Approval Under Section 27 of the EPA - For the Purpose of Conducting an Alternative Fuels Demonstration: Bowmanville Cement Plant", and all supporting documentation.

2. Memorandum dated November 11, 2008 from Janine Ralph, Jacques Whitford, to Andrew Neill, MOE, describing updates to the application package, including the addendum dated November 11, 2008 prepared by Jacques Whitford, revising the application package.

3. Email dated June 6, 2014 from Janine Ralph, HDR, Inc., to Andrew Neill, MOE, with changes to the description of the alternative fuel stream.

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

1. The reason for Condition 1 is to simplify the wording of the subsequent conditions and define the specific meaning of terms as used in this Provisional Certificate of Approval.

3. The reason for Conditions 2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 19, and 20 is to clarify the legal rights and responsibilities of the Owner and Operator.

4. The reason for Condition 4 is to ensure that the Site is operated in accordance with the applications and supporting documentation submitted by the Owner, and not in a manner which the Director has not been asked to consider.

5. The reasons for Condition 13 are to ensure that the Site is operated under the corporate name which appears on the application form submitted for this approval, to ensure that the Director is informed of any changes and to ensure that the former owners and/or operators of the Site are not involved in any aspect of the charge, management or control of the Site.

6. The reasons for Condition 14 are to restrict potential transfer or encumbrance of the Site without the approval of the Director and to ensure that any transfer of encumbrance can be made only on the basis that it will not compromise compliance with this Certificate of Approval.

7. The reason for Conditions 15, 16 and 17 is to ensure that sufficient funds are available to the Ministry to clean up the Site in the event that it appears the Owner is unable or unwilling to do so.

8. The reason for Condition 18 is to ensure that appropriate Ministry staff have ready access to the Site for inspection of facilities, equipment, practices and operations required by the conditions in this Certificate of Approval. This condition is supplementary to the powers of entry afforded a Provincial Officer pursuant to the EPA and OWRA.

9. The reason for Condition 21 is to ensure the availability of accurate record drawings for inspection and information purposes.

10. The reason for Conditions 22, 23, 32, 35, 36, 38, 40 and 41 is to ensure that the Site is operated in a manner which does not result in a nuisance or a hazard to the health and safety of the environment or people.

11. The reasons for Conditions 24, 25, 26, 27 and 28 are to specify the approved service area from which waste may be accepted at the Site, the types of waste that may be accepted at the Site, the amounts of waste that may be stored at the Site and the maximum rate at which the Site may receive and utilize waste, based on the applications and supporting documentation.

12. The reason for Condition 29 is to specify the hours of operation for the Site so that the Site is operated in a manner which does not result in a nuisance or a hazard to the health and safety of the environment or people.

13. The reason for Condition 30 is to ensure the controlled access and integrity of the Site by preventing unauthorized access when the Site is closed and no site attendant is on duty.

14. The reason for Condition 31 is to ensure that users of the Site are fully aware of important information and restrictions related to Site operations and access under this Certificate of Approval.

15. The reason for Conditions 33 and 34 is to ensure that all wastes are properly classified to ensure that they are managed, processed and disposed of in accordance with O. Reg. 347, R.R.O. 1990 and in a manner that protects the health and safety of the public and the environment.

16. The reason for Condition 39 is to ensure that detailed records of Site inspections are recorded and maintained for inspection and information purposes.

17. The reason for Conditions 42 and 43 is to ensure that the Site is operated by properly Trained staff in a manner which does not result in a hazard or nuisance to the natural environment or any person.

18. The reason for Condition 44 is to ensure that the public has full knowledge of the activities relating to operations at the Site and has a public forum to discuss any concerns it has with the operations .

19. The reason for Condition 45 is to ensure that any complaints regarding Site operations at the Site are responded to in a timely manner.

20. The reasons for Conditions 46, 47, 48, 49 and 50 are to ensure that an Emergency Response Plan is developed and maintained at the Site and that staff are properly trained in the operation of the equipment used at the Site and emergency response procedures.

21. The reasons for Condition 53 are to provide for the proper assessment of effectiveness and

efficiency of site design and operation, their effect or relationship to any nuisance or environmental impacts, and the occurrence of any public complaints or concerns. Record keeping is necessary to determine compliance with this Certificate of Approval, the EPA and its regulations.

22. The reasons for Condition 54 are to ensure that regular review of site development, operations and monitoring data is documented and any possible improvements to site design, operations or monitoring programs are identified. An annual report is an important tool used in reviewing site activities and for determining the effectiveness of site design.

23. The reasons for Condition 55 and 56 are to ensure that the Site is closed in accordance with Ministry standards and to protect the health and safety of the public and the environment.

In accordance with Section 139 of the Environmental Protection Act, you may by written Notice served upon me and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 142 of the Environmental Protection Act provides that the Notice requiring the hearing shall state:

1. The portions of the environmental compliance approval or each term or condition in the environmental compliance 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 environmental compliance approval number;
6. The date of the environmental compliance approval;
7. The name of the Director, and;
8. The municipality or municipalities within which the project is to be engaged in.

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

This Notice must be served upon:

The Secretary*
Environmental Review Tribunal
655 Bay Street, Suite 1500
Toronto, Ontario
M5G 1E5

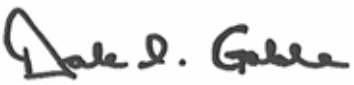
AND

The Director appointed for the purposes of
Part II.1 of the Environmental Protection Act
Ministry of the Environment
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) 212-6349, Fax: (416) 314-4506 or www.ert.gov.on.ca**

The above noted activity is approved under s.20.3 of Part II.1 of the Environmental Protection Act.

DATED AT TORONTO this 11th day of March, 2015



Dale Gable, P.Eng.
Director
appointed for the purposes of Part II.1 of the
Environmental Protection Act

AN/
c: District Manager, MOE York-Durham
Janine Ralph, Jacques Whitford Limited

Ministry of the Environment and Climate Change
Ministère de l'Environnement et de l'Action en matière de changement climatique

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AMENDMENT TO ENVIRONMENTAL COMPLIANCE APPROVAL
NUMBER 1255-7QVJ2N
Notice No. 1
Issue Date: March 17, 2017

St Marys Cement (Canada) Inc.
55 Industrial Street, 4th Floor
Toronto, Ontario
M4G 3M9

Site Location: 400 Waverley Road South
Clarington Municipality, Regional Municipality of Durham
L1C 3K3

You are hereby notified that I have amended Approval No. 1255-7QVJ2N issued on March 11, 2015 fora waste disposal site (utilization of alternative fuels), as follows:

I. Conditions 15 and 16 are hereby revoked and replaced by:

15. No later than **April 30, 2017**, and no less than thirty (30) days prior to any Alternative fuels being received at the Facility, the Owner shall submit to the Director, Financial Assurance, as defined in Section 131 of the EPA, in the amount of $8,820. This Financial Assurance shall be in a form and amount acceptable to the Director and shall provide sufficient funds for the analysis, transportation, Facility clean-up, monitoring and disposal of all quantities of Alternative fuels on-site at any one time.

16. No later than **March 31, 2020**, and on March 31 every three (3) years thereafter, the Owner shall provide, to the Director, a written re-evaluation of the amount of the Financial Assurance required to carry out the matters specified in Condition 15. The re-evaluation shall be based on the Financial Assurance Guideline applicable at the time of any re-evaluation. The revised Financial Assurance amount must be submitted to the Director within ten (10) days of written acceptance of the re-evaluation by the Director.

The reason for this amendment to the Approval is as follows:

1. To ensure that sufficient funds are available to the Ministry to clean up the Site in the event that it appears the Owner is unable or unwilling to do so.

This Notice shall constitute part of the approval issued under Approval No. 1255-7QVJ2N dated March 11, 2015

In accordance with Section 139 of the Environmental Protection Act, you may by written Notice served upon me and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 142 of the Environmental Protection Act provides that the Notice requiring the hearing shall state:

1. The portions of the environmental compliance approval or each term or condition in the environmental compliance 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.

Pursuant to subsection 139(3) of the Environmental Protection Act, a hearing may not be required with respect to any terms and conditions in this environmental compliance approval, if the terms and conditions are substantially the same as those contained in an approval that is amended or revoked by this environmental compliance approval.

The Notice should also include:

3. The name of the appellant;
4. The address of the appellant;
5. The environmental compliance approval number;
6. The date of the environmental compliance approval;
7. The name of the Director, and;
8. The municipality or municipalities within which the project is to be engaged in.

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

This Notice must be served upon:

The Secretary*****
Environmental Review Tribunal
655 Bay Street, Suite 1500
Toronto, Ontario
M5G 1E5

AND

The Director appointed for the purposes of Part II.1 of the Environmental Protection Act
Ministry of the Environment and Climate Change
135 St. Clair Avenue West, 1st Floor
Toronto, Ontario
M4V 1P5

*** Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 212-6349, Fax: (416) 326-5370 or www.ert.gov.on.ca**

The above noted activity is approved under s.20.3 of Part II.1 of the Environmental Protection Act.

DATED AT TORONTO this 17th day of March, 2017

Dale Gable, P.Eng.
Director
appointed for the purposes of Part II.1 of the
Environmental Protection Act

AN/
c: District Manager, MOECC York-Durham
Martin Vroegh, St. Marys Cement Inc. (Canada)

Appendix D

ECA (Air) Number 4614 826K9W (no amendments) (demonstration)

Ontario

Ministry of the Environment
Ministère de l'Environnement

ENVIRONMENTAL COMPLIANCE APPROVAL
NUMBER 4614-826K9W
Issue Date: November 5, 2014

St. Marys Cement Inc. (Canada)
410 Waverly Rd R.R. 2
Bowmanville, Ontario
L1C 3K3

Site Location: 400 Waverly Road South
Clarington, Ontario

You have applied under section 20.2 of Part II.1 of the Environmental Protection Act, R.S.O. 1990, c. E. 19 (Environmental Protection Act) for approval of:

A time-limited Demonstration Project to gather site specific air quality data, where up to 30% of the conventional fuel, based on total energy input, is substituted with the following Alternative Fuels:

Alternative Fuel	Description	Maximum Input Rate (tonnes/hour)
Post-composting plastic polymers and woody residuals.	Shredded and dried plastic film and other plastic materials and woody materials removed from finished compost.	5.5
Plastic polymers, paper fibres and woody residuals derived from industrial and/or post consumer sources.	Shredded plastic and other materials removed from post consumer recycling or from industrial manufacturing process.	6.5

all in accordance with the application for an Approval (Air & Noise), signed by Martin Vroegh and all supporting information, including Emission Summary and Dispersion Modelling Report dated September 29, 2008, prepared by Pottinger Gaherty Environmental Consultants.

For the purpose of this environmental compliance approval, the following definitions apply:

1. "Approval" means this Environmental Compliance Approval, including the application and all supporting documentation;

2. "Alternative Fuel" means plastic polymers, paper fibres and woody residuals derived from industrial and/or post consumer sources, received as single streams, or blends of these material types, classified as Municipal Solid Waste under Ontario Regulation 347, written under the EPA, to be used as a substitute fuel source in the Cement Kiln;

3. "Ambient Air Quality Monitoring Program" means the ambient air quality monitoring program outlined in the report titled "Ambient Air Sampling Program", prepared for St. Marys Cement Inc, by Pottinger Gaherty Environmental Consultants Ltd., July 2008 and Addendum dated December 10, 2008, signed by Bridget Mills;

4. "Baseline Conditions" means operating conditions where only Conventional Fuel is used in the Cement Kiln;

5. "CEM System" means the continuous monitoring and recording systems used to measure the emissions from the Cement Kiln, as described in the Company's application, this Approval and in the supporting documentation referred to herein, to the extent approved by this Approval;

6. "Company" means St. Marys Cement Inc. (Canada) that is responsible for the construction or operation of the Facility and includes any successors and assigns;

7. "Cement Kiln" means the Cement Kiln, the Calciner and associated control equipment and continuous emissions monitoring systems, firing Conventional Fuel and Alternative Fuel, described in the Company's application, this Approval and in the supporting documentation referred to herein, to the extent approved by this Approval;

8. "Conventional Fuel" means solid fuels such as, petroleum coke and coal;

9. "Demonstration Project" means the demonstration project where up to 30 % of Conventional Fuel is substituted with Alternative Fuel in the Cement Kiln, as described in the Company's application, this Approval and in the supporting documentation referred to herein, to the extent approved by this Approval;

10. "District Manager" means the District Manager of the appropriate local district office of the Ministry, where the Facility is geographically located;

11. "EPA" means the Environmental Protection Act, R.S.O. 1990, c.E.19, as amended;

12. "Equipment" means the equipment and operations associated with the Demonstration Project, located on the property where the Cement Kiln is located, as described in the Company's application, this Approval and in the supporting documentation referred to herein, to the extent approved by this Approval;

13. "Facility" means the entire operation located on the property where the Equipment is located;

14. "Manager" means the Manager, Technology Standards Section, Standards Development Branch, who has been appointed under Section 5 of the EPA for the purposes of Section 11(1)2 of O.Reg. 419, or any other person who represents and carries out the duties of the Manager, Technology Standards Section, Standards Development Branch, as those duties relate to the conditions of this Approval;

15. "Manual" means a document or a set of documents that provide written instructions to staff of the Company;

16. "Ministry" means the ministry of the government of Ontario responsible for the EPA and includes all officials, employees or other persons acting on its behalf;

17. "Point of Impingement" means any point in the natural environment. The point of impingement for the purposes of verifying compliance with the EPA with respect to the Demonstration Project, shall be chosen as the point located outside the Company's property boundaries at which the highest concentration is expected to occur, when that concentration is calculated in accordance with a method accepted by the Director;

18. "Pre-test Information" means the information outlined in Section 1.1 of the Source Testing Code;

19. "Source Testing" means sampling and testing to measure emissions resulting from operating the Cement Kiln at a level of typical maximum production within the approved operating range of the Cement Kiln which satisfies paragraph 1 of subsection 11(1) of O. Reg. 419;

20. "Source Testing Code" means the Source Testing Code, Version 2, Report No. ARB-66-80, dated November 1980, prepared by the Ministry, as amended;

21. "Test Contaminants" means those contaminants set out in Schedules "B1" and "B2" attached to this Approval;

22. "Publication NPC-205" means the Ministry Publication NPC-205, "Sound level Limits for Stationary Sources in Class 1 & 2 Areas (Urban)", October, 1995 as amended; and

23. "Publication NPC-232" means the Ministry Publication NPC-232, "Sound Level Limits for Stationary Sources in Class 3 Areas (Rural)", October, 1995 as amended.

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

TERMS AND CONDITIONS

OPERATION AND MAINTENANCE

1. (1) The Company shall ensure that the Facility is properly operated and maintained at all times while firing any amount of Alternative Fuel in the Cement Kiln during the Demonstration Project, so that operations of the Cement Kiln shall meet the operational limits set out in Schedule "A1". Alternative Fuel is to be stopped (following appropriate procedures) if one or more of Operational Limits is exceeded for more than one consecutive hour.

   (2) The Performance Objectives for emissions from the Cement Kiln Exhaust Stack are set out in Schedule "A2".

2. Unless otherwise approved in writing by the Director due to unforeseen delays in carrying out the Demonstration Project, the Company shall limit the combustion of Alternative Fuel in the Cement Kiln to the following:

   (1) Thirty (30) days for stack testing at the maximum fuel substitution (up to 30%);

   (2) Thirty (30) days for ramping up, stabilization, and ramping down.

3. The Company shall ensure that the Facility is properly operated and maintained at all times during the Demonstration Project. The Company shall:

   (1) prepare and update as necessary, prior to commencement of the Demonstration Project, a Design and Operations Manual specific to all aspects of the Facility, including the handling of Alternative Fuel and the use of Alternative Fuel in the Cement Kiln during the Demonstration Project, outlining the following:

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

      (c) emergency procedures;

      (d) procedures for any record keeping activities relating to the operations of the Facility;

      (e) all appropriate measures to minimize odour, noise and dust emissions from all potential sources from the Facility;

   (2) implement the recommendations of the Design and Operations Manual during the Demonstration Project.

4. The Company shall, at all times, ensure that the noise emissions from the Facility comply with the limits set out in Ministry Publication NPC-205 or Ministry Publication NPC-232, as applicable, during the Demonstration Project.

RAW FEED AND FUELS - ANALYSIS AND MONITORING

5. The Company shall prepare and implement, prior to the firing of Alternative Fuel in the Cement Kiln, a Raw Feed and Fuels Analysis and Monitoring Program to record the properties and quantities of the Raw Feed and Fuels used in the Cement Kiln during the Demonstration Project. The Raw Materials and Fuels Analysis and Monitoring Program shall specify as a minimum:

   (1) sampling methodology and frequency and chemical analysis of raw feed, Conventional Fuel and Alternative Fuel directed to the Cement Kiln;

   (2) hourly feed rate of the raw feed, Conventional Fuel and Alternative Fuel in the Cement Kiln during the Demonstration Project.

MONITORING

CONTINUOUS EMISSIONS MONITORING

6. The Company shall ensure that the existing Continuous Emissions Monitoring Systems, are fully operational during the Demonstration Project, to continuously monitor the following parameters in the exhaust gas stream of the Cement Kiln Exhaust Stack:

   (a) Nitrogen Oxides;
   (b) Sulphur Dioxide;
   (c) Opacity;

   The Continuous Emissions Monitoring Systems for Nitrogen Oxides and Sulphur Dioxide shall comply with the requirements of O. Reg. 194/05, EPA – "Industry Emissions – Nitrogen Oxides and Sulphur Dioxide" . The Continuous Emissions Monitoring System for Opacity shall comply with the requirements outlined in Schedule "D" attached to this Approval.

AMBIENT AIR QUALITY MONITORING

7. The Company shall conduct an Ambient Air Quality Monitoring Program during the Demonstration Project to determine the concentrations of the Test Contaminants listed in Schedule "B1", in accordance with the Ambient Air Quality Monitoring Program. Upwind and downwind sampling locations will be selected based on historical meteorological data and air dispersion modelling of the Cement Kiln stack. Ambient air sampling and monitoring will occur during both Baseline Conditions and with the use of Alternative Fuel in the Cement Kiln.

SOURCE TESTING

8. The Company shall conduct, a Source Testing Program, following the Source Testing Procedures listed in Schedule "C", during the Demonstration Project, to determine the rate of emission of the Test Contaminants listed in Schedule "B2" from the Cement Kiln Exhaust Stack. The Source Testing Program shall be designed to include both the Baseline Conditions and with the use of Alternative Fuel in the Cement Kiln.

REPORTING

9. The Company shall prepare and submit to the Director and District Manager, no later than six (6) months after the completion of the Demonstration Project, a Demonstration Project Summary Report. The Demonstration Project Summary Report shall include, as a minimum, but not limited to:

   (1) a summary of emission data and analysis obtained through the Source Testing Program, the Ambient Air Quality Monitoring Program and the Continuous Emissions Monitoring Program, conducted during the Demonstration Project, prepared in accordance with the requirements of the Reporting Procedures described in Schedule "C" attached to this Approval, as applicable;

   (2) a summary of all comments received by the Company during the Demonstration Project that pertain to the Demonstration Project from the public, the Ministry, or any other party.

10. The Company shall ensure that the above mentioned Demonstration Project Summary Report is made available and easily accessible for review by the public at the Facility and via an internet website, immediately after the document is submitted to the Ministry.

RECORD KEEPING REQUIREMENTS

11. The Company shall retain, for a minimum of five (5) years from the date of their creation and provide to the Ministry, upon request, in a timely manner, all reports, records and information required by this Approval and shall include but not be limited to:

   (1) time, date and duration of the Demonstration Project;

   (2) all records and reports produced from the Raw Feed and Fuels Analysis and Monitoring Program, the Source Testing Program, the Ambient Air Quality Monitoring Program and the Continuous Emissions Monitoring Program required under this Approval;

   (3) all records and reports produced as part of the assessments of emissions and impacts from the operation of the Cement Kiln, as a result of the utilization of Alternative Fuel for the Cement Kiln;

   (4) all records related to all environmental complaints made by the public during the Demonstration Project;

   (5) a copy of the Demonstration Project Summary Report required under Condition 8.

NOTIFICATION

12. The Company shall notify the District Manager, in writing, at least fifteen (15) business days prior to commencement of the Demonstration Project.

COMPLAINTS RESPONSE PROCEDURE

13. If at any time, the Company receives any environmental complaints from the public regarding the operation of the Facility during the Demonstration Project, the Company shall respond to these complaints according to the following procedure:

    (1) The District Manager shall be notified forthwith upon receipt of any complaint;

    (2) Each complaint shall be recorded and numbered, and shall include the following information, as a minimum:

        (a) nature of the complaint;
        (b) weather conditions and wind direction at the time of the complaint;
        (c) name and address of the complainant (if provided); and
        (d) time and date of the complaint;

    (3) Appropriate steps shall be taken forthwith to determine all possible causes of the complaint and to eliminate the cause of the complaint. A written reply shall be provided to the complainant, if known and if requested by the complainant, within 3 business days of receipt of the complaint by the Company.

SCHEDULE "A1"

OPERATIONAL LIMITS

Parameter	Limits	Comments
Quantity of Alternative Fuel	No more than 30% substitution (based on heating value).	Measured continuously.
Raw Material Feed Rate	>250 tonnes/hour	Measured continuously.
Temperature	>1000°C at a residence time of more than 6 seconds in the Kiln >850°C at a residence time of more than 3 seconds in the calciner	Measured by a continuous monitor Calculated as a rolling 1-hour arithmetic average measured by a continuous monitoring system that provides data at least once every 1 minute
Residual oxygen	>1% Residual oxygen at the backend of the kiln. >3% Residual oxygen at the calciner down comer duct.	Measured by a continuous monitor and calculated by volume on a dry basis in the undiluted gases leaving the Kiln. Calculated as a rolling 1-hour arithmetic average measured by a continuous monitoring system that provides data at least once every 1 minute
Pressure Control	Kiln must be operated under negative pressure at all times during the Demonstration Project.	Measured at the top of the preheater towers by continuous monitor.
Start-Up, Shut-down and Upset Operating conditions	No Alternative Fuel to be used.	-

SCHEDULE "A2"

PERFORMANCE OBJECTIVES

Parameter	Emission Limit	Comments
Particulate Matter (PM)	50 mg/Rm^3	calculated as the arithmetic average of three stack tests conducted in accordance with standard methods
Dioxins and Furans	80 pg/Rm^3 as ITEQ	calculated as the arithmetic average of three stack tests conducted in accordance with standard methods
Hydrochloric Acid (HCl)	27 mg/Rm^3	calculated as the arithmetic average of three stack tests conducted in accordance with standard methods
Cadmium	7 ug/Rm3	calculated as the arithmetic average of three stack tests conducted in accordance with standard methods
Lead	60 ug/Rm3	calculated as the arithmetic average of three stack tests conducted in accordance with standard methods
Mercury	20 ug/Rm3	calculated as the arithmetic average of three stack tests conducted in accordance with standard methods

Notes:

R - Reference flue gas conditions, defined as follows:

- Temperature 25 °C
- Pressure 101.3 kPa
- Oxygen content 11%
- Water content nil (dry conditions)

mg/Rm3 - milligrams per cubic metre of gas at Reference conditions.
ug/Rm3 - micrograms per cubic metre of gas at Reference conditions.
pg/Rm3 - picograms per cubic metre of gas at Reference conditions.
I-TEQ - a toxicity equivalent concentration calculated using the toxic equivalency factors (I-TEFs) derived for each dioxin and furan congener by comparing its toxicity to the toxicity of 2,3,7,8 tetrachloro dibenzo-p-dioxin, recommended by the North Atlantic Treaty Organizations's Committee on Challenges to Modern Society [NATO/CCMS] in 1989 and adopted by Canada in 1990.

SCHEDULE "B1"
TEST CONTAMINANTS
Ambient Air Quality Monitoring Program

Metals	Polycyclic Aromatic Hydrocarbons	Dioxins and Furans	Volatile Organic Compounds
Antimony (Sb)	1-Methyl naphthalene	2,3,7,8-Tetrachlorodibenzo-p-dioxin	acetone
Aluminum (Al)	1-Methyl phenanthrene	1,2,3,7,8-Pentachlorodibenzo-p-dioxin	benzene
Arsenic (As)	2-Chloronaphthalene	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	chloromethane
Barium (Ba)	2-Methylanthracene	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	bromomethane
Beryllium (Be)	2-Methylnaphthalene	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	chloroethane
Boron (B)	3-Methylcholanthrene	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	1,1- dichloroethylene (vinyl chloride)
Cadmium (Cd)	7,12-Dimethylbenzo(a)anthrace ne	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin	methylene chloride
Chromium (Cr)	9,10-Dimethylanthracene	2,3,7,8-Tetrachlorodibenzofuran	1,1- dichloroethane
Cobalt (Co)	Acenaphthene	2,3,4,7,8-Pentachlorodibenzofuran	trans - 1,2 -dichloroethylene
Copper (Cu)	Acenaphthylene	1,2,3,7,8-Pentachlorodibenzofuran	cis - 1,2 -dichloroethylene
Lead (Pb)	Anthracene	1,2,3,4,7,8-Hexachlorodibenzofuran	chloroform
Manganese (Mn)	Benzo(a)anthracene	1,2,3,6,7,8-Hexachlorodibenzofuran	1,2 -dichloroethane
Mercury (Hg)	Benzo(b)fluoranthene	1,2,3,7,8,9-Hexachlorodibenzofuran	2- butanone
Molybdenum (Mo)	Benzo(k)fluoranthene	2,3,4,6,7,8-Hexachlorodibenzofuran	1,1,1 –trichloroethane
Nickel (Ni)	Benzo(a)fluorene	1,2,3,4,6,7,8-Heptachlorodibenzofuran	carbon tetrachloride
Phosphorus (P)	Benzo(b)fluorene	1,2,3,4,7,8,9-Heptachlorodibenzofuran	1,1,2- trichloroethane
Potassium (K)	Benzo(g,h,i)perylene	1,2,3,4,6,7,8,9-Octachlorodibenzofuran	1,2- dichloropropane
Selenium (Se)	Benzo(a)pyrene		trichloroethylene
Silver (Ag)	Benzo(e)pyrene		bromodichloromethane
Strontium (Sr)	Chrysene		dibromochloromethane
Thalium (Tl)	Coronene		toluene
Tin (Sn)	Dibenzo(a,e)pyrene		tetrachloroethylene
Titanium (Ti)	Dibenzo(a,h)anthracene		chlorobenzene
Vanadium (V)	Fluoranthene		ethylbenzene
Zinc (Z)	Fluorene		m/p xylene
Calcium Oxide (CaO)	Indeno(1,2,3-cd)pyrene		o - xylene
Iron Oxide (FeO)	Naphthalene		styrene
	Perylene		bromoform
	Phenanthrene		1,1,1,2 -tetrachloroethane
	Pyrene		1,1,2,2 -tetrachloroethane
	Tetralin		cumene (isopropyl benzene)
	Dibenzo(a,c)anthracene + Picene (sum of 2)		1,2-dibromoethane (ethylene dibromide)

SCHEDULE "B2"

TEST CONTAMINANTS

Source Testing Program

Nitrogen Oxides
Sulphur Dioxide
Carbon Monoxide
Carbon Dioxide
Total Suspended Particulate Matter
PM 10
PM 2.5
Hydrogen Chloride
Ammonia
Calcium Oxide
Ferric Oxide

Metals		Volatile Organic Matter
Cd	Cadmium	acetone
Be	Beryllium	benzene
Pb	Lead	bromodichloromethane
Mo	Molybdenum	bromoform
Cr	Chromium	bromomethane
Ni	Nickel	butanone, 2 -
V	Vanadium	carbon tetrachloride
Al	Aluminum	chlorobenzene
Ti	Titanium	chloroethane
Mg	Magnesium	chloroform
B	Boron	chloromethane
Ba	Barium	cumene (isopropyl benzene)
P	Phosphorus	dibromochloromethane
K	Potassium	dichloroethane, 1,1 -
Hg	Mercury	dichloroethane, 1,2 -
As	Arsenic	dichloroethene, trans - 1,2 -
Zn	Zinc	dichloroethene, 1,1 – (vinyl chloride)
Sb	Antimony	dichloroethylene, cis - 1,2 -
Mn	Manganese	dichloropropane, 1,2 -
Co	Cobalt	ethylbenzene
Se	Selenium	ethylene dibromide (1,2-dibromoethane)
Cu	Copper	methylene chloride
Ag	Silver	styrene
Sn	Tin	tetrachloroethane, 1,1,1,2 -
Sr	Strontium	tetrachloroethane, 1,1,2,2 -
Tl	Thalium	tetrachloroethene
		toluene
		trichloroethane, 1,1,1 –
		trichloroethane, 1,1,2 -
		trichloroethene (trichloroethylene, 1,1,2 -)
		xylenes

Dioxins, Furans and Dioxin-like PCBs

2,3,7,8-Tetrachlorodibenzo-p-dioxin [2,3,7,8-TCDD]
1,2,3,7,8-Pentachlorodibenzo-p-dioxin [1,2,3,7,8-PeCDD]
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin [1,2,3,4,7,8-HxCDD]
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin [1,2,3,6,7,8-HxCDD]
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin [1,2,3,7,8,9-HxCDD]
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin [1,2,3,4,6,7,8-HpCDD]
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin [1,2,3,4,6,7,8,9-OCDD]
2,3,7,8-Tetrachlorodibenzofuran [2,3,7,8-TCDF]
2,3,4,7,8-Pentachlorodibenzofuran [2,3,4,7,8-PeCDF]
1,2,3,7,8-Pentachlorodibenzofuran [1,2,3,7,8-PeCDF]
1,2,3,4,7,8-Hexachlorodibenzofuran [1,2,3,4,7,8-HxCDF]
1,2,3,6,7,8-Hexachlorodibenzofuran [1,2,3,6,7,8-HxCDF]
1,2,3,7,8,9-Hexachlorodibenzofuran [1,2,3,7,8,9-HxCDF]
2,3,4,6,7,8-Hexachlorodibenzofuran [2,3,4,6,7,8-HxCDF]
1,2,3,4,6,7,8-Heptachlorodibenzofuran [1,2,3,4,6,7,8-HpCDF]
1,2,3,4,7,8,9-Heptachlorodibenzofuran [1,2,3,4,7,8,9-HpCDF]
1,2,3,4,6,7,8,9-Octachlorodibenzofuran [1,2,3,4,6,7,8,9-OCDF]

3,3',4,4'-Tetrachlorobiphenyl [3,3',4,4'-tetraCB (PCB 77)]
3,4,4',5- Tetrachlorobiphenyl [3,4,4',5-tetraCB (PCB 81)]
3,3',4,4',5- Pentachlorobiphenyl (PCB 126) [3,3',4,4',5-pentaCB (PCB 126)]
3,3',4,4',5,5'- Hexachlorobiphenyl [3,3',4,4',5,5'-hexaCB (PCB 169)]
2,3,3',4,4'- Pentachlorobiphenyl [2,3,3',4,4'-pentaCB (PCB 105)]
2,3,4,4',5- Pentachlorobiphenyl [2,3,4,4',5-pentaCB (PCB 114)]
2,3',4,4',5- Pentachlorobiphenyl [2,3',4,4',5-pentaCB (PCB 118)]
2',3,4,4',5- Pentachlorobiphenyl [2',3,4,4',5-pentaCB (PCB 123)]
2,3,3',4,4',5- Hexachlorobiphenyl [2,3,3',4,4',5-hexaCB (PCB 156)]
2,3,3',4,4',5'- Hexachlorobiphenyl [2,3,3',4,4',5'-hexaCB (PCB 157)]
2,3',4,4',5,5'- Hexachlorobiphenyl [2,3',4,4',5,5'-hexaCB (PCB 167)]
2,3,3',4,4',5,5'- Heptachlorobiphenyl [2,3,3',4,4',5,5'-heptaCB (PCB 189)]

Polycyclic Organic Matter:
Acenaphthylene
Acenaphthene
Anthracene
Benzo(a)anthracene
Benzo(b)fluoranthene
Benzo(k)fluoranthene
Benzo(a)fluorene
Benzo(b)fluorene
Benzo(ghi)perylene
Benzo(a)pyrene
Benzo(e)pyrene
2-Chloronaphthalene
Chrysene
Coronene
Dibenzo(a,c)anthracene
9,10-Dimethylanthracene
7,12-Dimethylbenzo(a)anthracene

Fluoranthene
Fluorene
Indeno(1,2,3-cd)pyrene
2-Methylanthracene
3-Methylcholanthrene
1-Methylnaphthalene
2-Methylnaphthalene
1-Methylphenanthrene
9-Methylphenanthrene
Naphthalene
Perylene
Phenanthrene
Picene
Pyrene
Tetralin
Triphenylene

Chlorinated Organics

total dichlorobenzenes
total trichlorobenzenes (1,3,5-; 1,2,3-; 1,2,4-)
total tetrachlorobenzenes (1,2,4,5-; 1,2,3,5-)
pentachlorobenzene
hexachlorobenzene
total dichlorophenols (2,3-; 2,4-; and 2,6-)
total trichlorophenols (2,3,4-; 2,4,5-; 2,4,6-; 3,4,5-)
total tetrachlorophenols (2,3,4,6-;2,3,5,6)
total pentachlorophenols

SCHEDULE "C"

MONITORING AND REPORTING PROCEDURES

A. SOURCE TESTING PROCEDURES

1. The Company shall submit, to the Manager a test protocol including the Pre-Test Information required by the Source Testing Code, at least thirty (30) days prior to the scheduled dates of the Source Testing Program.

2. The Company shall finalize the test protocol in consultation with the Manager.

3. The Company shall not commence the Source Testing until the Manager has accepted the test protocol.

4. The Company shall notify the District Manager and the Manager in writing of the location, date and time of any impending Source Testing required by this Approval, at least fifteen (15) days prior to the Source Testing.

5. The Director may not accept the results of the Source Testing Program if:
   (1) the Source Testing Code or the requirements of the Manager were not followed; or
   (2) the Company did not notify the District Manager and the Manager of the Source Testing; or
   (3) the Company failed to provide a complete report on the Source Testing.

B. REPORTING PROCEDURES

SOURCE TESTING PROGRAM

1. The Company shall submit a report on the Source Testing Program to the District Manager and the Manager not later than six (6) months after completing the Source Testing Program. The report shall be in the format described in the Source Testing Code, and shall also include, but not be limited to:

   (1) an executive summary;
   (2) records of operating conditions; including a summary of the results of the Raw Feed and Fuels Analysis and Monitoring Program as required by Condition 4 of this Approval;
   (3) all records produced by the continuous monitoring systems during the Demonstration Project;
   (4) assessment of compliance with the Cement Kiln Exhaust Stack Operating Limits for the parameters listed in Schedule "A1" attached to this Approval;
   (5) the results of source testing and air dispersion calculations in accordance with regulation 419/05, indicating the maximum concentration of the Test Contaminants emitted from the Cement Kiln Stack at the Point of Impingement and an assessment of compliance with Regulation 419/05 Schedule 3 standards; and
   (6) a description and explanation of any statistically significant changes in emissions from the Cement Kiln Exhaust Stack and Point of Impingement Concentrations of the Test Contaminants, if any, resulting from the use of Alternative Fuel, relative to the Baseline Conditions.

AMBIENT AIR MONITORING PROGRAM

2. The Company shall submit a report on the results of the Ambient Air Quality Monitoring Program, to the District Manager not later than six (6) months after completing the Demonstration Project . The report shall include, but not be limited to:

(1) an executive summary;
(2) records of operating conditions; including a summary of the results of the Raw Feed and Fuels Analysis and Monitoring Program;
(3) sample dates, frequency and duration;
(4) information on the exact location of samplers, including the analysis to site them. A map must be included, clearly showing where each monitoring station is located.
(5) a description of the specifications of the monitors used in the Ambient Air Quality Monitoring Program;
(6) a description of the specifications of the meteorological stations used to monitor and record meteorological conditions and analysis of wind direction
(7) results of the Ambient Air Monitoring Program for the Test Contaminants listed in Schedule B1;
(8) a description and explanation of any statistically significant changes in ambient air concentrations of the Test Contaminants, if any, resulting from the use of Alternative Fuel, relative to the Baseline Conditions.

SCHEDULE "D"

Continuous Monitoring System Requirements

PARAMETER: **Opacity**

INSTALLATION:
The Continuous Opacity Monitor shall be installed at an accessible location where the measurements are representative of the actual opacity of the gases leaving the *Cement Kiln Exhaust Stack* and shall meet the following design and installation specifications:

PARAMETERS	SPECIFICATION
1. Wavelength at Peak Spectral Response (nanometres, nm):	500 - 600
2. Wavelength at Mean Spectral Response (nm):	500 - 600
3. Detector Angle of View:	≤ 5 degrees
4. Angle of Projection:	≤ 5 degrees
5. Range (percent of opacity):	0 -100

PERFORMANCE:
The Continuous Opacity Monitor shall meet the following minimum performance specifications for the following parameters.

PARAMETERS	SPECIFICATION
1. Span Value (percent opacity):	80 percent
2. Calibration Error:	≤ 3 percent opacity
3. Attenuator Calibration:	≤ 2 percent opacity
4. Response Time (95 percent response to a step change):	≤ 10 seconds
5. Schedule for Zero and Calibration Checks:	daily minimum
6. Procedure for Zero and Calibration Checks:	all system components checked
7. Zero Calibration Drift (24-hours):	≤ 2 percent opacity
8. Span Calibration Drift (24-hours):	≤ 2 percent opacity
9. Conditioning Test Period:	≥ 168 hours without corrective maintenance
10. Operational Test Period:	≥ 168 hours without corrective maintenance

CALIBRATION:
The monitor shall be calibrated, to ensure that it meets the drift limits specified above, during the Demonstration Project . The results of all calibrations shall be recorded at the time of calibration.

DATA RECORDER:
The data recorder must be capable of registering continuously the measurement of the monitor with an accuracy of 0.5 percent of a full scale reading or better and with a time resolution of 30 seconds or better.

RELIABILITY:
The monitor shall be operated and maintained so that accurate data is obtained during a minimum of 90 percent of the time during the Demonstration Project.

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

1. Condition No. 1 is included to outline the minimum performance requirements considered necessary to prevent an adverse effect resulting from the utilization of any Alternative Fuel for the Cement Kiln during the Demonstration Project.

2. Condition Nos. 2, 3 and 4 are included to require the Company to operate and maintain the Facility in accordance with the terms and conditions of this Approval.

3. Condition Nos. 5, 6, 7 and 8 are included to require the Company to gather accurate information so that the environmental impact and subsequent compliance with the EPA, Regulation 419/05 and this Approval can be verified.

4. Condition Nos. 9, 10, 11 and 12 are included to require the Company to retain records of information gathered during the Demonstration Project and to provide easy public access to information related to the Demonstration Project, so that the environmental impact and subsequent compliance with the EPA, the regulations and this Approval can be verified.

5. Condition No. 13 is included to require the Company to respond to any environmental complaints related to the Demonstration Project, according to procedures that include methods for preventing recurrence of similar incidents.

In accordance with Section 139 of the Environmental Protection Act, you may by written Notice served upon me and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 142 of the Environmental Protection Act provides that the Notice requiring the hearing shall state:

1. The portions of the environmental compliance approval or each term or condition in the environmental compliance 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 environmental compliance approval number;
6. The date of the environmental compliance approval;
7. The name of the Director, and;
8. The municipality or municipalities within which the project is to be engaged in.

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

This Notice must be served upon:

The Secretary*
Environmental Review Tribunal
655 Bay Street, Suite 1500
Toronto, Ontario
M5G 1E5

AND

The Director appointed for the purposes of
Part II.1 of the Environmental Protection Act
Ministry of the Environment
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) 212-6349, Fax: (416) 314-4506 or www.ert.gov.on.ca**

The above noted activity is approved under s.20.3 of Part II.1 of the Environmental Protection Act.

DATED AT TORONTO this 5th day of November, 2014

Rudolf Wan, P.Eng.
Director
appointed for the purposes of Part II.1 of the
Environmental Protection Act

QN/
c: District Manager, MOE York-Durham
Bridget Mills, P.Eng., BCX Environmental Consulting.

Appendix E

Alternative Fuel Sampling Methodology for Offsite Fuel Generator Locations

ST MARYS	Location: Offsite Fuel Generators	**ST. MARYS CEMENT COMPANY Procedure**	**Page 1 of 6**
	Department: Environment	**Title:** Alternative Fuel Sampling Methodology for Offsite Fuel Generator Locations	**Revision:** 3
	System: All		**Type:**

1.0 PURPOSE

1.1 The purpose of this procedure is to describe the proper fuel sampling and testing that will be performed at off-site locations to assist in ensuring that alternative fuel (including low-carbon alternative fuel (LCF) and demonstration fuel materials) meets established specifications for both operational and environmental objectives. Operationally, the plant must ensure that the materials meet specifications related to particle size and moisture content so that the materials are suitable for injection into the main kiln burner. Environmentally, the metals/metal hydrides scan will be completed in accordance with current adjunct fuel requirements in the Bowmanville Plant ECA (Air). Other parameters will also be tested to support assessment of fuel quality.

2.0 SCOPE

2.1 This procedure applies to the operations and activities undertaken at off-site locations from which alternative fuel will be supplied to the Bowmanville Cement Plant, related to the proper fuel sampling and testing that will be performed ensuring the alternative fuel meets established specifications for both operational and environmental objectives.

3.0 OVERVIEW OF OFF-SITE ALTERNATIVE FUEL SAMPLING AND INSPECTION APPROACH

During the trial runs of alternative fuel suppliers under the low-carbon fuel (LCF) approvals, and during the alternative fuel demonstration testing period, St. Marys (SMC) will implement an initial fuel screening protocol over the course of the trial period and during subsequent acceptance periods pending the outcome of various material trials' in which a visual screening and sampling process will be undertaken at the point of supply, prior to shipment to the Bowmanville plant. This approach will allow for SMC to determine that the material quality specifications are being met and will minimize the potential for the rejection/return of loads and disruption to stable operations using alternative fuel.

Table 1: Alternative Fuel Specifications – Operating Parameters

Operational Specification	Parameter	Rationale
Moisture	≤ 25% by weight	▪ Fuel quality ▪ Prevention of run-off ▪ Consistent heating value
Total Halogen Content	≤ 1% by weight	▪ Fuel quality, in accordance with ECA (Air) Number 0469-9YUNSK ▪ Similar to regulatory guideline in other jurisdictions for similar wood waste materials (as well as other materials including plastic, paper, and textiles) ▪ Testing undertaken in accordance with CSA C22.2 No. 0.3 or MIL-DTL-24643
Calorific Value	≥ 10 MJ/kg	▪ Similar to guidance provided by US EPA under CFR 241.3 (d)(1) for non-waste fuels ▪ Ease of operation

Table 2: Alternative Fuel Specifications – Environmental Parameters

Environmental Specification	Parameter	Rationale
Metals and Metal Hydrides	Testing for the following metals in accordance with current adjunct fuel requirements in the St. Marys Plant ECA (Air): ▪ Antimony ▪ Arsenic ▪ Barium ▪ Beryllium ▪ Cadmium ▪ Chromium ▪ Cobalt ▪ Iron ▪ Lead ▪ Manganese ▪ Mercury ▪ Nickel ▪ Selenium ▪ Silver ▪ Tin ▪ Vanadium	▪ Quarterly testing of the alternative fuel for metals currently listed on Schedule of D of the ECA (Air) Number 0469-9YUNSK, Condition number 9.(1)(a). ▪ Results of POI concentration modeling based on determination of the proportion of the contribution of the alternative fuel to the mass of the material to the cement plant, should indicate that the POI would not be exceeded. ▪ Applies the current approach for testing of Fuel Adjunct Materials in the Bowmanville Plant ECA (Air) Condition 4. (1) (a)

LCF Fuel Supplier Sampling and Inspections

The LCF suppliers will be required to sample each load of LCF during the trial and during the 'acceptance period', typically six months, in order to establish consistency of the material supply. Once the initial acceptance period is complete and if the LCF supplier has established that they can

consistently meet SMC's alternative fuel specifications, the frequency of sampling would be reduced to a quarterly basis.

During the demonstration as well as any acceptance period, St. Marys will also be able to audit and undertake periodic random inspections at the point of supply performed by a person acting on behalf of St Marys who is familiar with the desired composition of the alternative fuel. The inspector will be in position so as to safely observe the material as it is being handled. If the inspector observes any material in the load which is deemed to be unsuitable for use as an alternate (low carbon) fuel, loading will cease immediately. Unacceptable materials or conditions could include:

- excessively wet material
- oversized material
- non-combustible materials (inert materials including rock, concrete, dirt and metals)
- significant quantities of un-processable or material detrimental to the process(metal, PVC etc.)
- hazardous materials (asbestos, hazardous waste as defined by O. Reg. 347); and,
- highly odorous materials.

The St. Marys Cement inspector will also take random samples of the alternative fuel at the point of supply for testing following an appropriate bulk material sampling protocol. The bulk material sampling protocol will be the same protocol to be used for the sampling performed by the LCF supplier under agreement.

Demonstration Alternative Fuel Sampling

St. Marys will be conducting a demonstration for other alternative fuel. For this demonstrationSt. Marys will be using a fuel comprised of a blend of several components including post-consumer and post-composting materials. The material will be sourced from several different suppliers prior to the testing, and blended into a composite fuel prior to the demonstration. Use of a blended fuel over the demonstration period allows for a consistent material to be utilized throughout the stack testing runs, as well as allows for the test to be conducted at permitting limits for feed rate and calorific value.

For the demonstration period loads will be shipped to a third party site (Durham Disposal) for shredding and blending, with the composite fuel being sent to the Bowmanville plant for utilization. During the demonstration, St. Marys will designate inspectors (HDR) to monitor the incoming material streams, the material processing and the outbound loads. The incoming material streams will be sampled on an as needed basis at either the supplier location, or at the processing facility. The outbound blended material will be sampled on a per load basis prior to shipment to the Bowmanville Cement Plant. All sampling will follow the sampling protocol.

Long Term Sampling

Once the initial acceptance period is complete and if the LCF supplier has established that they can consistently meet St. Marys Cement's alternative fuel specifications, the frequency of visual inspections and random sampling at the point of supply will be reduced to a quarterly basis.

3.1 SAMPLING FOR LABORATORY ANALYSIS

The following methodology will be applied when obtaining all alternative fuel samples to be sent for analysis. These standard material handling procedures should be adhered to when collecting all samples:

- Wear appropriate PPE (safety boots, reflective vest, hard hat, puncture proof gloves, long sleeves). Dust masks are optional.

- Do not use metal tools or containers when collecting the samples as this can potentially contaminate the samples. Use a plastic shovel or trowel to obtain the sample. Use a 18 L plastic container or plastic pail.

- Thoroughly clean any scoop or trowel used before and after sample collection (i.e. for instance, first wipe it off with a clean towel then wash it off with water and dry it with a clean towel.)

One composite sample will be taken from each truck load of material. In order to prepare a composite sample of the alternative fuel material, grab samples must first be obtained. The following steps specify how the grab samples and composite sample are to be prepared.

<u>Obtaining grab samples</u>:

- For each truck load of alternative fuel, a total of 10, 18 litre plastic pails or containers of the alternative fuel will be obtained.
- Grab samples will be taken randomly, and in a manner that provides representation of the entire load of material. .
- For stockpiled materials:
    - Grab samples will be collected alternatively from the top, middle and bottom of the alternative fuel load.
- For materials being continuously loaded:
    - Grab samples will be obtained randomly during loading and distributed throughout the loading period.
- Grab samples will be taken to a location in which a plastic tarp has been laid to prevent contamination with other materials and emptied into a pile.
- Staff taking samples should take care not to walk across the tarped surface or step in the material sample, to avoid contamination.

<u>Preparation of composite sample</u>:

All grab samples collected will be thoroughly mixed thoroughly together. A composite sample will be prepared from the mixed grab samples by quartering.

Quartering will be performed in the following manner:

i. The alternative fuel material is formed into a conical pile.
ii. The top of the pile is flattened and the pile divided into four piles along two diameters at right angles to each other
iii. Two of the diagonally opposite quarters are removed and discarded,

iv. The two remaining quarters are mixed and the previous steps (i-iii) are repeated until the desired sample volume is obtained of between 500 g (minimum) and 1 kg.

Once the sample has been obtained, the remaining material should be swept up from the area, and returned to the load. The area used for the preparation of composite samples should be swept to remove remaining materials prior to the next use.

Labelling and Chain of Custody:

A sample recovery sheet will be filled and sample information will be written on a chain of custody form:

- For sampling of loads directed by LCF suppliers to the Bowmanville Plant, the chain of custody form would include information regarding the specific trailer and load of material from which the sample was taken.

- For sampling of loads undertaken by SMC at the offsite alternative fuel suppliers, the chain of custody form would include the date and time of the sampling, and the notation "Alternative Fuel Inspection Acceptance Testing" or "Alternative Fuel Inspection Trial Runs".

If not already attached to the sample container (i.e., a large Ziploc bag), attach a new label to the container and label with the sample number, date and sampler's initials with a permanent marker. This information should correlate with that included on the chain of custody form.

Place the composite sample in the sample container, seal the container and place it in a cooler to be stored.

Verify that sampling information has been recorded on sample recovery sheet, and chain of custody sheet.

For samples taken by SMC inspectors, an additional 500g sample may also be taken from the composite sample noted above in order to conduct moisture analysis as noted below.

Handling of Samples:

For samples taken by SMC inspectors as part of fuel inspections:

- At the end of each day, coolers containing the samples should be stored in a secure location (i.e., locked office with limited access).
- All samples would be couriered to an accredited lab, along with the appropriate chain of custody sheets.
- Duplicates of the chain of custody sheets would be retained by SMC.

For samples provided by LCF Suppliers which would accompany each load of LCF material sent to the Bowmanville Plant:

- Following sampling, coolers containing the samples should be stored in a secure location (i.e., locked office with limited access) until the load is shipped.
- A cooler containing the sample for each load would be provided along with the chain of custody form to the driver to bring to the Bowmanville plant to be dropped off at the

location designated by SMC

- SMC operations staff would retrieve the sample and store in a cooler in a designated location along with the chain of custody until the sample is couriered to the lab (next day).
- On a bi-weekly basis, samples will be chosen randomly to be couriered to an accredited lab, along with the appropriate chain of custody sheets.
- Duplicates of the chain of custody sheets would be retained by SMC.
- SMC will also choose random samples to test for moisture content, particle size and presence of treated wood.

For samples provided by LCF Suppliers being analyzed prior to the LCF material being sent to the Bowmanville Plant:

- Following sampling, coolers containing the samples should be stored in a secure location (i.e., locked office with limited access) until the sample is shipped.
- All samples would be couriered to an accredited lab, along with the appropriate chain of custody sheets.
- Duplicates of the chain of custody sheets along with records of testing would be provided to SMC.

3.2 LABORATORY TESTS

Alternative fuel Samples would be directed to an accredited laboratory, where the samples would be prepared (grinding/pulverizing) for the following tests:

a) Calorific Value (MJ/kg)

b) Moisture content (% by weight as received)

c) Total Halogen content (% by weight as received) and Chlorine (% by weight as received)

d) Metals and Metal Hydrides analysis (antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, iron, lead, manganese, mercury, nickel, selenium, silver, tin, vanadium) (ug/g)

e) Sulfur (% by weight as received)

f) Carbon analysis (% by weight as received)

g) Ash analysis (% by weight as received)

The laboratory would provide the Chain of Custody forms as noted above.

3.3 MOISTURE CONTENT ANALYSIS

Should SMC choose to analyze samples for moisture content itself for any Alternative Fuel at the Bowmanville site, the samples would be tested in accordance with current testing protocols at

the St. Marys Laboratory for moisture analysis.

3.4 ALTERNATIVE FUEL PARTICLE SIZE ANALYSIS

Analysis of particle size may also be performed by SMC on the Alternative Fuel material to determine if at least 80% of the particles are less than 2.5 cm in size. The following procedure would be followed:

- A sample would be chosen randomly from those provided, and weighed.
- The sample will be dumped onto a tarp a spread out to an area of 1 m^2.
- The inspector will carefully inspect the material on the tarp and will remove any items that are larger than 2.5 cm in size (in any dimension).
- After being removed, the collected 2.5 cm material will be weighed.
- If the proportion of the 2.5 cm material to the total sample weight is greater than 20% (i.e. 200 g) the load of material would not meet St. Marys requirements and remedial measures including grinding or return of the load to the material supplier may be required.

3.5 LCF COMPOSITION ANALYSIS

Analysis to review the materials contained within the samples, may also be performed by SMC on the LCF material according to the fuel type i.e. for woody biomass to determine if the LCF includes less than 5% treated wood. The following procedure would be followed:

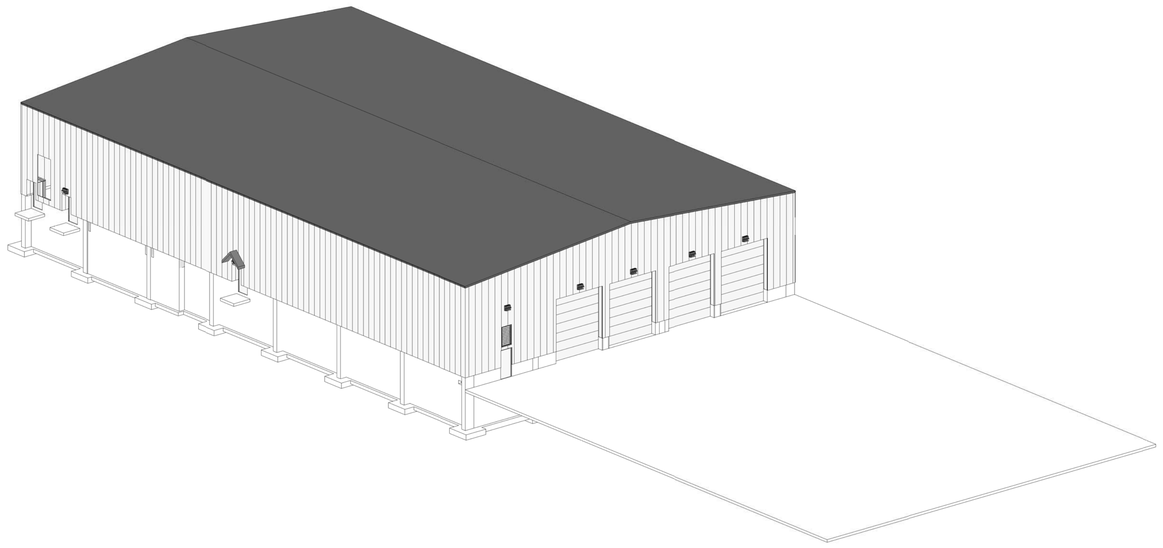
- A sample would be chosen randomly from those provided, and weighed.
- The sample will be dumped onto a tarp a spread out to an area of 1 m^2.
- The inspector will carefully inspect the material on the tarp and will remove any items that appear to consist of inert material, or material that may be detrimental to the process.
- After being removed, the collected material will be weighed.
- If the proportion of unacceptable material would not meet St. Marys requirements, remedial measures including increased screening by the supplier would be required.

Appendix F

Alternative Fuels Building and Equipment, Engineering Drawings

ALTERNATE FUEL BUILDING

ST. MARY'S, 400 WAVERLEY ROAD SOUTH, BOWMANVILLE, ONTARIO



LIST OF DRAWINGS:

A000 COVER SHEET

CIVIL

CV-1 GRADING, SERVICING AND ESC PLAN

ARCHITECTURAL

A001 LEGENDS & SCHEDULES
A101 SITE PLAN
A201 GROUND FLOOR PLAN
A202 MEZZANINE FLOOR PLAN
A203 ROOF PLAN
A301 ELEVATIONS
A302 ELEVATIONS
A401 BUILDING SECTIONS
A501 SECTIONS
A502 SECTIONS
A510 DETAILS

STRUCTURAL

S101 GENERAL NOTES, SCHEDULES AND TYPICAL DETAILS
S201 FOUNDATION PLAN
S202 ENLARGED PLANS AND SECTIONS

MECHANICAL

M1 LEVEL 1 MECHANICAL
M2 UPPER LEVEL (ELECT. RM.), SPECIFICATIONS MECHANICAL

ELECTRICAL

E1 ELECTRICAL SITE PLAN
E2 SINGLE LINE DIAGRAM
E3 LIGHTING LAYOUT
E4 POWER PLAN & FIRE ALARM
E5 SPECIFICATIONS

SPRINKLER

SP 101 NOTES, SITE SERVICE, DETAILS
SP 102 PIPING AT ROOF

Architectural/Structural :

BARRY BRYAN ASSOCIATES

Architects
Engineers

Project Managers

201-250 Water St.
Whitby Ontario L1N 0G5

Tel: (905) 666-5252
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e-mail: bba@bba-archeng.com

CIVIL:

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Consulting Engineering & Project Management
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Tel: (905)567-8678
Fax: (905)875-1339
Email: mgm@mgm.on.ca
www.mgm.on.ca

MECHANICAL:

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293 FAIRLAWN AVENUE
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F: 416 484-0206
E: jcfrederickjltd@rogers.com

ELECTRICAL:

570 Water Street
Peterborough, Ontario
K9H 3M8
p. (705) 745-2831
f. (705) 741-1526
www.kirklandeng.com
KIRKLAND ENGINEERING LTD.

SPRINKLERS:

MITCHEL FIRE PROTECTION
P.O. BOX 1704
BRIGHTON, ONTARIO
K0K 1H0
TEL: 1.613.475.0008
FAX: 1.613.475.0333

NAME OF PROJECT : BARRY BRYAN ASSOCIATES
CERTIFICATE OF PRACTICE NUMBER : 5192
250 WATER STREET, SUITE 201
WHITBY, ONTARIO, CANADA.
L1N
0G5
TEL : (905) - 666 - 5252
(Toronto) (905) - 427 - 4495
FAX : (905) - 666 - 5256
NAME OF PROJECT :
ALTERNATE FUEL BUILDING

LOCATION OF PROJECT :
ST. MARYS, 400 WAVERLY ROAD SOUTH, BOWMANVILLE, ONTARIO

DATE :
JAN. 20, 2017

TECH ISSUE
ONTARIO ASSOCIATION OF ARCHITECTS
FEB 28, 2017
WILLIAM VICTOR
LICENCE
4310

Ontario Building Code Data Matrix Part 3

			OBC Reference
3.00	Building Code Version:	O. Reg. 332/12 Last Amendment: O. Reg. 191/14	
3.01	Project Type:	☑ New ☐ Addition ☐ Renovation ☐ Change of use ☐ Addition and Renovation Description INDUSTRIAL BUILDING	[A] 1.1.2.
3.02	Major Occupancy Classification:	Occupancy: INDUSTRIAL / Use: ALT FUEL BUILDING	3.1.2.1.(1)
3.03	Superimposed Major Occupancies:	☐ Yes ☑ No Description -	3.2.2.7
3.04	Building Area (m²)	Description: GROUND FLOOR; Existing: -; New: 1500 m²; Total: 1500 m²; Total=	[A] 1.4.1.2.
3.05	Gross Area (m²)	Description: GROUND FLOOR / MEZZANINE; Existing: -; New: 1500 m² / 60 m²; Total: 1500 m² / 60 m²; Total= 1560 m² / 1560 m²	[A] 1.4.1.2.
3.06	Mezzanine Area (m²)	Description: -; Existing: -; New: 60 m²; Total: 60 m²; Total=	3.2.1.1
3.07	Building Height	ONE Storeys above grade; - Storeys below grade; - (m) Above grade	[A] 1.4.1.2 & 3.2.1.1
3.08	High Building	☐ Yes ☑ No	
3.09	Number of streets/ fire fighter access:	ONE street(s) (MAX. ALLOWABLE IS 3,200 m²)	3.2.2.10 & 3.2.5
3.10	Building Classification:	3.2.2.70 (A) Group/ Div. GROUP F DIVISION 2	3.2.2.20. - 83
3.11	Sprinkler System	☐ Required ☑ Not Required Proposed: ☐ entire building ☐ selected compartments ☐ selected floor areas ☐ basement ☐ in lieu of roof rating ☐ none	3.2.1.5 & 3.2.2.17
3.12	Standpipe System	☐ Required ☑ Not Required	3.2.9
3.13	Fire Alarm System	☐ Required ☑ Not Required	3.2.4
3.14	Water Service/ Supply is Adequate	☑ Yes ☐ No	
3.15	ConstructionType: Actual construction	Restriction: ☑Combustible Permitted ☐Non-combustible Required Actual: ☐Combustible ☑Non-combustible ☐Combination Heavy Timber Construction : ☑No ☐Yes	3.2.2.20. - 83 & 3.2.1.4
3.16	Importance Category:	☑ Low ☐ Low human Occupancy ☐ Post-disaster shelter ☐ Normal ☐ High ☐ Minor storage building ☐ Explosives or hazardous substances ☐ Post-disaster	4.1.2.1. (3) & T4.1.2.1.B
3.17	Seismic Hazard Index:	(I, Fa Sa (0.2))= 0.208 Seismic design required for Table 4.1.1.18. items 6 to 21: (I Fa Sa (0.2))= or = 0.35 or Post-disaster) ☑No ☐Yes	4.1.2.1. (3) 4.1.8.18.(2)
3.18	Occupant Load:	Floor Level/ Area: GROUND FLOOR; Occupancy Type: INDUSTRIAL; Based On: -; Occup. Load: - OCCUPANT LOAD IS ANTICIPATED TO BE ONE PERSON IN THE BLDG.	3.1.17
3.19	Barrier-free Design:	☐ Yes Explaination REFER TO 3.8.1.1. (1) (b) APPENDIX ☑ No THERE IS NO BARRIER FREE PATH OF TRAVEL TO THIS BUILDING	3.8
3.20	Hazardous Substances:	☐ Yes Explaination ☑ No	3.3.1.2 & 3.3.1.19
3.21	Required Fire Resistance Ratings:	Horizontal Assembly / Rating / Supporting Assembly (H) / Non combustible in lieu of rating? Floors over basement: N/A / - / ☐No ☐Yes ☑N/A Floors: N/A / - / ☐No ☐Yes ☑N/A Mezzanine: N/A / - / ☐No ☐Yes ☐N/A Roof: - / - / ☐No ☐Yes ☑N/A	3.2.2.20. - 83 & 3.2.1.4
3.22	Spatial Separation:		3.2.3

Wall	Area Of EBF (m²)	L.D. (m)	L/H or H/L	Permitted Max. % Of Openings	Proposed % Of Openings	FRR (Hours)	Noncombustible construction	Combustible construction w/ noncombustible cladding
North	386 m²	30	1/8	100%	-	-	-	-
South	386 m²	30	1/8	100%	-	-	-	-
East	259 m²	25	1/3	100%	-	-	-	-
West	259 m²	25	1/3	100%	-	-	-	-

(Addition wall areas contiued below)

3.23	Plumbing Fixture Requirments: ZERO FIXTURE PROVIDED	Ratio: Male/Female = 50:50 Except as noted otherwise Floor level/ Area; Occupant Load; OBC Ref/article; Fixtures Required; Fixtures Provided ALL WASHROOMS ARE EXISTING IN ADJACENT CHANGE ROOM BUILDING	3.7.4
3.24	Energy Efficiency:	Compliance Path: N/A UNHEATED BUILDING Climatic Zone: N/A OBC Table: N/A	
3.25	Notes:	EAST HALF OF BUILDING IS SPRINKLERED (VOLUNTARY). ROOMS AT GROUND FLOOR NOT SPRINKLERED.	

No.	Issues	Date	By
1	Issued for Site Plan Approval	JAN. 23 2017	BBA
2	Issued for Building Permit	FEB. 28 2017	BBA

ALTERNATE FUEL BUILDING
ST. MARY'S, 400 WAVERLEY ROAD SOUTH, BOWMANVILLE, ONTARIO

Project No. 15155

A000

REMARKS LEGEND:

1 - CLOSER
2 - STANDARD KICK PLATE
3 - DOOR STOP
4 - PANIC DEVICE
5 - LOCKSET COMMERCIAL GRADE
6 - INSULATED DOOR & FRAME
7 - THRESHOLD
8 - CABLE / CHAIN : DOOR PULL
9 - DOOR TIE-OFFS : WALL MOUNTED

GENERAL NOTES

1. PRESSED STEEL FRAME DEPTHS SHALL BE 146MM UNLESS OTHERWISE NOTED.

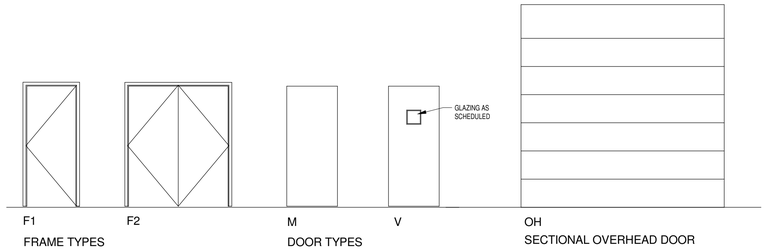
GLAZING TYPES

GL1 INSULATED GLASS UNITS; 25mm SEALED TEMPERED, DOUBLE GLAZED UNITS

GL2 6mm TEMPERED SINGLE GLAZED UNITS

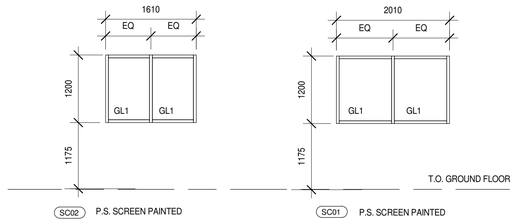
DOOR AND FRAME SCHEDULE

	DOOR					FRAME					FIRE RATING	REMARKS
							DETAIL					
NO.	SIZE AND THICKNESS	TYPE	MATERIAL	FINISH	GLASS	TYPE	HEAD	JAMB	MATERIAL	FINISH		
D1	915 x 2134 x 45	V	H.M.	P	GL2	F1	H1	J1/J2	P.S.	P	-	1,2,4,5,7
D2	915 x 2134 x 45	V	H.M.	P	GL2	F1	H1	J1/J2	P.S.	P	-	1,2,4,5,7
D3	915 x 2134 x 45	V	H.M.	P	GL2	F1	H2	J1/J2	P.S.	P	-	1,2,4,5,7
D4	915 x 2134 x 45	V	H.M.	P	GL2	F1	H1	J1/J2	P.S.	P	-	1,2,4,5,7
D5	915 x 2134 x 45	V	H.M.	P	GL2	F1	H1	J1/J2	P.S.	P	-	1,2,4,5,7
D6	2 - 915 x 2134 x 45	M	H.M.	P	-	F2	H3	J3	P.S.	P	3/4HR	1,5
D7	915 x 2134 x 45	V	H.M.	P	GL2	F1	H3	J3	P.S.	P	-	1,2,3,5,6
D8	915 x 2134 x 45	M	H.M.	P	-	F1	H3	J3	P.S.	P	-	1,5
D9	2 - 915 x 2134 x 45	M	H.M.	P	-	F2	H3	J3	P.S.	P	-	1,5,8,9
OH1	4267 (14'-0") x 4877 (16'-0")	OH	STL	PREFIN.	-	-	H4	J4/J5			-	ELECTRICALLY OPERATED
OH2	4267 (14'-0") x 4877 (16'-0")	OH	STL	PREFIN.	-	-	H4	J4/J5			-	ELECTRICALLY OPERATED
OH3	4267 (14'-0") x 4877 (16'-0")	OH	STL	PREFIN.	-	-	H4	J4/J5			-	ELECTRICALLY OPERATED
OH4	4267 (14'-0") x 4877 (16'-0")	OH	STL	PREFIN.	-	-	H4	J4/J5			-	ELECTRICALLY OPERATED
OH5	4267 (14'-0") x 3658 (12'-0")	OH	STL	PREFIN.	-	-	H4	J4/J5			-	ELECTRICALLY OPERATED

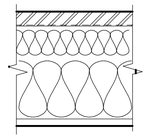


F1 F2 M V OH

FRAME TYPES — DOOR TYPES — SECTIONAL OVERHEAD DOOR



ROOF TYPES SCHEDULE

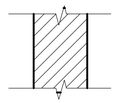


R1 PRE-ENG METAL ROOF: PREFIN. STANDING SEAM METAL ROOF (INSULATION MIN. R20 c/w VAPOUR BARRIER) ROOF PURLINS

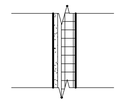
WALL TYPES SCHEDULE

W1 PREFINISHED METAL CLADDING on PRE-ENG GIRTS

PARTITION TYPES SCHEDULE



P1 190mm CONCRETE BLOCK - 2HR F.R.R. (REFER TO STRUCTURAL FOR VERTICAL REINFORCING)



P2 16mm ABUSE RESISTANT GYPSUM BOARD on 51mm RIGID INSULATION LAMINATED TO MASONRY WALL c/w RETAINER TEE STUDS BETWEEN ADJOINING INSULATION SHEETS

NOTES:

1. EXTERIOR CLADDING NON-INSULATED.
2. UNLESS OTHERWISE NOTED, ALL PARTITIONS TERMINATE AT UNDERSIDE OF STRUCTURE ABOVE.
3. AT OPENINGS IN INSULATION SHEETS PROVIDE CLOSURE ANGLE w/ GYPSUM BOARD RETURN FINISH (TYP.).

FLOOR PLAN NOTATIONS

EXTERIOR WALL TYPE

INTERIOR WALL TYPE

DOOR NUMBER

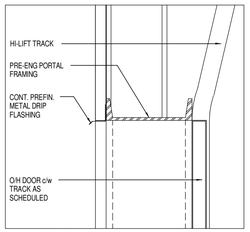
INTERIOR GLAZING SCREEN NUMBER

BUILDING SECTION/ EXTERIOR ELEVATION WALL SECTION REFERENCE

PROJECT NORTH

ABBREVIATION LEGEND

ALUM	ALUMINUM
ANOD	ANODIZED
BH	BULKHEAD
CB	CONCRETE BLOCK
CIP	CAST-IN-PLACE CONCRETE
CLG	CEILING
CONC	CONCRETE
DET	DETAIL
DR	DOOR
DN	DOWN
EP	ELECTRICAL PANEL
EXP	EXPOSED
FA	FIRE ALARM ANUNCIATOR
FD	FLOOR DRAIN
FEC	FIRE EXTINGUISHER & CABINET
FFE	FINISHED FLOOR ELEVATION
FG	FIXED GLASS
FIN	FINISHED
FL	FLOOR
FTG	FOOTING
FND	FOUNDATION
FRR	FIRE RESISTANCE RATING
G	GLASS
GALV	GALVANIZED
GYP. BD.	GYPSUM BOARD
HM	HOLLOW METAL
HSS	HOLLOW STRUCTURAL SECTION
HT	HEIGHT
INSUL	INSULATION
LF	LIGHT FIXTURE
MECH	MECHANICAL
MLP	METAL LINER PANEL
MTL	METAL
NIC	NOT IN CONTRACT
NTS	NOT TO SCALE
OH	OVERHEAD
PLY	PLYWOOD
PNL	PANEL
PREFIN	PRE-FINISHED
PS	PRESSED STEEL
PT	PAINT
P.T.	PRESSURE TREATED
REIN	REINFORCED
RWL	RAIN WATER LEADER
SEAL	CONCRETE SEALER
STL	STEEL
STRUCT	STRUCTURAL
TG	TEMPERED GLASS
TYP	TYPICAL
VB	VERTICAL BRACING
WD	WOOD



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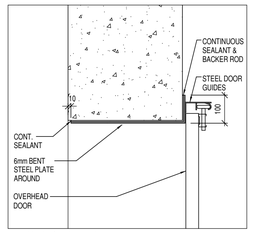
1:10



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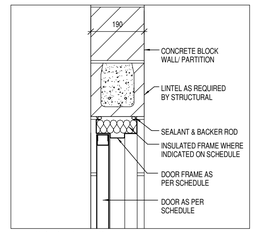

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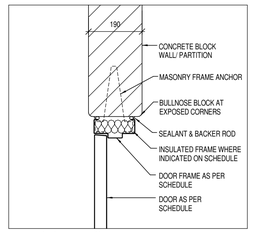

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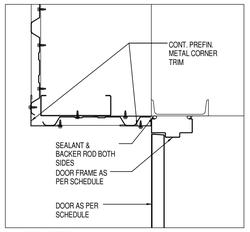

HEAD DETAIL 'H2'
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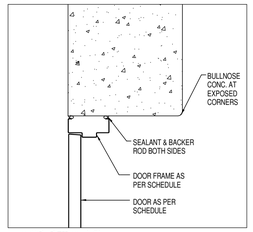

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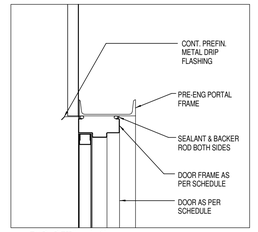

HEAD DETAIL 'H1'
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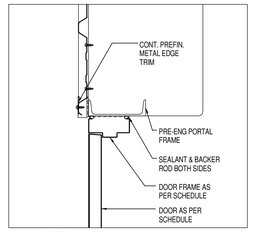

JAMB DETAIL 'J1'
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CHECK AND VERIFY ALL DIMENSIONS AT THE SITE.

DRAWINGS ARE NOT TO BE USED FOR CONSTRUCTION UNTIL SIGNED AND SEALED BY THE CONSULTANT.

peak engineering & construction ltd.

NO.	ISSUES	DATE	BY
1	Issued for Building Permit	FEB. 28 2017	BBA

NO.	REVISIONS	DATE	BY

PROJECT:
ALTERNATE FUEL BUILDING

ST. MARYS
400 Waverley Road South,
Bowmanville, Ontario

Municipality of Clarington

DRAWING:
LEGENDS AND SCHEDULES

BARRY · BRYAN ASSOCIATES

Architects
Engineers
Project Managers

250 Water Street
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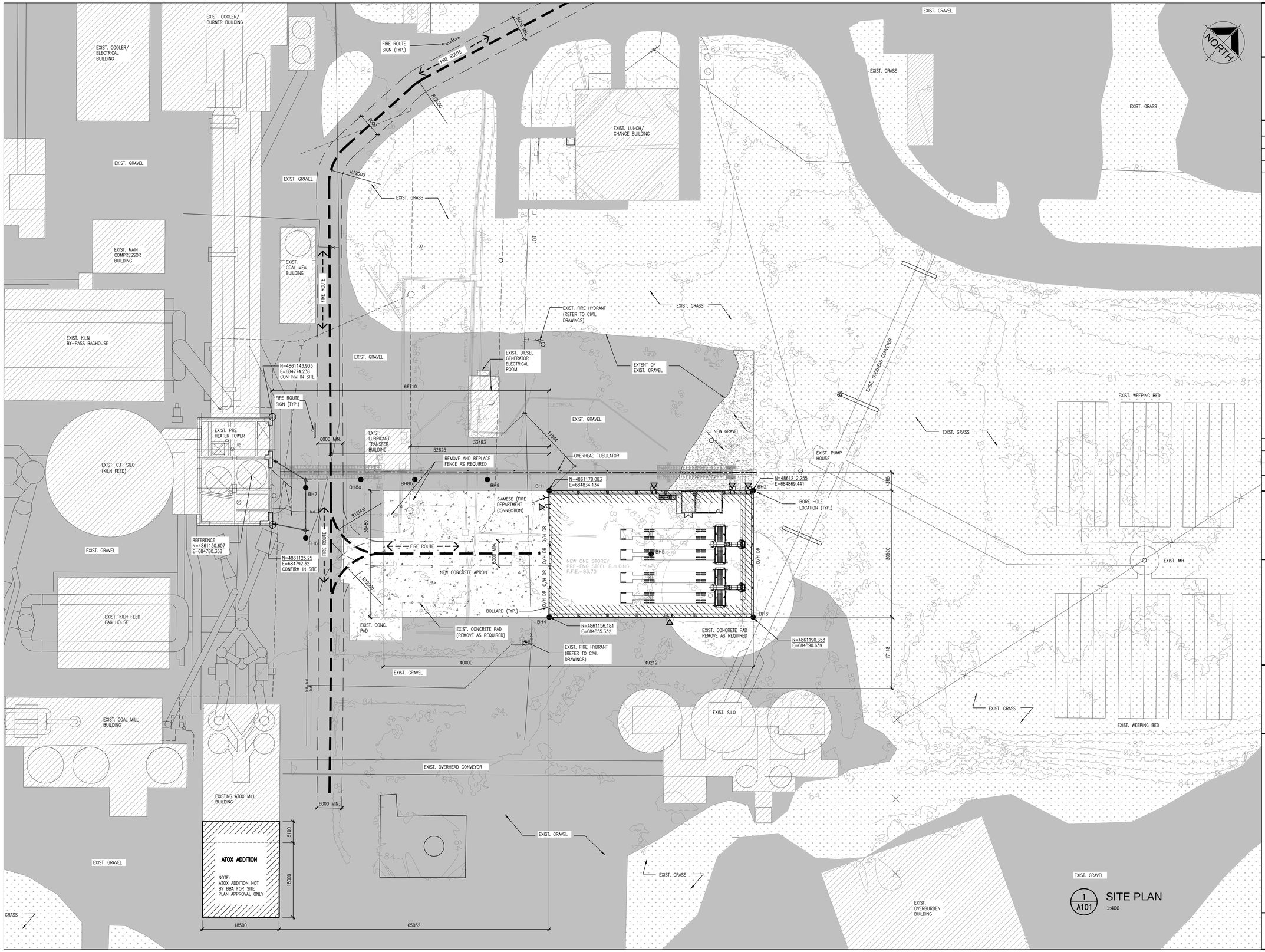
ONTARIO ASSOCIATION OF ARCHITECTS
FEB 28, 2017
WILLIAM WEMA
LICENCE
4310

DESIGN BY: WW	SUBMISSION / DATE:
DRAWN BY: DP	% COMPLETE:
CHECKED BY:	TOTAL:
DATE: 06/06/16	
SCALE: As indicated	

FILE: 15155 / DRAWINGS / CURRENT / 15155 St Marys Alt Fuel.rvt

PROJECT NO: 15155

DRAWING NO: A001



1 A101 SITE PLAN
1:400

peak engineering & construction ltd.

NO.	ISSUES	DATE	BY
1	ISSUED FOR SITE PLAN APPROVAL	JAN. 23 2017	BBA
2	ISSUED FOR BUILDING PERMIT	FEB. 28 2017	BBA

NO.	REVISIONS	DATE	BY

PROJECT:

ST. MARYS ALT FUEL BUILDING

400 Waverly Road South, Bowmanville Ontario

Municipality of Clarington

DRAWING:

SITE PLAN

BBA

BARRY BRYAN ASSOCIATES

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ONTARIO ASSOCIATION OF ARCHITECTS
TECHNICIAN
15155 ST MARYS
WWWEIMA
FEB 28, 2017
WILLIAM WEIMA
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DESIGN BY: WW	DOC. CONTROL DATE:
DRAWN BY: NV	TL COMPLETE:
CHECKED BY:	INITIAL:
DATE: JAN. 2017	
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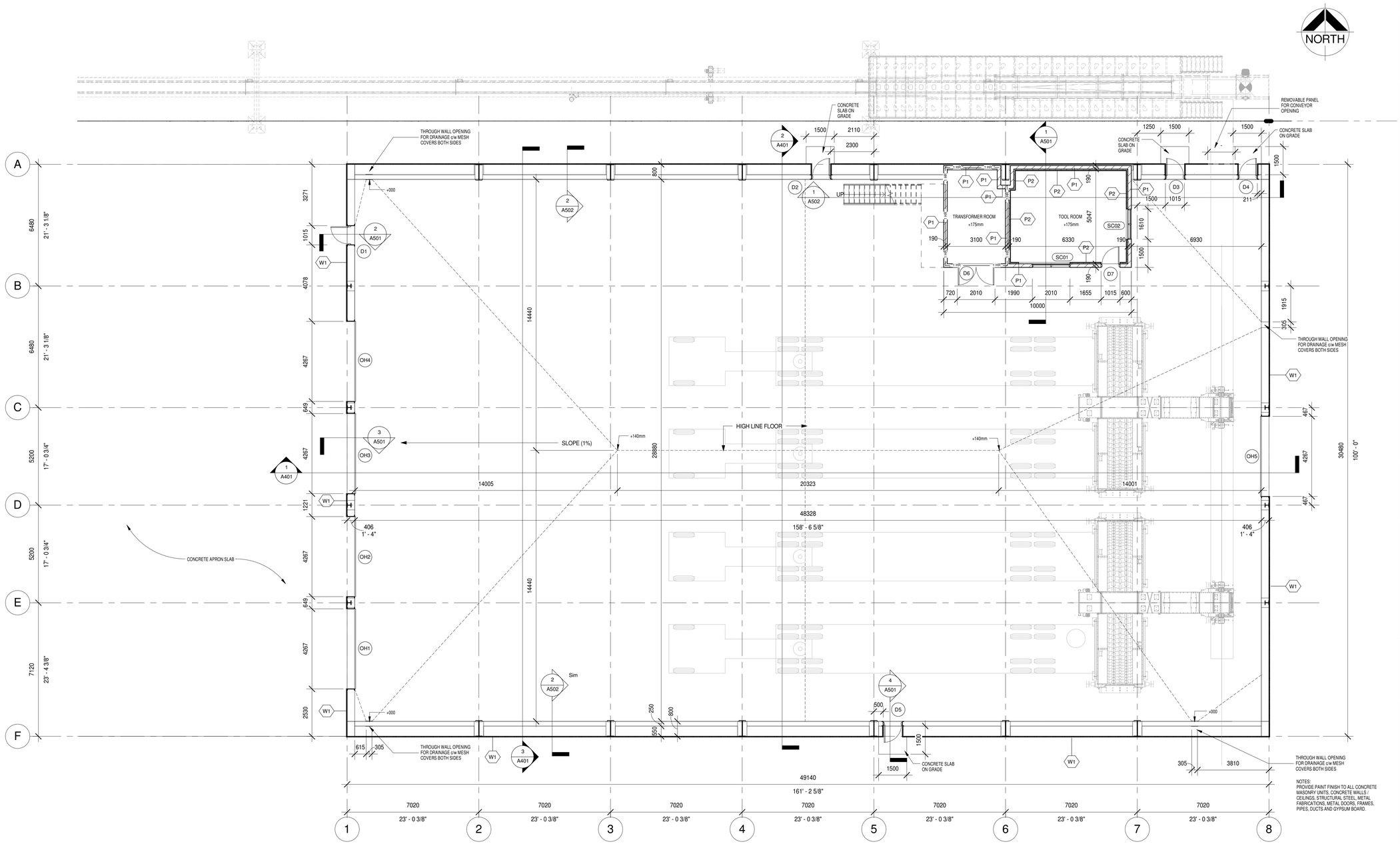
FILE: 15155 A101.DWG	

PROJECT NO: **15155**

DRAWING NO: **A101**



CHECK AND VERIFY ALL DIMENSIONS AT THE SITE.

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NO.	REVISIONS	DATE	BY

PROJECT:
ALTERNATE FUEL BUILDING

ST. MARYS
400 Waverley Road South,
Bowmanville, Ontario

Municipality of Clarington

DRAWING:
GROUND FLOOR PLAN

BARRY · BRYAN ASSOCIATES

Architects
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Project Managers

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e-mail: bba@bba-arcteng.com

ONTARIO ASSOCIATION OF ARCHITECTS
FEB 28, 2017
WILLIAM WIEMA
LICENCE
4319

DESIGN BY: WW	QUALITY CONTROL: DP
DRAWN BY: DP	S. COMPLIED:
CHECKED BY:	INITIAL:
DATE: 03/10/16	
SCALE: 1 : 100	
FILE: 15155 / DRAWINGS / CURRENT / 15155 St Marys Alt Fuel.rvt	

PROJECT NO: 15155

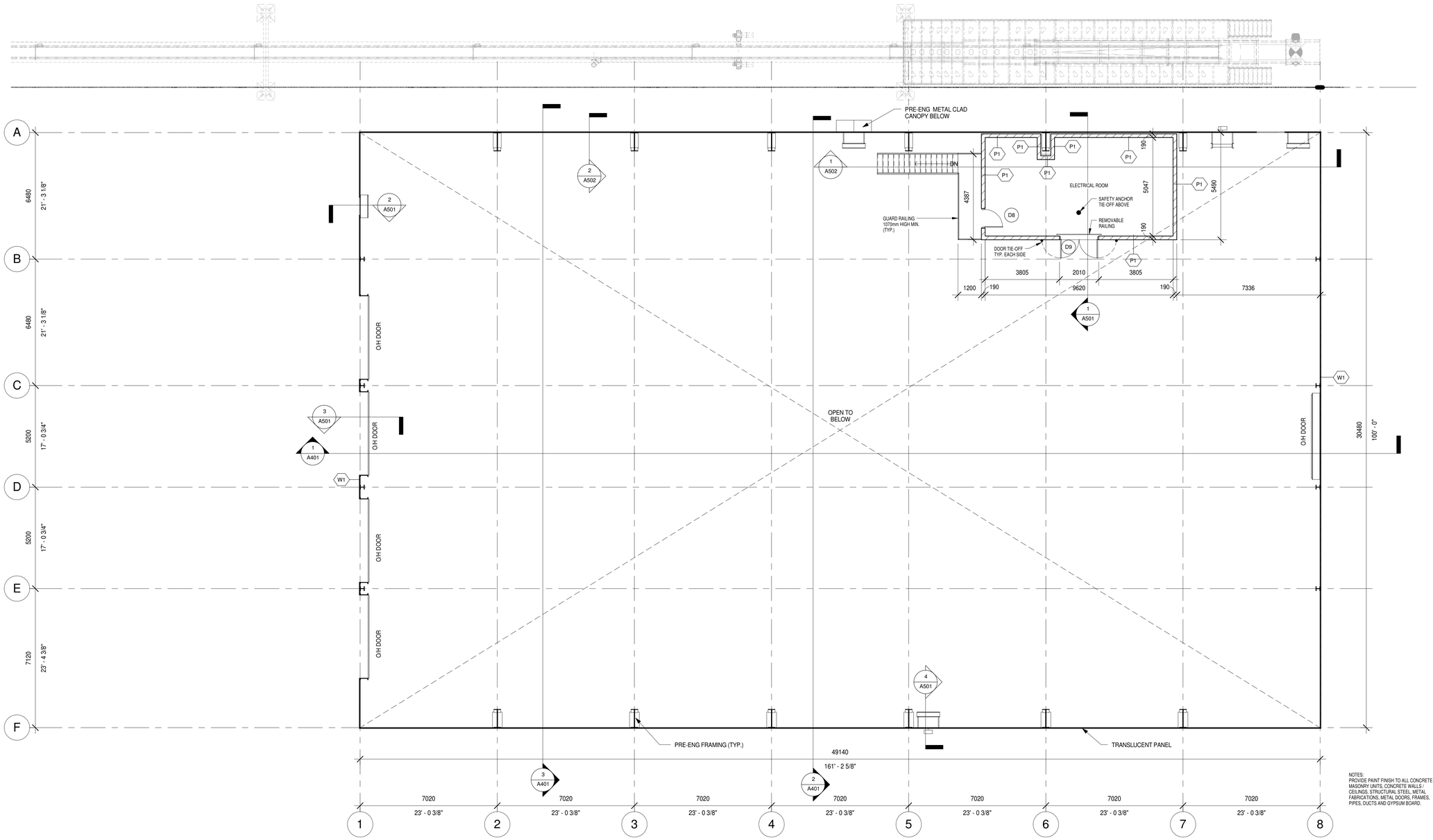
DRAWING NO: A201

ANCHOR DESIGN SHOWN IS FOR GENERAL ARRANGEMENT ONLY. MANUFACTURER IS RESPONSIBLE TO DESIGN AND ENGINEER FALL ARREST ANCHORS AT EACH LOCATION SHOWN TO MEET SPECIFIED REQUIREMENTS. THE SUPPORT CAPABILITY OF AN ANCHOR POINT SHALL EXCEED THE TOTAL BREAKING STRENGTH OF ALL SUPPORT LINES ATTACHED TO IT (REG. 859, SECTION 29(2)).

ANCHOR POINTS FOR VERTICAL LIFELINES, EQUIPMENT TIEBACK AND DIRECT ATTACHMENT OF PRIMARY LINES FOR SUSPENDED EQUIPMENT SHALL BE DESIGNED AND ENGINEERED BY THE MANUFACTURER TO RESIST THE APPLICATION OF A FORCE OF 22.2 KN (5000 LBF) IN ANY DIRECTION WITHOUT FRACTURE OF ANY COMPONENT OR PULLOUT, OR BOTH FROM THE ANCHORAGE [CLAUSE 9.4.3(A) CAN/CSA Z271-10].

COMPLETE A TEST LOADING OF 11.1 KN ON THE NEW ANCHOR POINTS AFTER INSTALLATION. THE ANCHOR POINTS SHALL BE WITHOUT PERMANENT DEFORMATION OF ANY COMPONENT WHEN SUBJECTED TO TEST LOADING IN THE DIRECTION(S) THAT GENERATE THE MOST CRITICAL EFFECT ON THE ANCHORAGE SYSTEM WITH RESPECT TO STABILITY AND STRENGTH [CLAUSE 9.4.3 (B) CAN/CSA Z271-10].

NORTH



NOTES:
PROVIDE PAINT FINISH TO ALL CONCRETE MASONRY UNITS, CONCRETE WALLS / CEILINGS, STRUCTURAL STEEL, METAL FABRICATIONS, METAL DOORS, FRAMES, PIPES, DUCTS AND GYPSUM BOARD.

CHECK AND VERIFY ALL DIMENSIONS AT THE SITE.

DRAWINGS ARE NOT TO BE USED FOR CONSTRUCTION UNTIL SIGNED AND SEALED BY THE CONSULTANT.

peak engineering & construction ltd.

NO.	ISSUES	DATE	BY
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NO.	REVISIONS	DATE	BY

PROJECT:
ALTERNATE FUEL BUILDING

ST. MARYS
400 Waverley Road South,
Bowmanville, Ontario

Municipality of Clarington

DRAWING:
MEZZANINE FLOOR PLAN

BARRY · BRYAN ASSOCIATES

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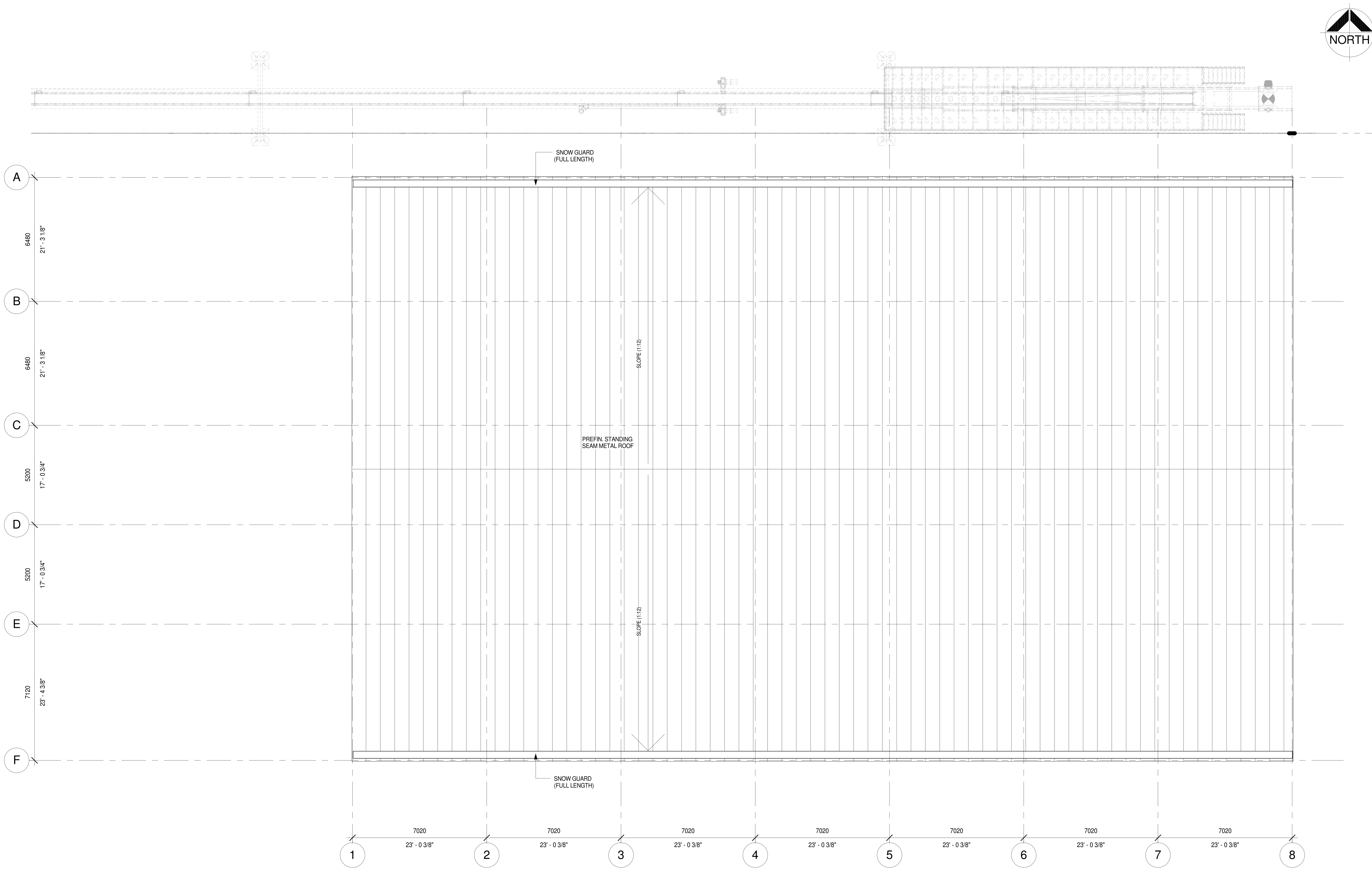
OTTAWA ASSOCIATION OF ARCHITECTS
REGISTERED ARCHITECT
WILLIAM WEIMA
LICENCE
2010

DESIGN BY: WW	SUC. SCHEM. DD
DRAWN BY: DP	% COMPLETE
CHECKED BY:	TOTAL
DATE: 04/26/16	
SCALE: 1 : 100	
FILE: 15155 / DRAWINGS / CURRENT / 15155 St Marys Alt Fuel.rvt	

PROJECT NO: 15155

DRAWING NO: A202



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engineering & construction ltd.

NO.	ISSUES	DATE	BY
1	Issued for Site Plan Approval	JAN. 23 2017	BBA
2	Issued for Building Permit	FEB. 28 2017	BBA

NO.	REVISIONS	DATE	BY

PROJECT:

ALTERNATE FUEL BUILDING

ST. MARYS
400 Waverley Road South,
Bowmanville, Ontario

Municipality of Clarington

DRAWING:

ROOF PLAN

BBA

ONTARIO ASSOCIATION OF ARCHITECTS
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DESIGN BY: *WW* | DOC CONTROL: DATE:
DRAWN BY: *DP* | % COMPLETE:
CHECKED BY: | INITIAL:

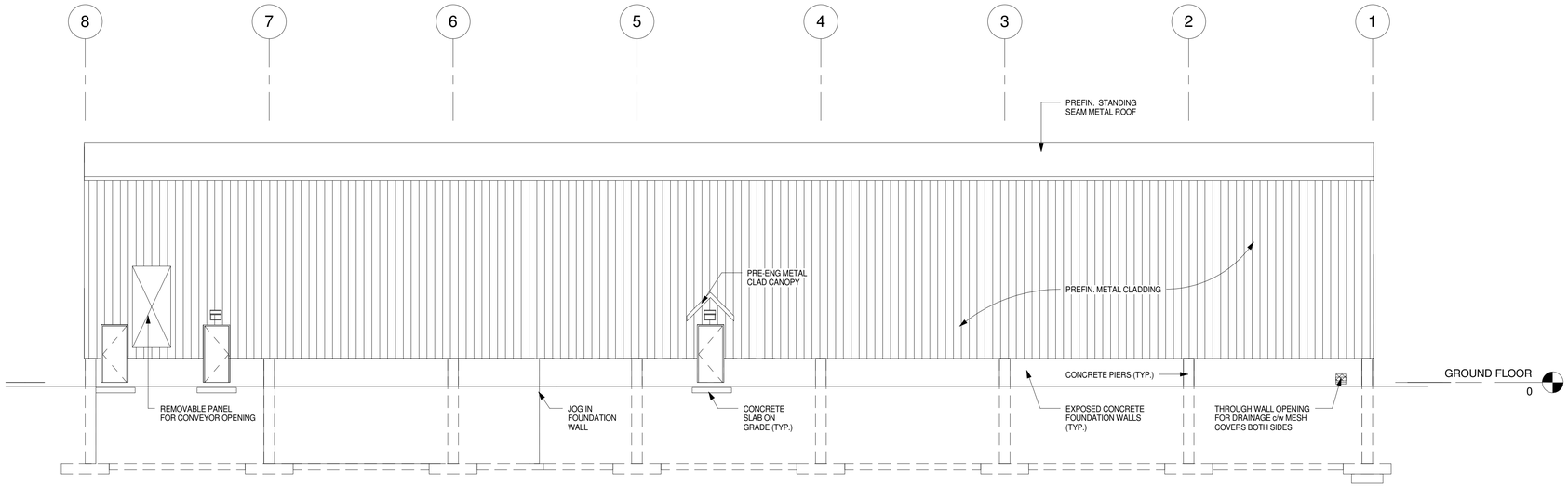
DATE: *06/06/16*

SCALE: *1 : 100* D1

FILE: 15155 / DRAWINGS / CURRENT / 15155 St Marys Alt Fuel.rvt

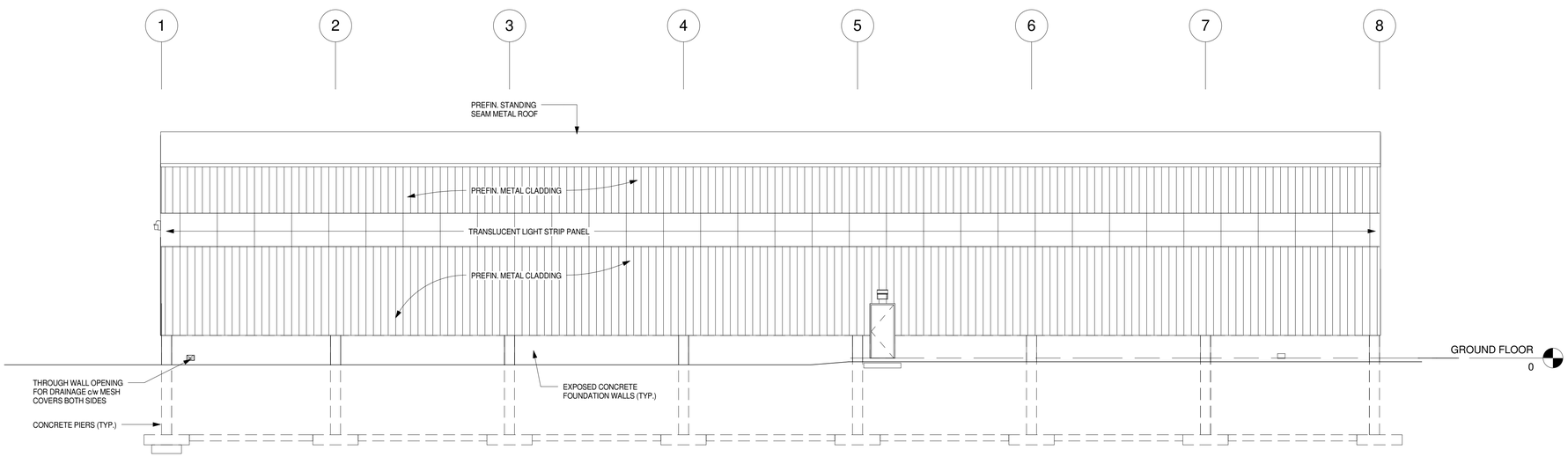
PROJECT NO: **15155**

DRAWING NO: **A203**



2 / A301 NORTH ELEVATION

1 : 100



1 / A301 SOUTH ELEVATION

1 : 100

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NO.	ISSUES	DATE	BY
1	Issued for Site Plan Approval	JAN. 23 2017	BBA
2	Issued for Building Permit	FEB. 28 2017	BBA

NO.	REVISIONS	DATE	BY

PROJECT:

ALTERNATE FUEL BUILDING

ST. MARYS
400 Waverley Road South,
Bowmanville, Ontario

Municipality of Clarington

DRAWING:

ELEVATIONS

BARRY · BRYAN ASSOCIATES

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ONTARIO ASSOCIATION OF ARCHITECTS
REGISTERED ARCHITECT
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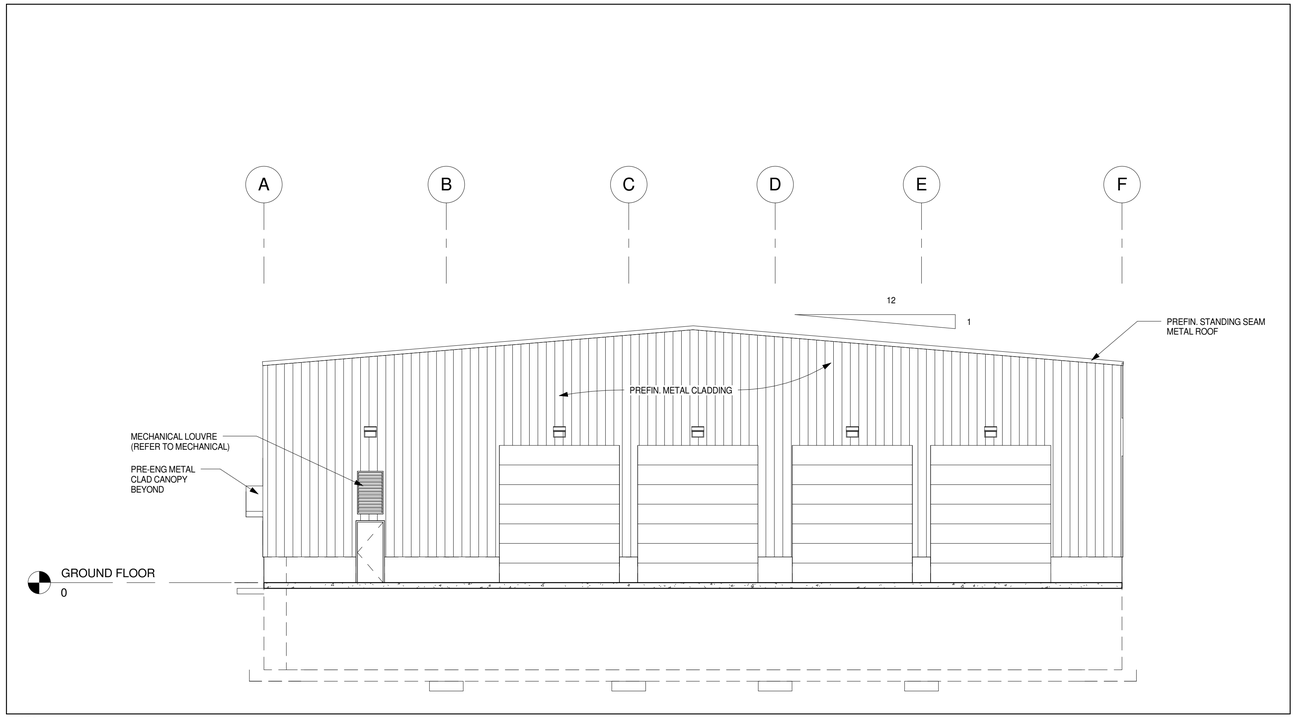
LICENCE
4319

DESIGN BY: WW	NO. STOREYS: 1
DRAWN BY: DP	% COVERED:
CHECKED BY:	TOTAL:
DATE: 03/10/16	
SCALE: 1 : 100	

FILE: 15155 / DRAWINGS / CURRENT / 15155 St Marys Alt Fuel.rvt

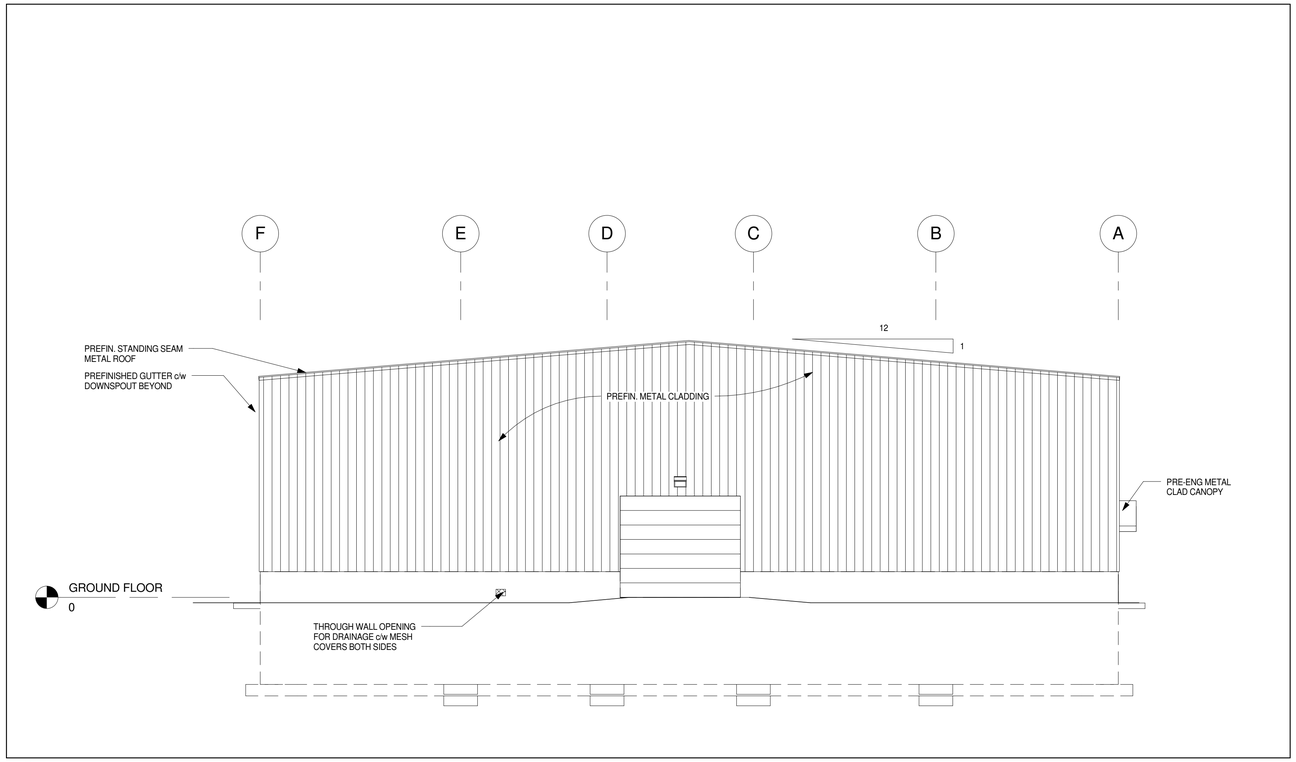
PROJECT NO: **15155**

DRAWING NO: **A301**



2 / A302 WEST ELEVATION

1 : 100



1 / A302 EAST ELEVATION

1 : 100

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NO.	ISSUES	DATE	BY
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PROJECT:

ALTERNATE FUEL BUILDING

ST. MARYS
400 Waverley Road South,
Bowmanville, Ontario

Municipality of Clarington

DRAWING:

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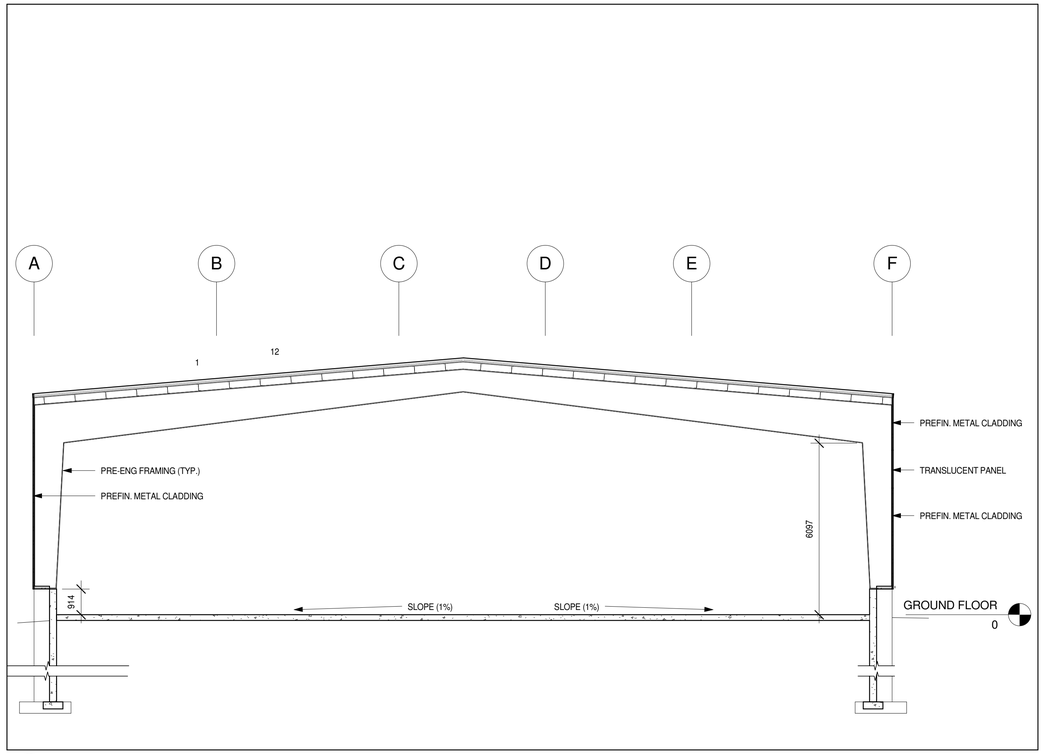
DESIGN BY: WW	SIGNATURE:
DRAWN BY: DP	SIGNATURE:
CHECKED BY:	SIGNATURE:
DATE: 06/06/16	
SCALE: 1 : 100	
FILE: 15155 / DRAWINGS / CURRENT / 15155 St Marys Alt Fuel.rvt	

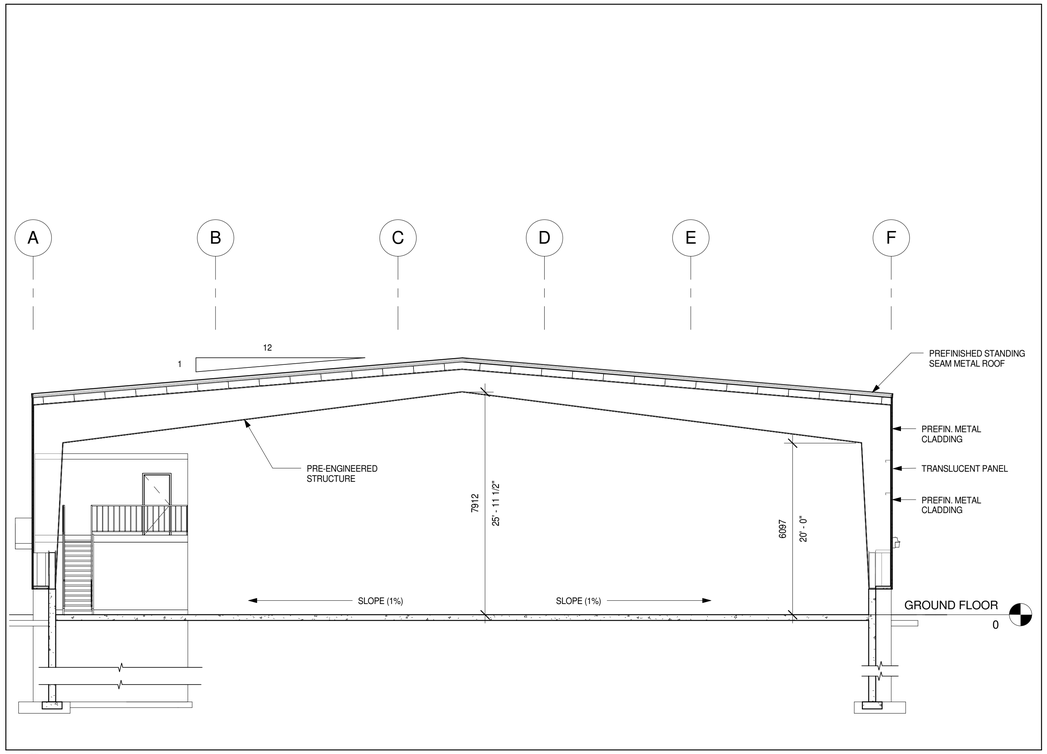
PROJECT NO: **15155**

DRAWING NO: **A302**



3 / A401 BUILDING SECTION

1 : 100



2 / A401 BUILDING SECTION

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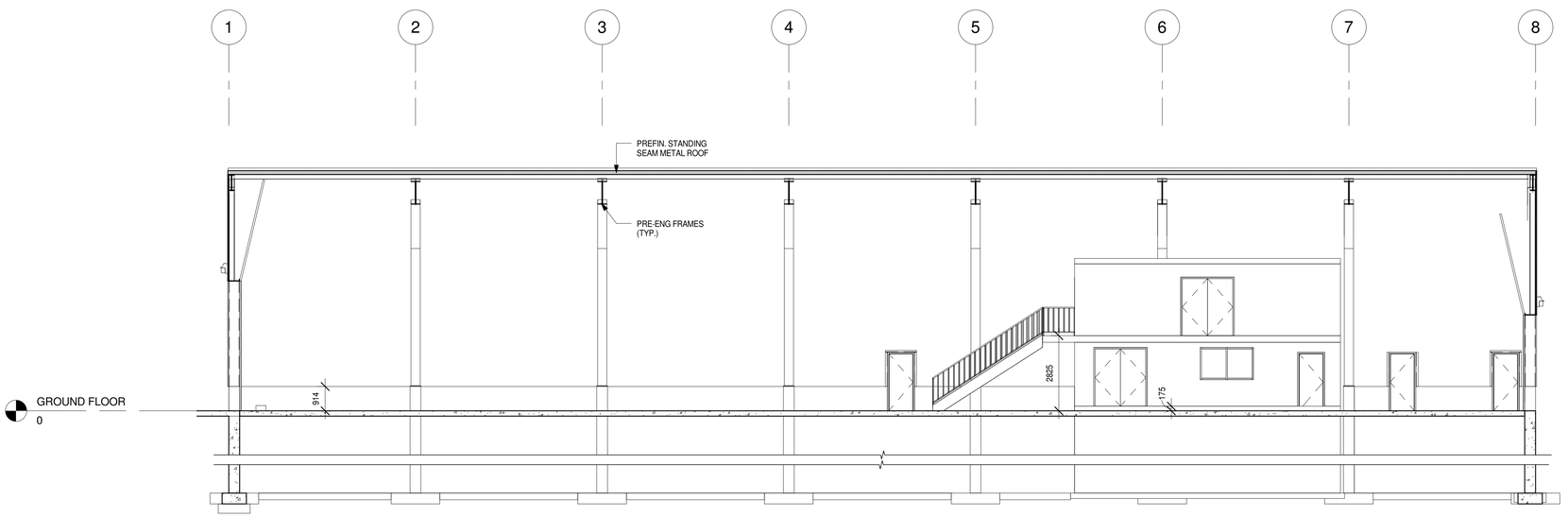

1 / A401 BUILDING SECTION

1 : 100

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PROJECT:

ALTERNATE FUEL BUILDING

ST. MARYS
400 Waverley Road South,
Bowmanville, Ontario

Municipality of Clarington

DRAWING:

BUILDING SECTIONS

BARRY · BRYAN ASSOCIATES

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FEB 28, 2017
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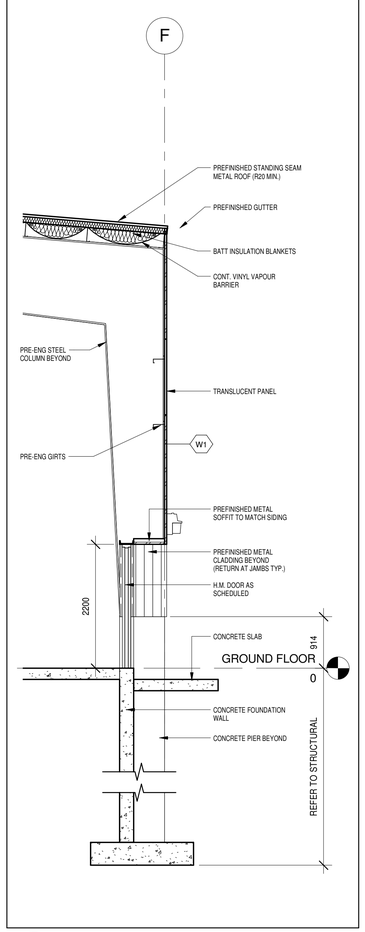
2010

DESIGN BY: WW	SUC. TENDING PTS
DRAWN BY: DP	S. COMPLETE
CHECKED BY:	INITIAL
DATE: 06/06/16	
SCALE: 1 : 100	PL
FILE: 15155 / DRAWINGS / CURRENT / 15155 St Marys Alt Fuel.vxt	

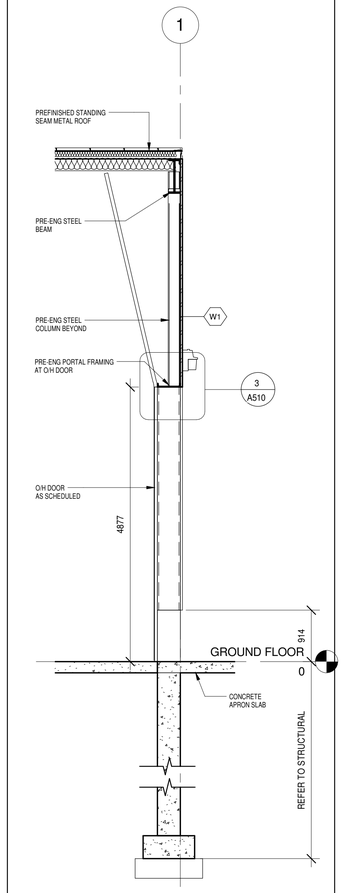
PROJECT NO: **15155**

DRAWING NO: **A401**



4 / A501 WALL SECTION

1 : 50



3 / A501 WALL SECTION

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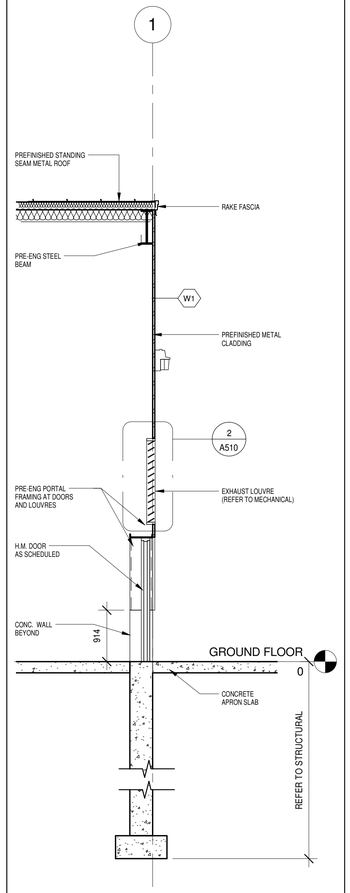

2 / A501 WALL SECTION

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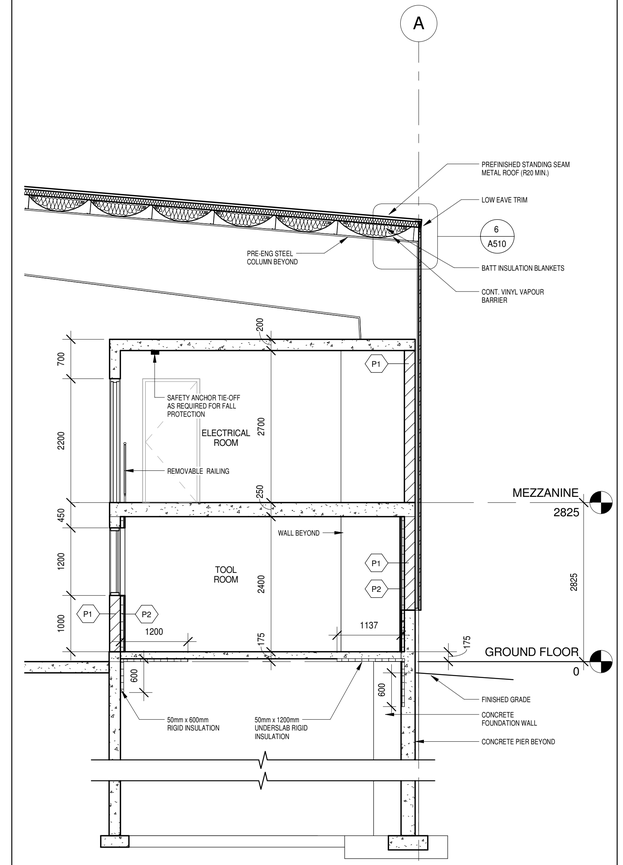

1 / A501 SECTION AT TOOL ROOM

1 : 50

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PROJECT:

ALTERNATE FUEL BUILDING

ST. MARYS
400 Waverley Road South,
Bowmanville, Ontario

Municipality of Clarington

DRAWING:

SECTIONS

BARRY · BRYAN ASSOCIATES

Architects
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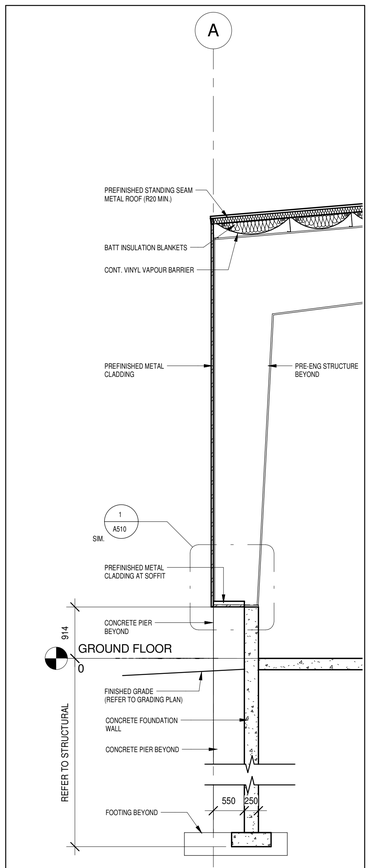
FEB 28 2017
WILLIAM WEBBA
LICENCE
4310

DESIGN BY:	WW
DRAWN BY:	DP/NV
CHECKED BY:	
DATE:	06/06/16
SCALE:	1 : 50

FILE: 15155 / DRAWINGS / CURRENT / 15155 St Marys Alt Fuel.rvt

PROJECT NO: **15155**

DRAWING NO: **A501**



2 A502 WALL SECTION

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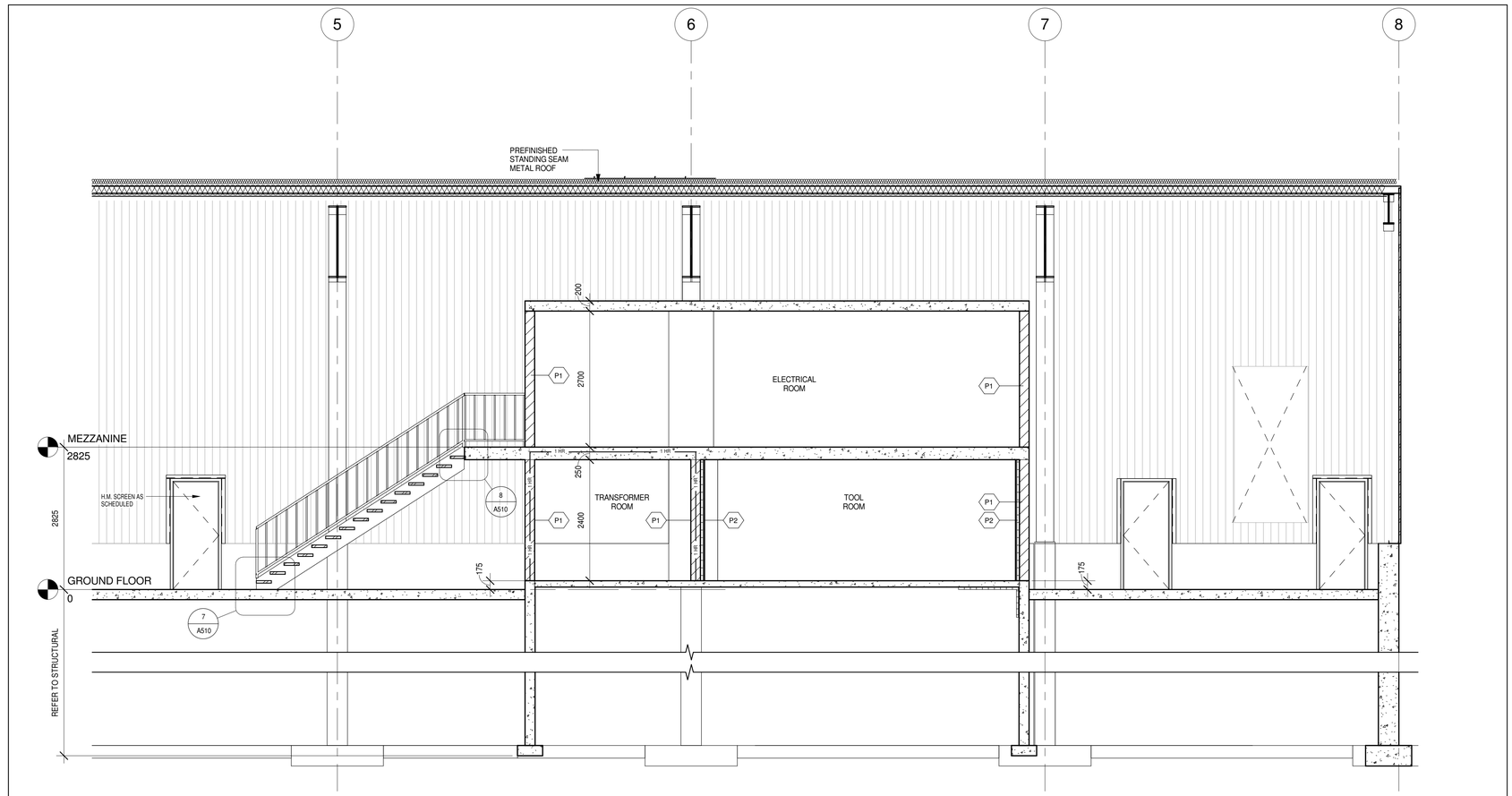

1 A502 SECTION

1 : 50

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PROJECT:

ALTERNATE FUEL BUILDING

ST. MARYS
400 Waverley Road South,
Bowmanville, Ontario

Municipality of Clarington

DRAWING:

SECTIONS

BARRY · BRYAN ASSOCIATES

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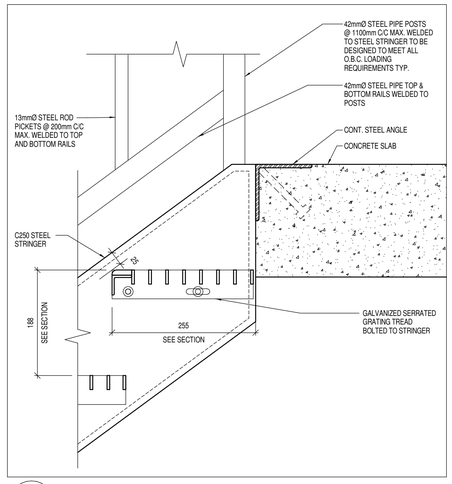
DESIGN BY:	WW
DRAWN BY:	DP
CHECKED BY:	
DATE:	06/06/16
SCALE:	1 : 50

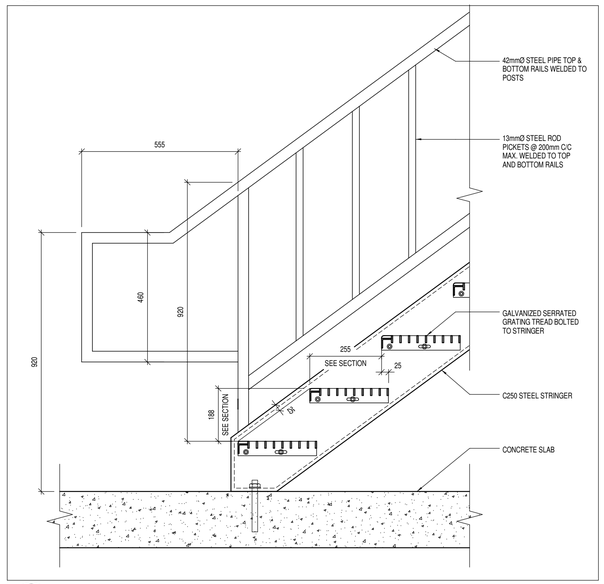
FILE: 15155 / DRAWINGS / CURRENT / 15155 St Marys Alt Fuel.rvt

PROJECT NO: 15155

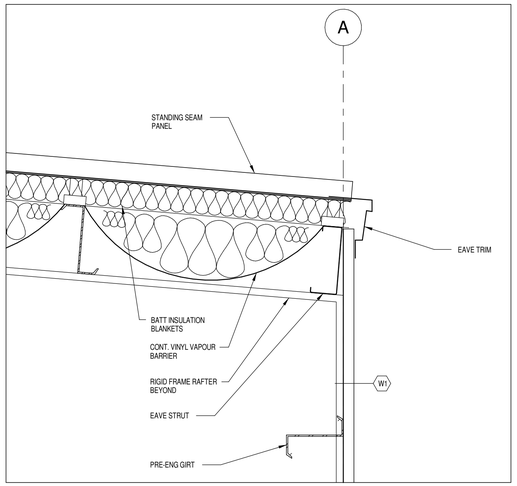
DRAWING NO: A502



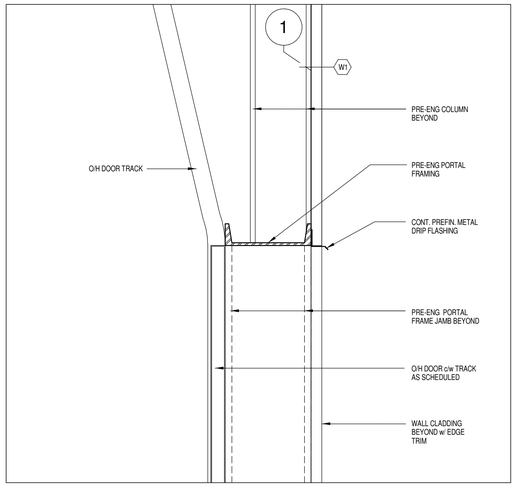
8 / A510 STAIR LANDING DETAIL
1:5



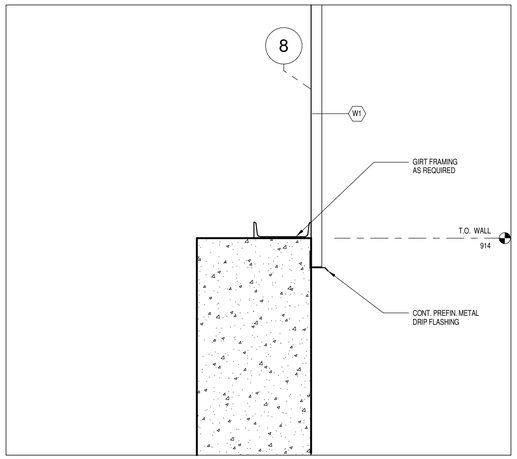
7 / A510 STAIR BASE DETAIL
1:10



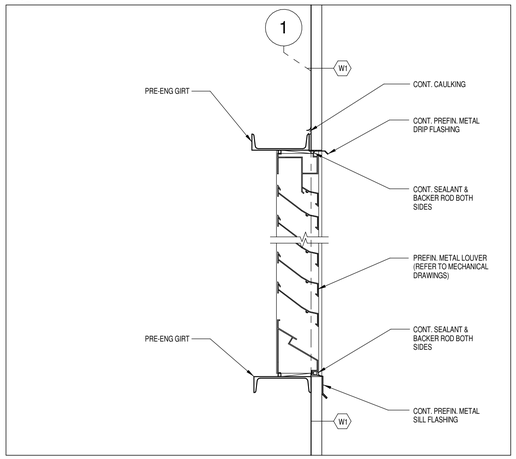
6 / A510 DETAIL AT LOW EAVE (NO GUTTER)
1:10



3 / A510 HEAD DETAIL @ O/H DOOR
1:10



5 / A510 BASE DETAIL
1:10



2 / A510 LOUVER DETAIL
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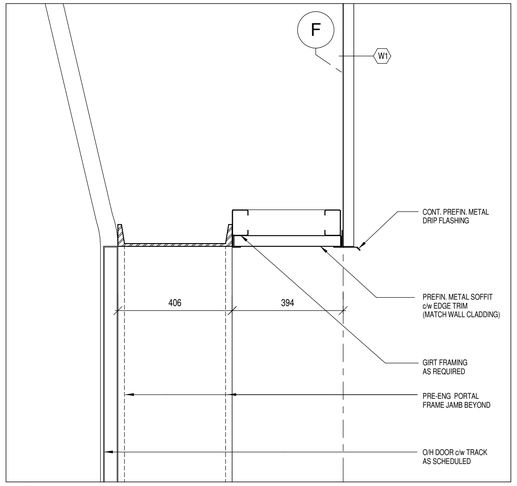
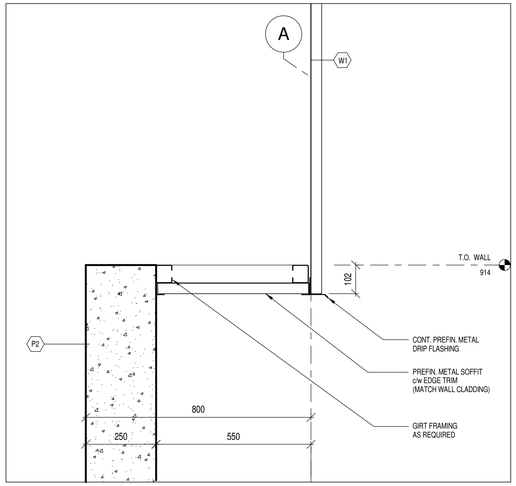


4 / A510 HEAD / SOFFIT DETAIL AT O/H DOOR
1:10



1 / A510 TYPICAL SOFFIT DETAIL
1:10

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NO.	ISSUES	DATE	BY
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NO.	REVISIONS	DATE	BY

PROJECT:
ALTERNATE FUEL BUILDING

ST. MARYS
400 Waverley Road South,
Bowmanville, Ontario

Municipality of Clarington

DRAWING:
DETAILS

BARRY · BRYAN ASSOCIATES

Architects
Engineers
Project Managers

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ONTARIO ASSOCIATION OF ARCHITECTS
FEB 28, 2017
WILLIAM WEMA
LICENCE 4319

DESIGN BY: WW	DATE:
DRAWN BY: DP	CHECKED:
CHECKED BY: DB	TOTAL:
DATE: 06/23/16	
SCALE: As indicated	
FILE: 15155 / DRAWINGS / CURRENT / 15155 St Marys Alt Fuel.rvt	

PROJECT NO: 15155

DRAWING NO: A510

GENERAL

1. ALL DIMENSIONS AND ELEVATIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.

2. SITE VERIFY ALL DIMENSIONS AND LEVELS PRIOR TO CONSTRUCTION. REPORT ANY DISCREPENCIES TO THE DESIGN ENGINEER.

3. CONFORM TO THE REQUIREMENTS OF THE ONTARIO BUILDING CODE, LATEST EDITION.

4. CONFORM TO THE REQUIREMENTS OF THE OCCUPATIONAL HEALTH AND SAFETY ACT/ REGULATIONS FOR CONSTRUCTION PROJECTS, LATEST EDITION.

5. CONFORM TO THE OWNERS GENERAL SPECIFICATIONS INCLUDING ALL SAFETY REQUIREMENTS.

6. KEEP THE SITE THROUGHOUT THE WORK AREA IN A CLEAN AND ORDERLY CONDITION AT ALL TIMES TO THE SATISFACTION OF THE OWNER.

7. THE LATEST EDITION OF ALL CODES AND STANDARDS SHALL BE USED.

8. ALL STRUCTURAL DRAWINGS ARE TO BE READ IN CONJUNCTION WITH OTHER CONSULTANTS DRAWINGS AND SPECIFICATIONS.

9. IMPORTANCE CATEGORY FOR THIS BUILDING AS PER OBC TABLE 4.1.2.(3). ULS IMPORTANCE FACTOR IS NORMAL.

FOUNDATIONS

1. FOUNDATION DESIGN AND DESIGN BEARING CAPACITY OF 120 kPa (SLS) AND 180 kPa (ULS) ON NATIVE MATERIAL WAS BASED ON GEOTECHNICAL INVESTIGATION REPORT 11139272.01 Report No. 1 DATED FEBRUARY, 2017 PREPARED BY GHD. THE BEARING CAPACITY MUST BE CONFIRMED BY THE GEOTECHNICAL ENGINEER PRIOR TO PLACING FOUNDATIONS.

2 ALL FOOTINGS SHALL BEAR ON UNDISTURBED NATIVE SOIL OR ENGINEERED FILL AS APPROVED BY THE GEOTECHNICAL CONSULTANT. REPORT ANY DOUBTFUL BEARING CONDITIONS TO THE STRUCTURAL ENGINEER BEFORE PLACING FOOTING.

3. MATERIALS FOR BACKFILL SHALL BE GRANULAR 'A' AND GRANULAR 'B' CONFORMING TO OPSS STANDARDS COMPACTED TO 98% STANDARD PROCTOR MAX. DRY DENSITY.

4. ALL EXTERIOR FOOTINGS SHALL BE MINIMUM 1200mm BELOW FINISHED GRADE TO ELEVATION, AS SHOWN ON DRAWINGS.

5. ALL PIERS AND FOOTINGS UNDER COLUMNS TO BE CENTRED UNDER THE COLUMNS UNLESS NOTED OTHERWISE ON THE PLAN.

CONCRETE

1. CONCRETE CONSTRUCTION SHALL CONFORM TO THE LATEST EDITION OF CAN/CSA-A23.3 WITH THE FOLLOWING PROVISION:

LOCATION	DESIGN STRENGTH (28 DAYS)	SLUMP	EXPOSURE CLASS
EXTERIOR FOOTINGS/ FOUNDATION WALLS & PIERS	30 MPa	80 +/-30	F-2
ALL EXTERIOR REINFORCED CONCRETE	35 MPa U.N.O.	80 +/-30	C-1
EXTERIOR UN-REINFORCED CONCRETE (CURBS & CONCRETE WALKWAYS)	32 MPa U.N.O.	80 +/-30	C-2
INTERIOR SLAB ON GRADE AND SUSPENDED SLAB	30 MPa	80 +/-30	C-1

2. NO ADDITIONAL WATER SHALL BE ADDED AT THE JOB SITE. CONCRETE WHICH HAS BEEN WATERED OR DOES NOT MEET SPECIFICATIONS SHALL BE REJECTED.

3. WHEN THE OUTSIDE TEMPERATURE FALLS BELOW 5 DEGREES C, PROVIDE TEMPORARY HEATING OF CONCRETE IN ACCORDANCE WITH THE REQUIREMENTS OF CSA A23.1.

4. STRUCTURAL GROUT SHALL BE NON-SHRINK, NON-METALLIC M-BED STANDARD PREMIX BY SIKA OR APPROVED EQUAL.

5. ALL EPOXY SHALL BE HILTI HIT-HY 200 OR APPROVED EQUIVALENT U.N.O.

SLAB-ON-GRADE

1. CAST SLAB-ON-GRADE ON 150mm MINIMUM GRANULAR 'A' BACKFILL AS PER OPSS, COMPACTED TO A MINIMUM OF 100% OF ITS SPMDD.

2. CONTRACTOR SHALL REMOVE ALL TOPSOIL, LOOSE AND WET SOILS AND ORGANICS TO APPROVED NATIVE BEARING SOIL. BUILD UP SUBGRADE WITH FREE DRAINING GRANULAR 'B' TYPE 1 BACKFILL AS PER OPSS 1010, PLACED IN LIFTS NO THICKER THAN 200mm BEFORE COMPACTION, AND COMPACTED TO A MINIMUM OF 100% OF ITS SPMDD. REFER TO GEOTECHNICAL REPORT FOR ADDITIONAL INFORMATION.

3. DO NOT CAST SLAB MORE THAN 30 METERS IN LENGTH IN EITHER DIRECTION. CONTRACTOR SHALL SUBMIT A DETAILED POUR SCHEDULE TO THE CONSULTANT FOR REVIEW AND APPROVAL.

4. MAINTAIN MINIMUM SPECIFIED THICKNESS AT ALL SLAB DEPRESSIONS AND CHANGES IN ELEVATIONS.

5. WELDED WIRE MESH REINFORCING IN SLABS ON-GRADE MUST BE PROPERLY CHAIRED. LIFTING OF THE WIRE MESH DURING POURS WILL NOT BE ACCEPTED.

6. REFER TO ARCHITECTURAL DRAWINGS FOR EXTENT AND LOCATION OF ALL FINISHES, DEPRESSIONS AND SLOPES.

7. PROVIDE SAWCUTS WITHIN 6 TO 18 HOURS. REFER TO TYPICAL SAWCUT DETAIL FOR ADDITIONAL REQUIREMENTS.

8. CONTRACTOR SHALL SUBMIT A SAWCUT PLAN COMPLYING TO DRAWING REQUIREMENTS TO THE CONSULTANT FOR REVIEW AND APPROVAL.

9. PROVIDE VAPOUR BARRIER BELOW SLAB WHERE SHOWN ON ARCHITECTURAL DRAWINGS.

CONCRETE REINFORCEMENT

1. THE CLEAR DISTANCE BETWEEN REINFORCING STEEL AND SURFACE OF CONCRETE SHALL BE AS FOLLOWS, U.N.O.:

LOCATION	CLEAR COVER
FOOTINGS	75mm UNDERSIDE 50mm TOP AND ENDS
WALLS	75mm AGAINST EARTH 40mm AGAINST FORM
SLABS	60mm TOP BARS 60mm BOTTOM BARS
SURFACE CAST AGAINST GROUND	75mm

2. DETAIL REINFORCING STEEL IN ACCORDANCE WITH "REINFORCING STEEL MANUAL OF STANDARD PRACTICE" BY THE REINFORCING STEEL INSTITUTE OF CANADA, LATEST EDITION.

3. REINFORCING BAR SPLICES FOR DEFORMED BARS: COLUMNS ARE COMPRESSION LAP U.N.O., WALLS ARE CLASS 'B' TENSION SPLICE, U.N.O. AND ALL OTHERS ARE CLASS 'B' TENSION LAP, U.N.O.

4. ALL REINFORCING STEEL SHALL BE DEFORMED HARD GRADE BILLET STEEL CONFORMING TO CSA G30.18 GRADE 400.

5. WELDED STEEL WIRE FABRIC, PLAIN TYPE CONFORMING TO CSA G30.5M IN FLAT SHEETS NOT ROLLED.

6. ALL CONCRETE REINFORCEMENT MUST BE PROPERLY CHAIRED WITH APPROVED BAR SUPPORTS.

7. PROVIDE CHAIRS, SPACER BARS, SUPPORT BARS AND OTHER ACCESSORIES TO SUPPORT REINFORCING IN ACCORDANCE WITH THE LATEST EDITIONS OF CSA A23.1 AND CSA A23.3.

8. CHAIRS SHALL BE SPACED AT 1200MM (4'-0") c/c MAXIMUM.

9. THE CONTRACTOR SHALL PREPARE AND SUBMIT TO THE CONSULTANFOR REVIEW REINFORCEMENT SHOP DRAWINGS INCLUDING SCALED PLANS, CONNECTIONS, ANCHORS, ELEVATIONS, LEVELS AND DETAILS.

MASONRY

1. PERFORM MASONRY WORK IN ACCORDANCE WITH CAN/CSA A370 AND CAN/CSA A371, EXCEPT WHERE SPECIFIED OTHERWISE.

2. ONLY TYPE 'S' MORTAR SHALL BE USED. MINIMUM STRENGTH SHALL BE 12.4 MPa AT 28 DAYS. MORTAR FOR EXPOSED EXTERIOR MASONRY SHALL BE AIR ENTRAINED IN ACCORDANCE WITH TYPICAL TYPE "S" MORTAR PROPERTIES

3. PROVIDE VERTICAL WALL REINFORCING FOR FULL HEIGHT OF LIFT CONTINUOUS FROM FLOOR TO FLOOR/ ROOF, WITH CLASS B LAPS. WELD REINFORCING TO ALL BEARING PLATES AND STEEL BEAMS WHICH INTERSECT AND CUT THE CONTINUOUS REINFORCING STEEL.

4. MASONRY WORK SHALL CONFORM TO CAN/CSA A371, LATEST EDITION AND ITS REFERENCED DOCUMENTS.

5. SUBMIT EVIDENCE OF MORTAR AND GROUT STRENGTH. FIELD CONTROL AND TESTING SHALL COMPLY WITH REQUIREMENTS OF CLAUSE 5 OF CAN S304.

6. PROVIDE TEMPORARY BRACING OF THE MASONRY WORK UNTIL PERMANENT LATERAL SUPPORT IS IN PLACE. TEMPORARY BRACING IS THE RESPONSIBILITY OF THE GENERAL CONTRACTOR.

7. PROVIDE LINTELS OVER ALL OPENINGS IN MASONRY WALLS. SEE LINTEL SCHEDULE FOR REQUIREMENTS.

8. REFER TO TYPICAL DETAILS FOR BOND BEAM AND BEARING REQUIREMENTS AT FLOORS AND ROOFS.

9. MINIMUM STANDARD LAP LENGTH:

WIRE REINF.	200mm(8")
10M BARS	400mm(16")
15M BARS	600mm(24")
20M BARS	800MM(32")

10. FILL CELLS CONTAINING VERTICAL REINFORCING AND BOLTS WITH GROUT. VIBRATE OR PUDDLE TO FILL CELLS COMPLETELY.

11. UNLESS NOTED OTHERWISE FOR LOAD BEARING AND NON-LOAD BEARING WALL, PROVIDE 2-15M VERTICAL BARS AND GROUT SOLID THE CELL FULL HEIGHT AT:

A. UNSUPPORTED ENDS OF WALLS.

B. EACH SIDE OF CONTROL JOINTS, EXCEPT WHERE LOCATED DIRECTLY BELOW A WINDOW OPENING, BARS MAY BE OMITTED. PROVIDE CLEANOUT PORT AT BOTTOM OF EACH GROUTED CORE WHEN REQUIRED BY ENGINEER. DO NOT CLOSE PORT OR PLACE GROUT UNTIL CORE AND STEEL HAVE BEEN INSPECTED.

12. CONTROL JOINTS SHALL BE INSTALLED AT MAXIMUM SPACING OF 6000mm (20'-0") IF NOT OTHERWISE SHOWN ON ARCHITECTURAL DRAWINGS. REFER TO ARCHITECTURAL DRAWINGS FOR ADDITIONAL INFORMATION. NOTE: FULL HEIGHT CONTROL JOINTS ADJACENT TO WINDOW OR DOOR OPENINGS SHALL BE LOCATED TO ENSURE SOLID FILLED LINTELS ARE NOT CUT, COMPROMISING THE STRUCTURAL INTEGRITY. HORIZONTAL STEPS IN CONTROL JOINTS IS UNACCEPTABLE. CONTRACTOR SHALL SUBMIT PLAN OF CONTROL JOINTS TO CONSULTANT FOR REVIEW AND APPROVAL.

13. FILL BLOCK CORES UNDER ALL BEAMS, JOISTS AND OTHER CONCENTRATED POINT LOADS WITH CONCRETE GROUT. GROUT SHALL EXTEND A MINIMUM OF 600mm (24") BELOW LOAD.

14. NO MASONRY WORK SHALL BE PERMITTED WITH TEMPERATURE BELOW 5 DEGREES C, UNLESS PROVISIONS ARE MADE FOR HEATING THE MATERIALS AND PROTECTING THE WORK.

15. SET BASE PLATES ON MASONRY ON MINIMUM 25 MPa NON-SHRINK GROUT FOR LEVELING.

16. FIRST COURSE OF MASONRY TO BE LAID IN A FULL BED OF MORTAR. ALL OTHER COURSES TO BE LAID WITH MORTAR AT FACE SHELL AND HEAD JOINTS.

17. FILL CELLS IN 1500mm(60") LIFTS MAXIMUM OR BETWEEN BOND BEAMS, WHICHEVER IS LESS, UNLESS SPECIAL PROVISIONS ARE MADE TO ENSURE FULL GROUT COLUMNS HAVE BEEN MADE TO THE SATISFACTION OF THE ENGINEER.

CONCRETE BLOCK MASONRY COMPRESSIVE STRENGTH (MPa)			
LOCATION	NET	GROSS (f'm) FOR HOLLOW BLOCK	GROSS (f'm) FOR SOLID OR GROUTED BLOCK
LOAD BEARING CONCRETE BLOCK	20	13	10
NON-LOAD BEARING CONCRETE BLOCK	15	9.8	7.5

STRUCTURAL STEEL

1. STRUCTURAL STEEL HSS SHALL BE G40.21M-350W CLASS 'C'. W SECTIONS SHALL BE G40.21M-350W. ALL OTHERS SHALL BE G40.21M-300W.

2. DESIGN FORCES INDICATED ON DRAWINGS FOR STRUCTURAL STEEL WORK ARE UN-FACTORED FORCES, U.N.O.:

FORCES	kN
MOMENTS	kN*m
LIVE LOADS	kN/m
DISTRIBUTED LOADS	kPa

3. ALL CONNECTIONS SHALL BE DESIGNED BY THE FABRICATOR, U.N.O..

4. DRAWINGS OF COMPONENTS AND CONNECTIONS DESIGNED BY THE FABRICATOR'S ENGINEER SHALL BE SIGNED AND SEALED BY THAT ENGINEER.

5. FABRICATION, ERECTION AND WORKMANSHIP SHALL CONFORM TO CSA S16.1.

6. ALL WELDING SHALL CONFORM TO CSA W59 AND SHALL BE PERFORMED BY A QUALIFIED WELDER QUALIFIED UNDER CSA W47.

7. ALL CONNECTIONS SHALL BE WELDED USING E49XX ELECTRODES OR BOLTED USING ASTM A325 HIGH STRENGTH BOLTS.

8. ALL STRUCTURAL STEEL SHALL BE PAINTED WITH ONE SHOP APPLIED COAT OF PRIMER. SPOT PRIME ALL WELDED AREAS. SPOT PRIME AS AND WHEN REQUIRED.

9. REMOVE PAINT FILM FROM ALL STEEL SURFACES TO BE WELDED.

10. DO NOT CUT OR CORE ANY OPENINGS IN ANY STRUCTURAL STEEL MEMBERS WITHOUT PRIOR APPROVAL FROM THE STRUCTURAL ENGINEER.

11. WHERE A STRUCTURAL STEEL SHAPE SHOWN ON THE DRAWING(S) IS UNAVAILABLE, A SHAPE OF EQUAL OR GREATER SECTION PROPERTIES AND STRUCTURAL CAPACITY SHALL BE SUBSTITUTED UPON APPROVAL BY THE OWNER AND CONSULTANT AT NO EXTRA COST.

12. ALL SHOP DRAWINGS MUST BE STAMPED BY A PROFESSIONAL ENGINEER REGISTERED INTHE PROVINCE OF ONTARIO.

TEMPORARY WORKS

1. THE CONTRACTOR SHALL DESIGN, PROVIDE, ERECT, MAINTAIN, REMOVE AND ASSUME FULL AND SOLE RESPONSIBILITY FOR ALL TEMPORARY WORKS REQUIRED FOR THE SAFE AND COMPLETE EXECUTION OF THE WORKS.

2. IN THE EXECUTION OF THE TEMPORARY WORKS AND FOR THE DURATION OF THE CONTRACT, THE CONTRACTOR SHALL MAKE ADEQUATE PROVISION FOR ALL LIKELY CONSTRUCTION LOADING AND PROVIDE SUFFICIENT BRACING AND PROPS TO KEEP THE WORK IN PLUMB AND ALIGNMENT AND FREE FROM EXCESSIVE DEFLECTION.

3. ACCESS OF HEAVY CONSTRUCTION EQUIPMENT AND ACCUMULATION OF CONSTRUCTION MATERIALS ON THE FLOORS IS NOT PERMITTED, UNLESS SUCH HAVE BEEN CATERED FOR IN THE CONTRACTOR'S TEMPORARY WORK DESIGN TO THE SATISFACTION OF THE CONSULTANT.

4. SUBMIT SHOP DRAWING FOR ALL TEMPORARY WORKS FOR REVIEW BEFORE FABRICATION COMMENCES. SHOP DRAWINGS SHALL BE SEALED BY A PROFESSIONAL ENGINEER REGISTERED IN THE PROVINCE OF ONTARIO.

MASONRY WALL SCHEDULE

MARK	DESCRIPTION	VERT. REINF.	HORIZ. REINF.	REMARKS
MW1	190 CONC. BLOCK	15M @ 800 C/C	HEAVY DUTY HORIZ. JOINT LADDER REINF. @ 400 C/C	GROUT AT REINFORCED CORES

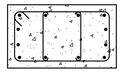
NOTES
1. REFER TO GENERAL MASONRY NOTES FOR ADDITIONAL REINFORCING REQUIREMENTS

CONCRETE FOUNDATION WALL SCHEDULE

MARK	THICKNESS	VERT. REINF.	HORIZ. REINF.	REMARKS
W1	406	15M @ 305 C/C E.F.	15M @ 305 C/C E.F.	
W2	200	15M @ 450 C/C	15M @ 450 C/C	
W3	250	10M @ 450 C/C E.F.	10M @ 450 C/C E.F.	

CONCRETE PIER SCHEDULE

MARK	SIZE	VERT. REINF.	TIES	REMARKS
P1	406 x 800	12-30M	15M @ 300 C/C	SEE DETAIL 1



DETAIL 1

WALL FOOTING SCHEDULE

MARK	WIDTH	DEPTH	REINFORCEMENT
WF1	914	350	3 - 15M CONT. TOP & BOT.
WF2	700	350	3 - 15M CONT. BOT.
WF3	600	300	3 - 15M CONT. BOT.

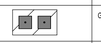
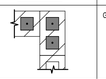
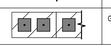
FOOTING SCHEDULE

MARK	SIZE	DEPTH	REINFORCEMENT
F1	1830 x 1830	406	6 - 20M T+B. E.W.
F2	1200 x 1200	350	5 - 15M T+B. E.W.

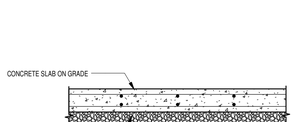
LINTEL SCHEDULE

MARK	SIZE	DETAIL	REMARKS
L1	190X450 CONCRETE LINTEL		2-25M BOT. 2-10M TOP. 10M STIRRUPS @ 300mm C/C
L2	190X700 CONCRETE LINTEL		2-20M BOT. 2-15M MID. 2-15M TOP 10M STIRRUPS @ 300mm C/C

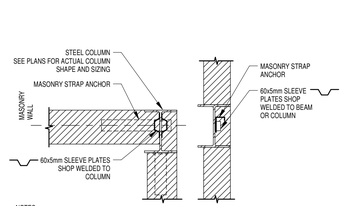
ZONE REINFORCEMENT SCHEDULE

MARK	REINFORCING	DETAIL	REMARKS
Z1	2-15M VERT		GROUT SOLID REINFORCED CORES
Z2	3-15M VERT		GROUT SOLID REINFORCED CELLS
Z3	3-20M VERT		GROUT SOLID REINFORCED CELLS

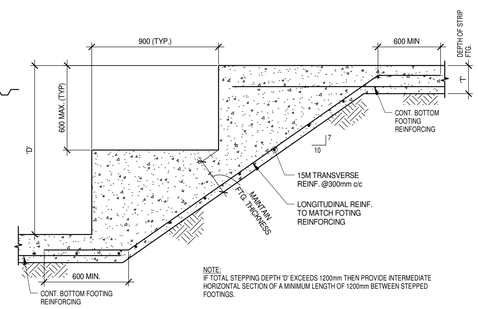
NOTES
1. REFER TO MASONRY NOTE 13 ON S101 FOR ADDITIONAL ZONE REINFORCING LOCATIONS WHICH MAY NOT BE NOTED ON PLAN
2. REINFORCED ZONES SHALL BE GROUTED SOLID
3. UNLESS NOTED OTHERWISE PROVIDE 21 AT END OF ALL OPENINGS.



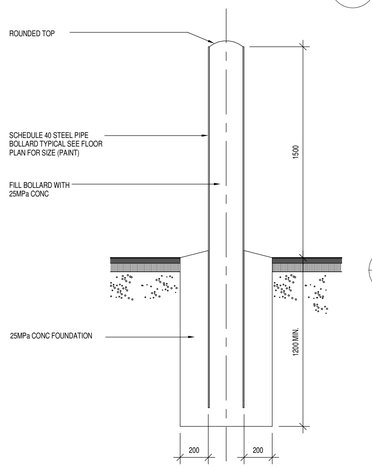
7 / S101 TYPICAL TIE ROD SECTION
1 : 20



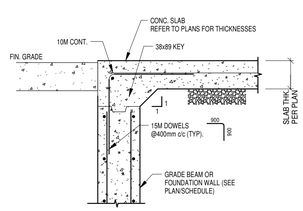
10 / S101 MASONRY ANCHORAGE TO COLUMN
1 : 20



9 / S101 TYPICAL STEPDOWN FOOTING DETAIL
1 : 20

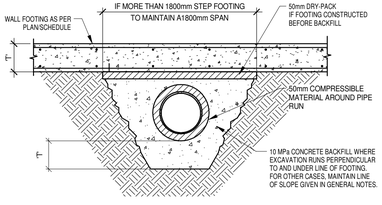


8 / S101 BOLLARD DETAIL
1 : 20

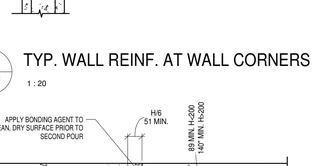


4 / S101 FOUNDATION AT EXTERIOR DOORS
1 : 20

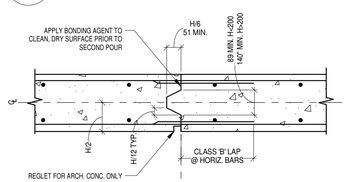
6 / S101 BACKFILL UNDER CONT. WALL FOOTING
1 : 20



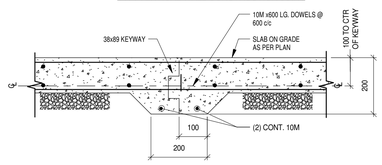
5 / S101 SLEEVES THROUGH CONCRETE WALLS
1 : 20



3 / S101 TYP. WALL REINF. AT WALL CORNERS
1 : 20

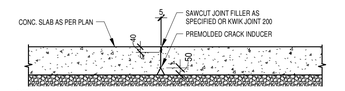


TYP. VERTICAL WALL CONSTRUCTION JOINT



TYP. SLAB ON GRADE CONSTRUCTION JOINT

2 / S101 TYP. CONSTRUCTION JOINT DETAILS
1 : 10



NOTES:
1. SAWCUTTING SHALL BE CARRIED OUT WITHIN 6 TO 18 HOURS OF PLACING CONCRETE.
2. AFTER THE SLAB IS 30 DAYS OLD REMOVE ALL DEBRIS FROM THE SAWCUTS AND FILL WITH MORTAR CONTAINING CEMENT, SAND AND LATEX BONDING AGENT, OR AS NOTED IN SPECIFICATIONS.
3. SPACE SAWCUTS SHOWN ON PLANS OR AT 3000mm c/c MAX.
4. SAWCUT LAYOUT TO BE REVIEWED/VERIFIED BY THE CONSULTANT DURING CONSTRUCTION.

1 / S101 TYPICAL SLAB SAWCUT DETAIL
1 : 20

CHECK AND VERIFY ALL DIMENSIONS AT THE SITE.

peak engineering & construction ltd.

NO.	ISSUES	DATE	BY
1	Issued for Building Permit	FEB. 28 2017	BBA

NO.	REVISIONS	DATE	BY

PROJECT:
ALTERNATE FUEL BUILDING

ST. MARYS
400 Waverley Road South,
Bowmanville, Ontario

Municipality of Clarington

DRAWING:
GENERAL NOTES, SCHEDULES AND TYPICAL DETAILS

BBA
BARRY · BRYAN ASSOCIATES
Architects Engineers Project Managers
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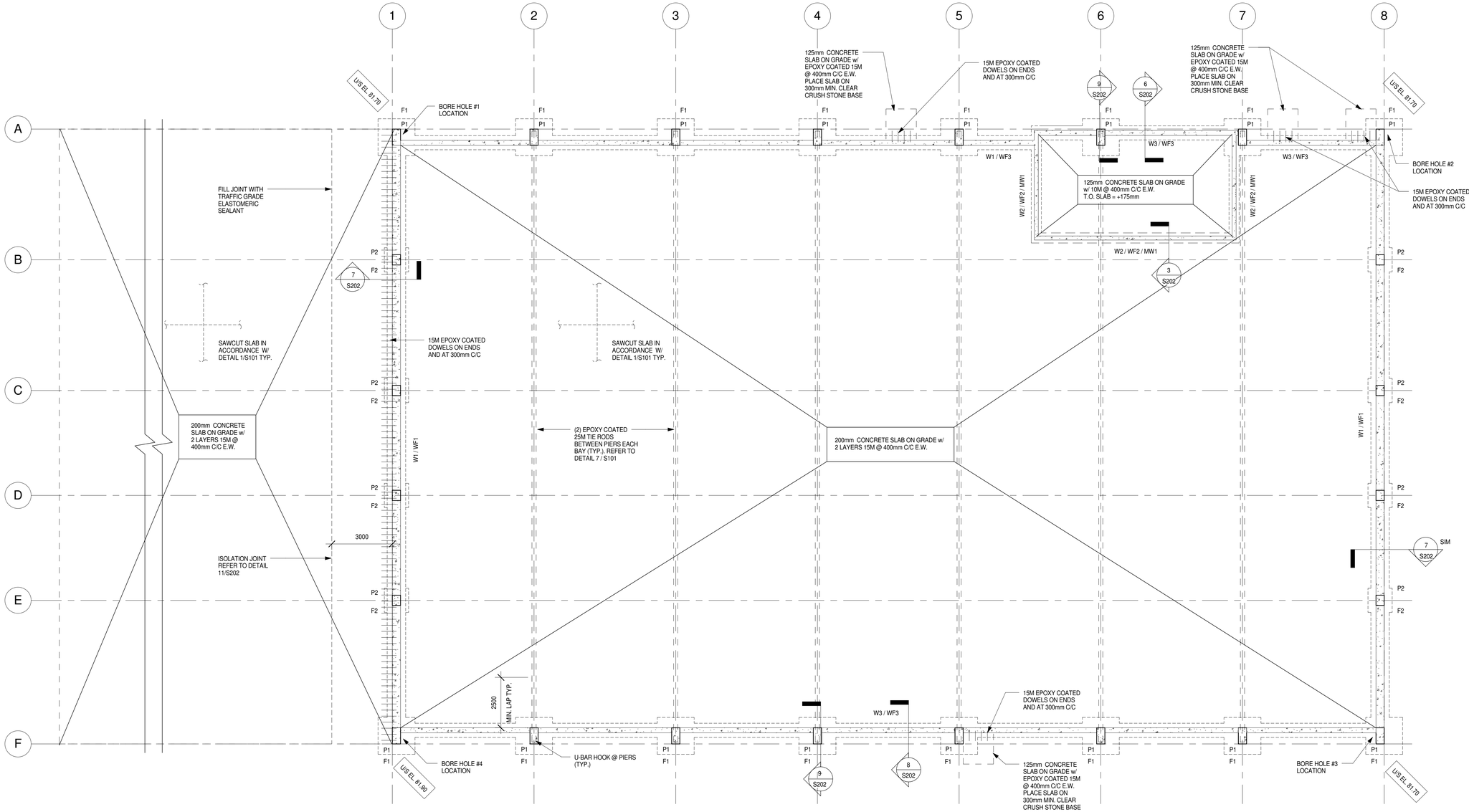
Whitby Ontario L1N 0G5
Tel: (905) 666-5252
Fax: (905) 666-5256
e-mail: bba@bba-arcneng.com

LICENSED PROFESSIONAL ENGINEER 26 287 2017 D. J. BOVILL 100166472 PROVINCE OF ONTARIO

DESIGN BY:	DB
DRAWN BY:	DP
CHECKED BY:	
DATE:	06/07/16
SCALE:	As indicated
FILE:	15155 / DRAWINGS / CURRENT / 15155 St Marys Alt Fuel.rvt

PROJECT NO: 15155

DRAWING NO: S101



FOUNDATION PLAN NOTES

1. FINISHED GROUND FLOOR IS AT ELEVATION 83.70 EXCEPT AS CROSSED AND NOTED. ELEVATIONS FOR AREAS CROSSED AND NOTED ARE TO BE READ FROM FINISHED FLOOR ELEVATION 83.70 UNLESS OTHERWISE NOTED.
2. ALL EXTERIOR FOOTINGS SHALL BE FOUNDED AT MINIMUM DEPTH EL.-1.5m FROM FINISHED GRADE. TYPICAL ALL FOOTINGS UNLESS NOTED OTHERWISE.
3. ALL FOOTINGS TO BE CENTERED UNDER PIERS, WALLS AND/OR COLUMNS EXCEPT AS NOTED ON PLAN.
4. SEE ARCHITECTURAL DRAWINGS FOR SLOPES AND DRAINS. MAINTAIN SLAB THICKNESS SHOWN.
5. FOUNDATION DESIGN AND DESIGN BEARING CAPACITY OF 120 kPa (SLS) AND 180 kPa (ULS) ON NATIVE MATERIAL WAS BASED ON GEOTECHNICAL INVESTIGATION REPORT NO. 111392720.01 Report No. 1 DATED FEBRUARY 6, 2017 PREPARED BY GHD. THE BEARING CAPACITY MUST BE CONFIRMED BY THE GEOTECHNICAL ENGINEER PRIOR TO PLACING FOUNDATIONS.
6. ALL FOOTINGS SHALL BEAR ON UNDISTURBED NATIVE SOIL OR ENGINEERED FILL AS APPROVED BY THE GEOTECHNICAL CONSULTANT. REPORT ANY DOUBTFUL BEARING CONDITIONS TO THE STRUCTURAL ENGINEER BEFORE PLACING FOOTING.
7. VERIFY EXISTING SITE SERVICES PRIOR TO PROCEEDING WITH WORK. NOTIFY CONSULTANTS OF ANY DISCREPANCIES. REFER TO MECHANICAL AND ARCHITECTURAL DRAWINGS FOR ADDITIONA INFORMATION. WHERE DEEP EXCAVATION IS REQUIRED TO ACCOMMODATE SITE SERVICES, BUILD SITE UP WITH ENGINEERED FILL, MIN. BEARING CAPACITY 150 kPa (SLS)
8. LOWER FOOTINGS TO ACCOMMODATE NEW AND/OR EXISTING FOOTINGS, MECHANICAL, ELECTRICAL OR CIVIL SERVICES. SEE MECHANICAL ELECTRICAL AND CIVIL DRAWINGS FOR ELEVATIONS OF SAME. FOOTINGS ARE NOT TO BE UNDERMINED BY EXCAVATION FOR SERVICES PITS, ETC.
9. PROTECT ALL EXISTING SUB GRADE SERVICES DURING INSTALLATION OF FOUNDATIONS.
10. REFER TO GENERAL NOTES AND TYPICAL DETAILS ON DRAWINGS FOR ADDITIONAL INFORMATION.
11. 'Z' DENOTES MASONRY ZONE REINFORCING, REFER TO SCHEDULES.
12. ALL FOOTINGS NEARBY EXISTING SHALL BE FOUNDED AT THE SAME U/S ELEVATION OF EXISTING FOOTINGS AND NOT TO UNDERMINE U.N.O. AND UNDERPINNED.
13. PROVIDE REINFORCED CONCRETE FOUNDATION WALL BELOW ALL LOAD BEARING MASONRY WALLS (U/S OF INTERIOR MASONRY WALL, AT THE TOP OF SLAB ON GRADE).
14. PROVIDE DOWELS IN THE FOOTING TO MATCH ALL VERTICAL WALL REINFORCEMENT.
15. SDF DENOTES STEP DOWN FOOTING. REFER TO TYPICAL DETAIL 21/S102 FOR ADDITIONAL INFORMATION.
16. PLACE ALL CONCRETE SLAB ON GRADE ON 150mm COMPACTED GRANULAR "A" SUB-BASE.
17. PERIMETER STRIP FOOTING SHALL BE ELEVATED TO MATCH COLUMN FOOTING ELEVATIONS. STEP FOOTINGS AS NECESSARY.
17. REMOVE ALL TOPSOIL, LOOSE AND WET SOILS AND ORGANICS TO SUITABLE NATIVE SUBGRADE MATERIAL AS APPROVED BY THE GEOTECHNICAL ENGINEER. THE EXISTING SUB-GRADE MUST BE PROOF-ROLLED AND COMPACTED PRIOR TO BACKFILLING. REFER TO THE GEOTECHNICAL REPORT FOR ADDITIONAL INFORMATION.
18. BACKFILL WITH GRANULAR "B" PLACED IN 200mm LIFTS TO UNDERSIDE OF NEW 150mm GRANULAR "A" BASE. REFER TO THE SOIL REPORT FOR EXISTING SOIL CONDITION AND TOPOGRAPHICAL SURVEY FOR EXISTING GRADES.

FOUNDATION DESIGN LOADS:

WIND:
q (1/50) = 0.48 kPa

SNOW:
Ss = 1.40 kPa
Sr = 0.40 kPa
S = 1.52 kPa

SEISMIC:
Sa (0.2) = 0.200
Sa (0.5) = 0.130
Sa (1.0) = 0.073
Sa (2.0) = 0.023
PGA = 0.078
Site Class 'D'

peak engineering & construction ltd.

NO.	ISSUES	DATE	BY
1	Issued for Building Permit	FEB. 28 2017	BBA

NO.	REVISIONS	DATE	BY

PROJECT:
ALTERNATE FUEL BUILDING

ST. MARYS
400 Waverley Road South,
Bowmanville, Ontario

Municipality of Clarington

DRAWING:
FOUNDATION PLAN

BARRY · BRYAN ASSOCIATES

Architects
Engineers
Project Managers

250 Water Street
Whitby Ontario L1N 0G5

Tel: (905) 666-5252
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e-mail: bba@bba-archeng.com

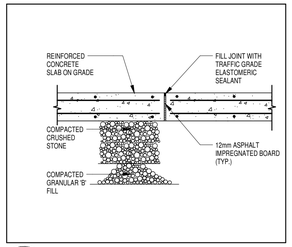
LICENSED PROFESSIONAL ENGINEER
Feb 28/17
D. J. BOVILL
100166472
PROVINCE OF ONTARIO

DESIGN BY:	DB
DRAWN BY:	DP
CHECKED BY:	
DATE:	06/07/16
SCALE:	1 : 100

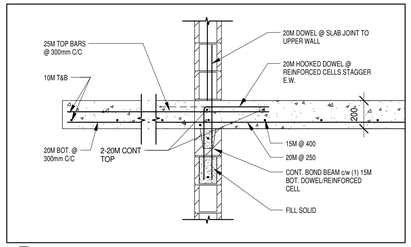
FILE: 15155 / DRAWINGS / CURRENT / 15155 St Marys Alt Fuel.rvt

PROJECT NO: 15155

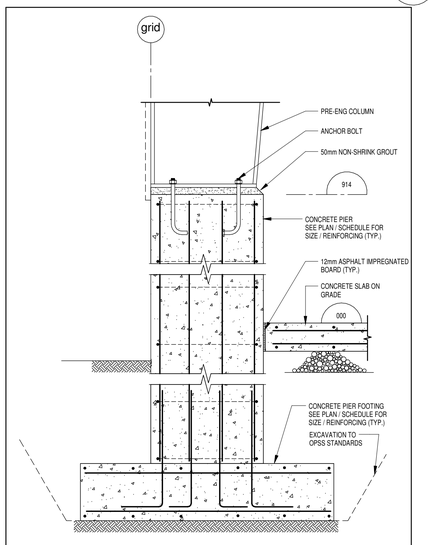
DRAWING NO: S201



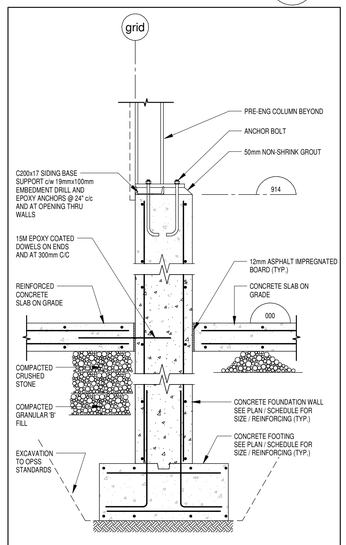
11 / S202 SECTION
1:20



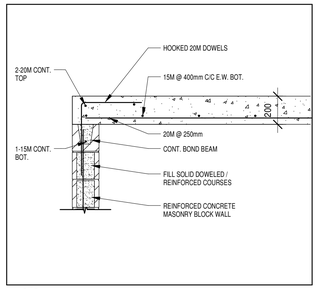
10 / S202 SECTION
1:20



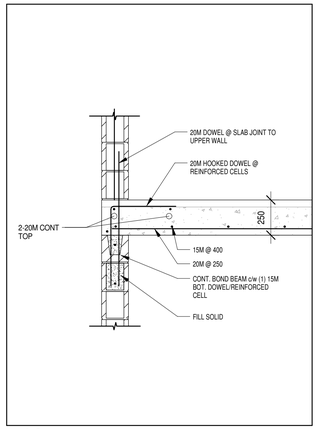
9 / S202 TYP. FOUNDATION SECTION
1:20



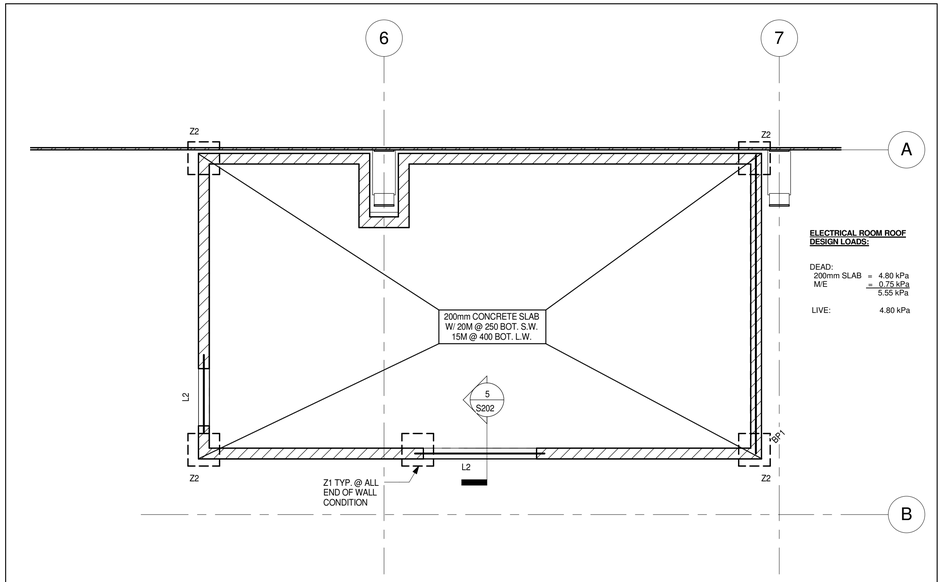
7 / S202 TYP. FOUNDATION SECTION
1:20



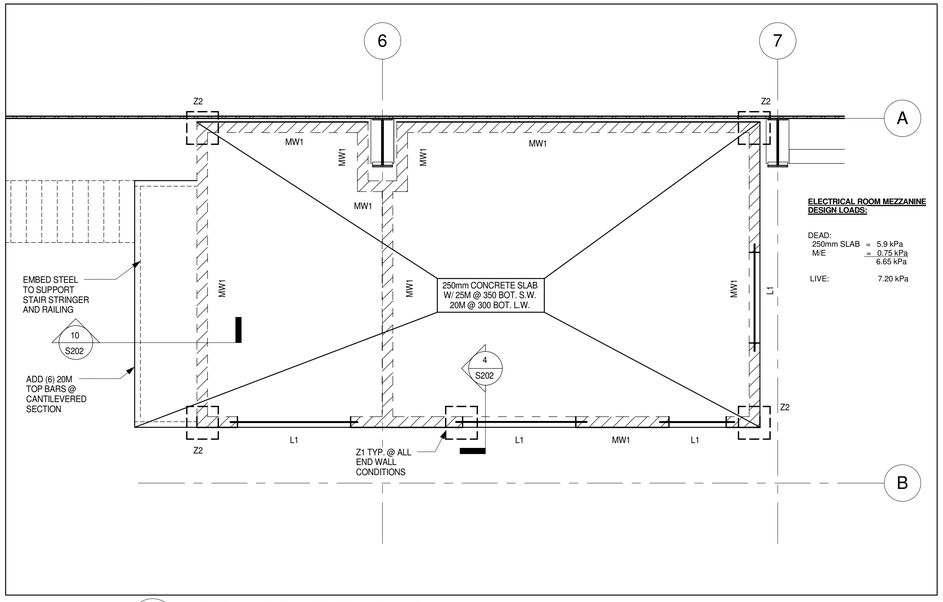
5 / S202 SECTION
1:20



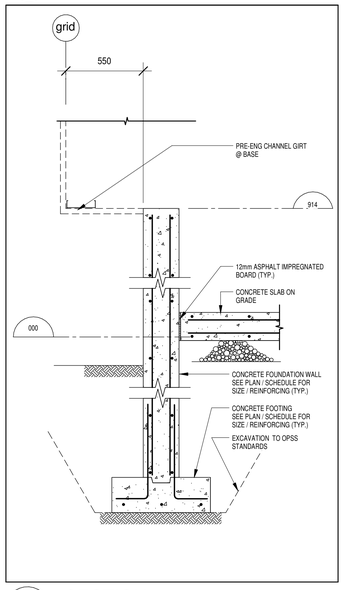
4 / S202 SECTION
1:20



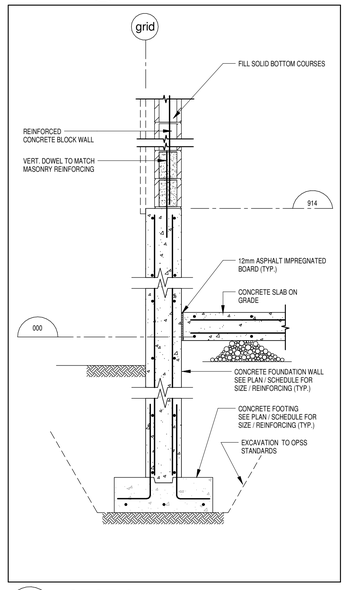
2 / S202 ELECTRICAL ROOM ROOF FRAMING PLAN
1 : 50



1 / S202 MEZZANINE FLOOR FRAMING PLAN
1 : 50



8 / S202 SECTION
1:20



6 / S202 SECTION
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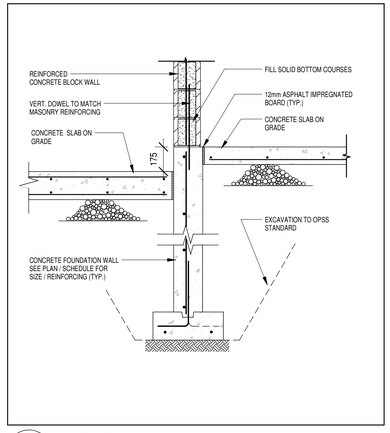


3 / S202 SECTION
1:20

CHECK AND VERIFY ALL DIMENSIONS AT THE SITE.

DRAWINGS ARE NOT TO BE USED FOR CONSTRUCTION UNTIL SIGNED AND SEALED BY THE CONSULTANT.

peak engineering & construction ltd.

NO.	ISSUES	DATE	BY
1	Issued for BuildingPermit	FEB. 28 2017	BBA

NO.	REVISIONS	DATE	BY

PROJECT:
ALTERNATE FUEL BUILDING

ST. MARYS
400 Waverley Road South,
Bowmanville, Ontario

Municipality of Clarington

DRAWING:
ENLARGED PLANS AND SECTIONS

BBA
BARRY · BRYAN ASSOCIATES
Architects
Engineers
Project Managers
250 Water Street
Whitby Ontario L1N 0G5
Tel: (905) 666-5252
Fax: (905) 666-5256
e-mail: bba@bba-arcneng.com

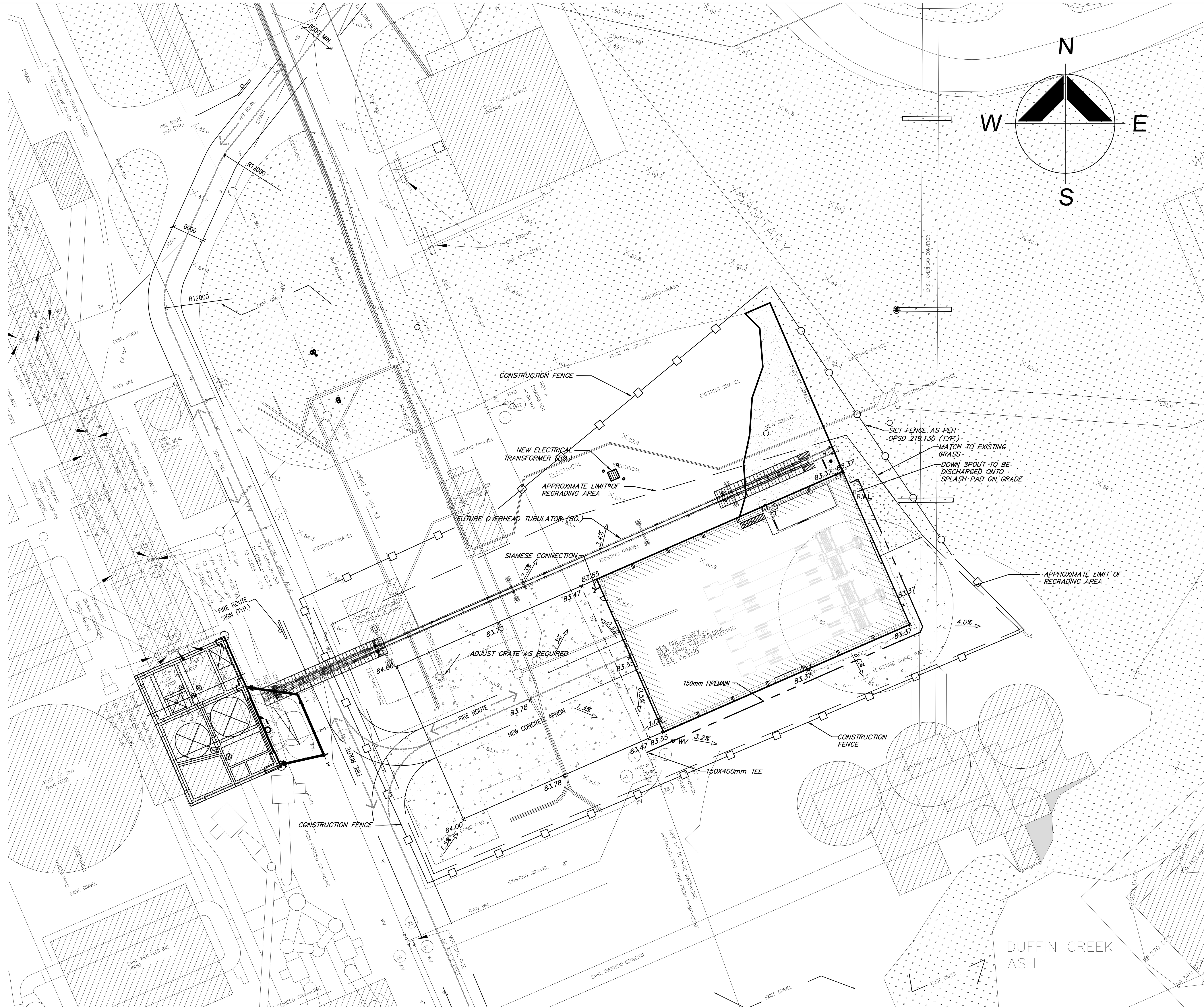
LICENSED PROFESSIONAL ENGINEER
Feb 28, 2017
D. J. BOVILL
100166472
PROVINCE OF ONTARIO

DESIGN BY: DB	M.E.P./FIRE PROT. ENG.
DRAWN BY: DP	S. COMPTON
CHECKED BY:	STRUCT.
DATE: 06/07/16	
SCALE: As indicated	

FILE: 15155 / DRAWINGS / CURRENT / 15155 St Marys Alt Fuel.rvt

PROJECT NO: 15155

DRAWING NO: S202



WATERMAINS

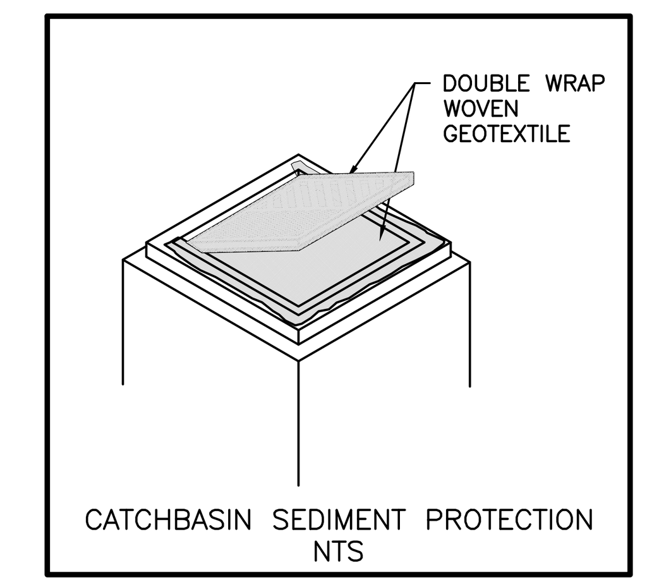
1. PIPE BEDDING FOR RIGID PIPE TO BE CLASS "B" AS PER OPSD 802.030. PIPE BEDDING FOR FLEXIBLE PIPE TO BE AS PER OPSD 802.010. BEDDING MATERIAL AND COVER MATERIAL TO BE GRAN. "A" TRENCH BACKFILL TO BE NATIVE MATERIAL REPLACED IN 300MM LIFTS AND COMPACTED TO 95% STANDARD PROCTOR DENSITY.
2. WATERMAINS 100MM AND LARGER SHALL BE PVC C900 CLASS 150 INSTALLED WITH MINIMUM 1.8M OF COVER. FITTINGS 100MM AND LARGER SHALL BE PC CLASS 150 (DR18) CSA B137.3.
3. WATERMAIN FITTINGS TO BE SUPPLIED WITH MECHANICAL JOINT RESTRAINTS FOR WATERMAIN PIPE SIZES 150MM ø OR LESS. ALL PIPE JOINTS TO BE RESTRAINED WITHIN 5.0M FROM ALL FITTINGS, IN EACH DIRECTION, UNLESS SHOWN OTHERWISE ON THE CONTRACT DRAWINGS. FOR WATERMAIN PIPE SIZES GREATER THAN 150MM ø ALL PIPE JOINTS TO BE RESTRAINED WITHIN 10.0M FROM FITTINGS, IN EACH DIRECTION, UNLESS SHOWN OTHERWISE ON THE CONTRACT DRAWINGS. ALL TEE'S TO HAVE MINIMUM 2.0M SOLID PIPE LENGTH ON EACH RUN OF THE TEE OR PROVIDE A THRUST BLOCK PER OPSD 1103.010. ALL MECHANICAL JOINT RESTRAINTS TO BE WRAPPED WITH APPROVED PETROLATUM TAPE IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATION.
4. ALL METALLIC FITTINGS (EXCLUDING CURB/MAIN STOP AND BRASS FITTINGS) AND APPURTENANCES INCLUDING SADDLES, VALVES, TEES, BENDS ETC ARE TO BE WRAPPED WITH AN APPROVED PETROLATUM SYSTEM CONSISTING OF PASTE, MASTIC AND TAPE. PARTICULAR ATTENTION SHALL BE PAID TO ANODE INSTALLATION. CONTRACTOR TO REFER TO THE MOST RECENT EDITION OF THE REGION AND AREA MUNICIPALITIES DESIGN GUIDELINES AND SUPPLEMENTAL SPECIFICATIONS FOR MUNICIPAL SERVICES, SECTION E2–14 FOR WRAPPING DETAILS.
5. WATERMAIN VALVES 100MM AND LARGER SHALL BE AS PER AWWA C509 – MUELLER A 2360–23 OR APPROVED EQUIVALENT (OPEN LEFT) INCLUDING VALVE BOX AND 2.3KG ANODE INCLUDING ANODE PROTECTION INSTALLED PER MUNICIPALITY OF CLAIRINGTON STANDARDS.
6. PVC WATERMAIN SHALL HAVE TWU STRANDED COPPER, AWGB TRACER WIRE STRAPPED TO TOP AT 5M INTERVALS. TRACER WIRE SHALL BE BROUGHT TO THE SURFACE AT ALL HYDRANTS AND CAD WELDED TO THE LOWER FLANGE OF THE HYDRANT.
7. WATER CONNECTIONS MAY BE PLACED IN THE SAME TRENCH WITH A STORM OR SANITARY CONNECTION ONLY IF A MINIMUM VERTICAL SEPARATION OF 500MM IS MAINTAINED BETWEEN THE WATER SERVICE AND ANY OTHER PIPE IN ACCORDANCE WITH SECTION 7.3.5.7.(2)(A)(I) OF THE ONTARIO BUILDING CODE.
8. ALL WATERMAINS AND SERVICES TO HAVE MINIMUM 1.8M COVER ON TOP OF PIPE.
9. ALL WATERMAIN TO BE PRESSURE TESTED IN ACCORDANCE WITH OPSS 701.

LEGEND

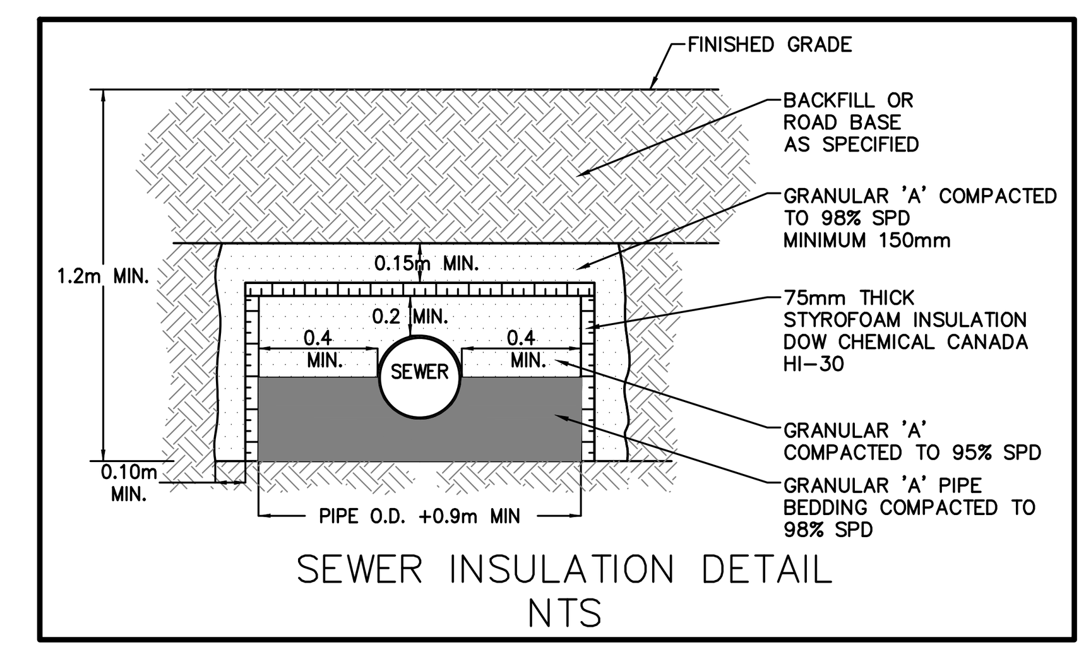
Symbol	Description
88.3+	EXISTING ELEVATION
1.0% ▷	PROPOSED SLOPE
88.21 ×	PROPOSED ELEVATION
R.W.L. □	PROPOSED RAIN WATER LEADER
— — —	PROPOSED WATERMAIN
—o—	PROPOSED SILT FENCE
—□—	PROPOSED CONSTRUCTION FENCE
(hatched)	AREA TO BE SODDED
——	PROPOSED STORM SEWER
● WV	PROPOSED WATER VALVE

CONSTRUCTION NOTES:

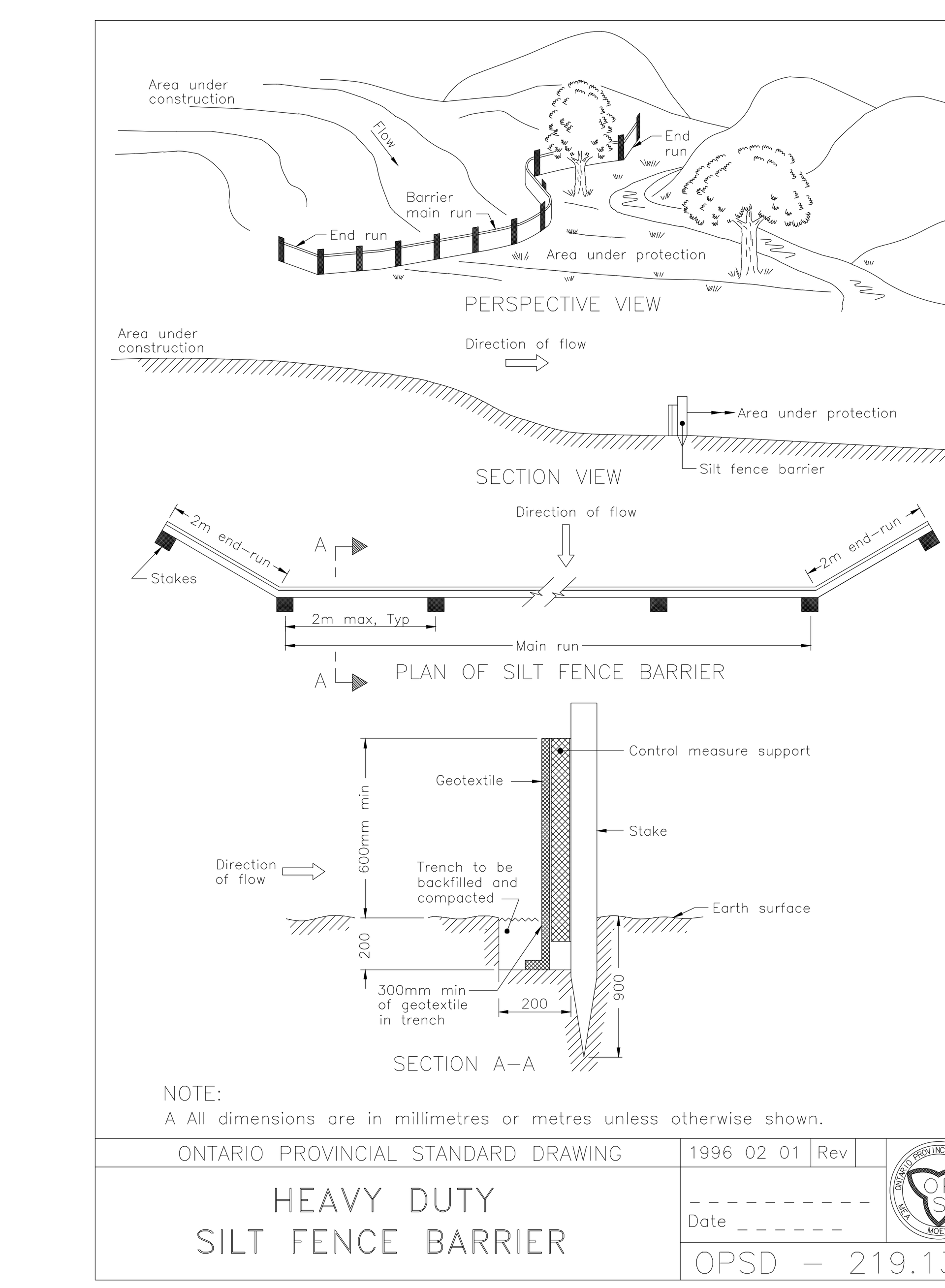
1. THE CONTRACTOR IS RESPONSIBLE FOR LOCATING AND PROTECTING ALL EX. SERVICES DURING CONSTRUCTION.
2. ALL DIMENSIONS AND INVERTS MUST BE VERIFIED PRIOR TO CONSTRUCTION.
3. ALL REMOVALS SHALL BE IN ACCORDANCE WITH OPSS 510. ALL REMOVED MATERIALS SHALL BE DISPOSED OFF SITE
4. SILTATION CONTROL SHALL BE MAINTAINED DURING ALL PHASES OF CONSTRUCTION.
5. ALL GRANULAR MATERIALS SHALL CONFORM TO OPSS 1010, AND BE INSTALLED IN ACCORDANCE WITH OPSS 314.
6. CONCRETE SHALL BE IN ACCORDANCE WITH OPSS 1350 AND HAVE A MINIMUM COMPRESSIVE STRENGTH OF 30MPa AFTER 28 DAYS
7. WATERMAIN TO BE PROVIDED A MIN. COVER OF 1.8m
8. TOPSOIL SHALL BE IN ACCORDANCE WITH OPSS 570 AND SOD IN ACCORDANCE WITH OPSS 571.
9. ALL DISTURBED GRASSED AREAS ARE TO BE RESTORED WITH 100mm DEPTH OF TOPSOIL AND HYDROSEED.
10. ALL DISTURBED AREAS TO BE RESTORED TO ORIGINAL CONDITION TO THE SATISFACTION OF THE CITY
11. CONTRACTOR TO MAINTAIN DRAINAGE AT ALL TIMES
12. CONTRACTOR TO COMPLY WITH ALL ASSOCIATED MUNICIPALITY OF CLAIRINGTON AND REGION OF DURHAM STANDARDS



CATCHBASIN SEDIMENT PROTECTION
NTS



SEWER INSULATION DETAIL
NTS



EROSION AND SEDIMENT CONTROL

1. CONTRACTOR TO INSTALL EROSION CONTROL MEASURES AS SHOWN PRIOR TO CONSTRUCTION AND MAINTAIN IN GOOD CONDITION UNTIL CONSTRUCTION IS COMPLETED AND VEGETATIVE COVER IS ESTABLISHED.
2. ALL SILT FENCING TO BE INSTALLED PRIOR TO ANY AREA GRADING, EXCAVATING OR DEMOLITION COMMENCING.
3. EROSION CONTROL FENCING TO BE INSTALLED AROUND BASE OF ALL STOCKPILES
4. ADDITIONAL EROSION CONTROL MEASURES MAY BE REQUIRED AS SITE DEVELOPMENT PROGRESSES. CONTRACTOR TO PROVIDE ALL ADDITIONAL EROSION CONTROL STRUCTURES.
5. NO ALTERNATIVE METHODS OR EROSION PROTECTION SHALL BE PERMITTED UNLESS APPROVED BY THE ENGINEER
6. CONTRACTOR TO CLEAN ROADWAY AND SIDEWALKS OF SEDIMENT RESULTING FROM CONSTRUCTION TRAFFIC FROM THE SITE EACH DAY.
7. CONTRACTOR MUST REMOVE EROSION AND SEDIMENTATION FENCING PRIOR TO COMPLETION OF PROJECT. CONTRACTOR TO HAVE EROSION AND SEDIMENTATION FENCE INSPECTED WHEN VEGETATION HAS ESTABLISHED, BUT PRIOR TO FENCE BECOMING OVERGROWN. ENGINEER'S REPRESENTATIVE TO DETERMINE IF VEGETATION HAS REACHED THE CRITICAL POINT AND WILL THEN INSTRUCT CONTRACTOR TO REMOVE FENCE.

MAINTENANCE RECOMMENDATIONS

1. EROSION CONTROL STRUCTURES TO BE MONITORED REGULARLY AND ANY DAMAGE REPAIRED IMMEDIATELY. SEDIMENTS TO BE REMOVED WHEN ACCUMULATIONS REACH A MAXIMUM OF 1/3 THE HEIGHT OF THE FENCE.
2. OWNERS REPRESENTATIVE TO MONITOR EROSION CONTROL STRUCTURES TO ENSURE FENCING IS INSTALLED AND MAINTENANCE IS PERFORMED TO CITY REQUIREMENTS.

NOTE:

CONTRACTOR TO CONTACT MGM CONSULTING INC. IMMEDIATELY SHOULD THERE BE ANY CONFLICTS BETWEEN EXISTING CONDITIONS AND PROPOSED GRADING AND/OR SERVICING DESIGN, OR CONFLICTS IN CONSTRUCTING THE WORK AS PER THE INTENT OF THE APPROVED DESIGN PRIOR TO CONSTRUCTION.

NOTE:

1. ALL WORK TO CONFORM TO THE LATEST MUNICIPAL STANDARDS AND SPECIFICATIONS AS WELL AS THE LATEST ADOPTED ONTARIO PROVINCIAL STANDARD DRAWINGS AND SPECIFICATIONS.
2. ALL DISTURBED AREAS TO BE RESTORED TO ORIGINAL CONDITION OR BETTER TO SATISFACTION OF THE MUNICIPALITY AND MGM CONSULTING INC.
3. CONTRACTOR TO LOCATE AND PROTECT ALL EXISTING SERVICES AND UTILITIES PRIOR TO AND DURING CONSTRUCTION
4. CONTRACTOR TO LOCATE AND CONFIRM ALL EXISTING UTILITIES AND SERVICE INFORMATION PRIOR CONSTRUCTION
5. CONTRACTOR TO ENSURE ADEQUATE CLEARANCE FROM ALL EXISTING SERVICES AND UTILITIES
6. CONTRACTOR TO CONFIRM ALL EXISTING INVERTS PRIOR TO INTERNAL SERVICING.

peak
engineering & construction ltd.

NO.	ISSUES	DATE	BY
1	Issued for Site Plan Approval	APR 21/16	MGM
2	Issued for Permit	JUN 27/16	MGM
3	Issued for SPA	JAN 24/17	MGM

NO.	REVISIONS	DATE	BY

BENCH MARK:
TOPOGRAPHIC SURVEY & EXISTING SERVICING INFORMATION ARE PROVIDED BY THE CLIENT

PROJECT:
ST. MARYS ALT FUEL BUILDING

400 Waverly Road South, Bowmanville, Ontario

Municipality of Clarington

DRAWING:
GRADING, SERVICING AND ESC PLAN

MGM CONSULTING INC
Consulting Engineering & Project Management
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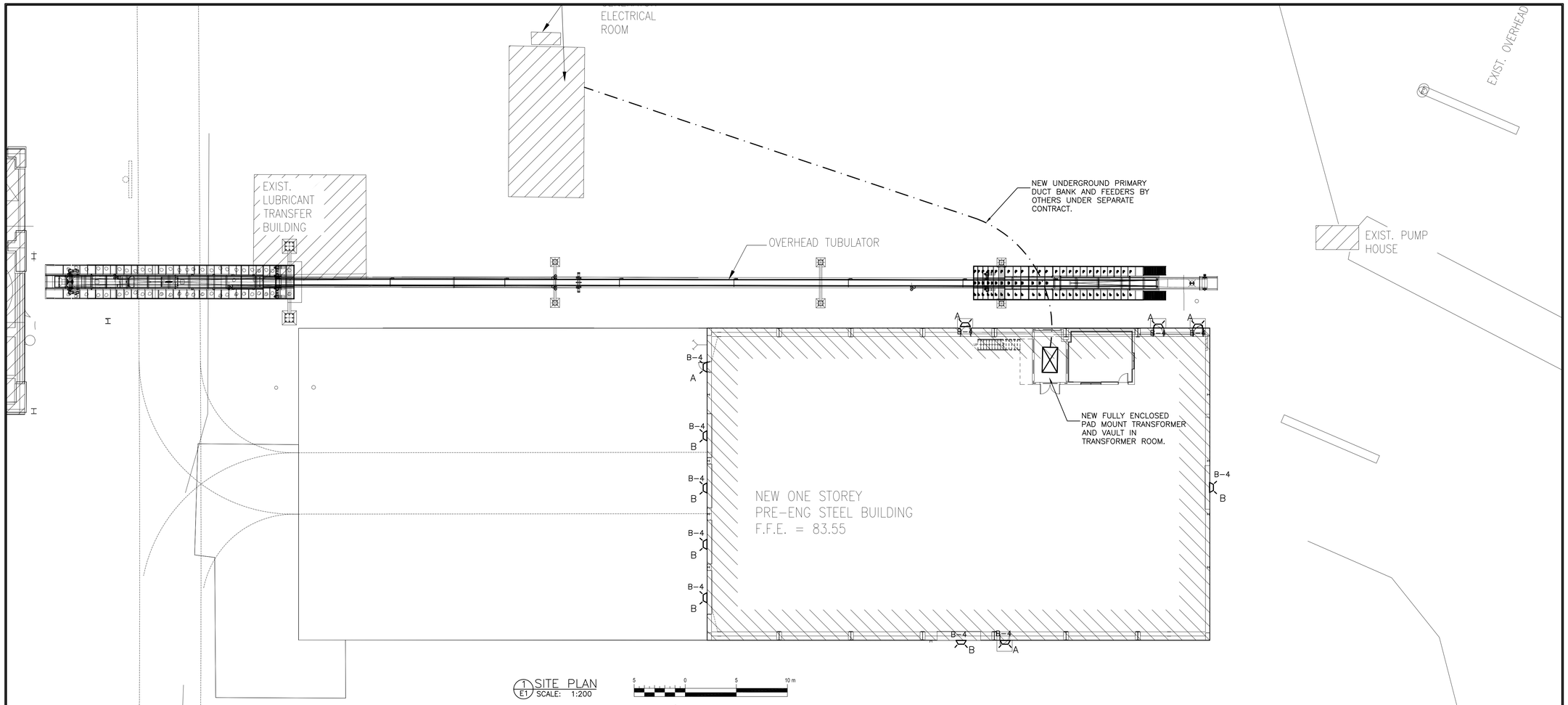
REGISTERED PROFESSIONAL ENGINEER
JAN 24, 2017
PROVINCE OF ONTARIO

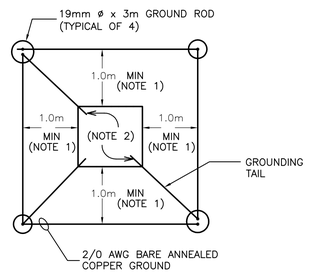
DESIGN BY: JB	
DRAWN BY: JL	
CHECKED BY:	
DATE:	
SCALE: 1:400	D1
FILE:	

PROJECT NO: **15-090**

DRAWING NO: **CV-1**



1 E1 SITE PLAN
SCALE: 1:200



NOTES

1. GROUND LOOP TO EXTEND AT LEAST 1.0m BEYOND CONCRETE TRANSFORMER VAULT.

2. GROUNDING TAILS TO BE CONNECTED TO GROUND RODS AS SHOWN. LEAVE 3.0m SLACK COIL IN PAD BOX FOR CONNECTION TO TRANSFORMER WITHOUT SPLICING.

3. CONNECT TRANSFORMER GROUND GRID TO BUILDING GROUND LOOP

2 E1 PAD MOUNT TRANSFORMER GROUNDING DETAIL
SCALE: N.T.S.

NOTES:

1. TYPE 'A' FIXTURES TO BE BUILDING MOUNTED, CENTERED ABOVE MAN DOORS MOUNTED AT 3500mm
2. TYPE 'B' FIXTURES TO BE BUILDING MOUNTED, CENTERED ABOVE TRUCK DOORS MOUNTED AT 5200mm
3. ALL EXTERIOR LIGHT FIXTURES ARE TO HAVE INTEGRAL DAYLIGHT SENSORS TO CONTROL LIGHTING OPERATION.
4. PROVIDE UTILITY VAULT FOR INDOOR TRANSFORMER TO ACCOMODATE PRIMARY CABLING.

LEGEND

—— · —— PRIMARY FEEDER DUCT BANK

— — — SECONDARY UNDERGROUND FEEDERS

NO.	DESCRIPTION	DATE	BY
3	REVISED BUILDING LOCATION	FEB 28/17	MJM
2	ISSUED FOR CONSTRUCTION	SEPT 22/16	MJM
1	ISSUED FOR PERMIT	JUN 24/16	MJM
0	ISSUED FOR SITE PLAN APPROVAL	APR 21/16	MJM

REVISIONS

REGISTERED PROFESSIONAL ENGINEER
M.J.MCPHAIL
100208170
FEB 28/17
PROVINCE OF ONTARIO
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www.kirklandeng.com
KIRKLAND ENGINEERING LTD.

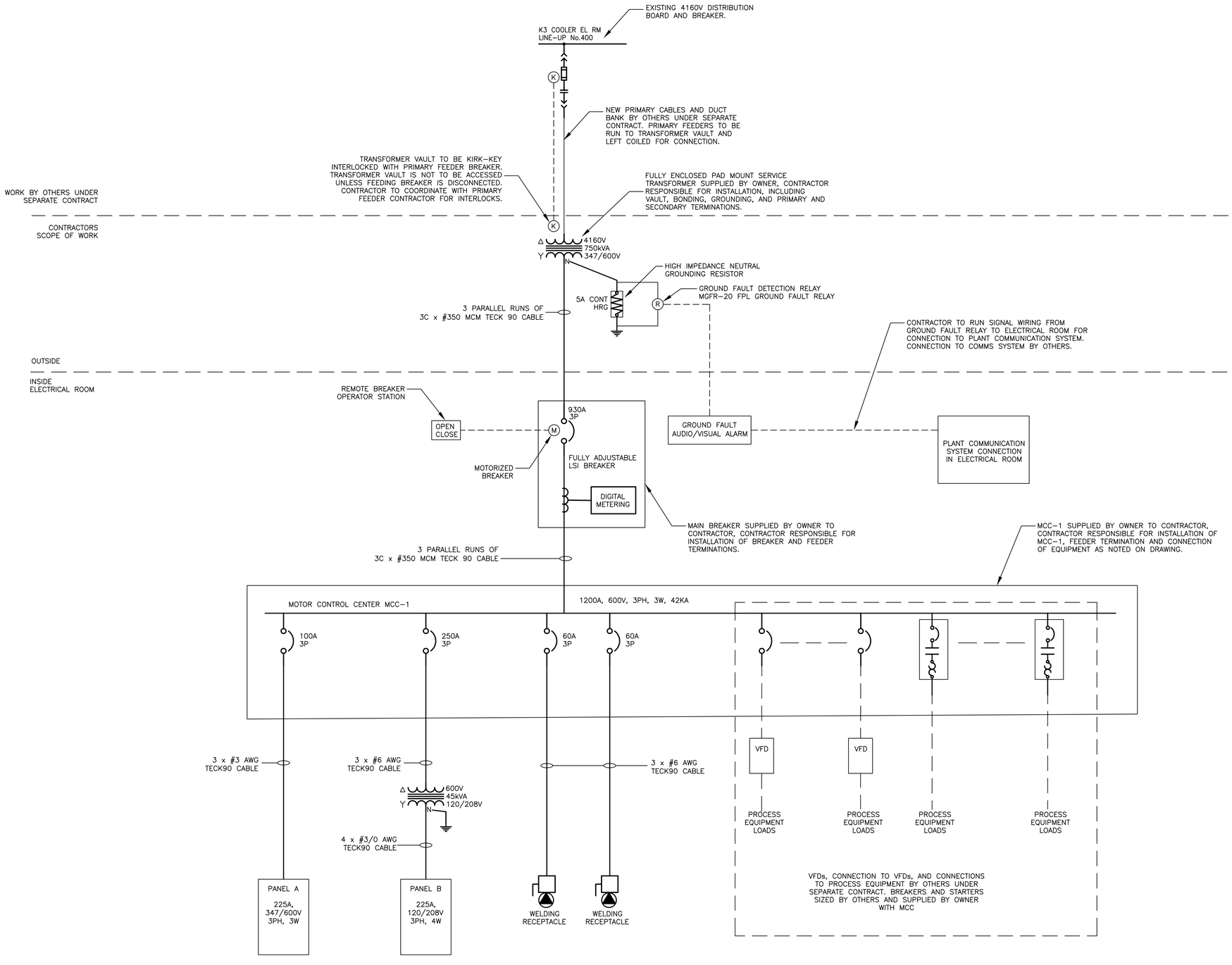
PROJECT
ST. MARY'S ALT FUEL BLDG

400 Waverley Rd South
Bowmanville, Ontario

TITLE
ELECTRICAL SITE PLAN

DESIGN	MJM	SCALE	AS NOTED
DRAWN	MJM	DWG NO.	E1
CHECKED	IMK		
APPROVED	MJM		
PROJECT	5815		

CADD FILE NO. 5815E1.DWG



NO.	DESCRIPTION	DATE	BY
2	REVISED BUILDING LOCATION	FEB 28/17	MJM
1	ISSUED FOR CONSTRUCTION	SEPT 22/16	MJM
0	ISSUED FOR PERMIT	JUN 24/16	MJM

REVISIONS

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PROJECT
ST. MARY'S ALT FUEL BLDG

400 Waverley Rd South
Bowmanville, Ontario

TITLE
SINGLE LINE DIAGRAM

DESIGN	MJM	SCALE	AS NOTED
DRAWN	MJM	DWG NO.	E2
CHECKED	IMK		
APPROVED	MJM		
PROJECT	5815		

CADD FILE NO. 5815E2.DWG

LIGHTING SCHEDULE

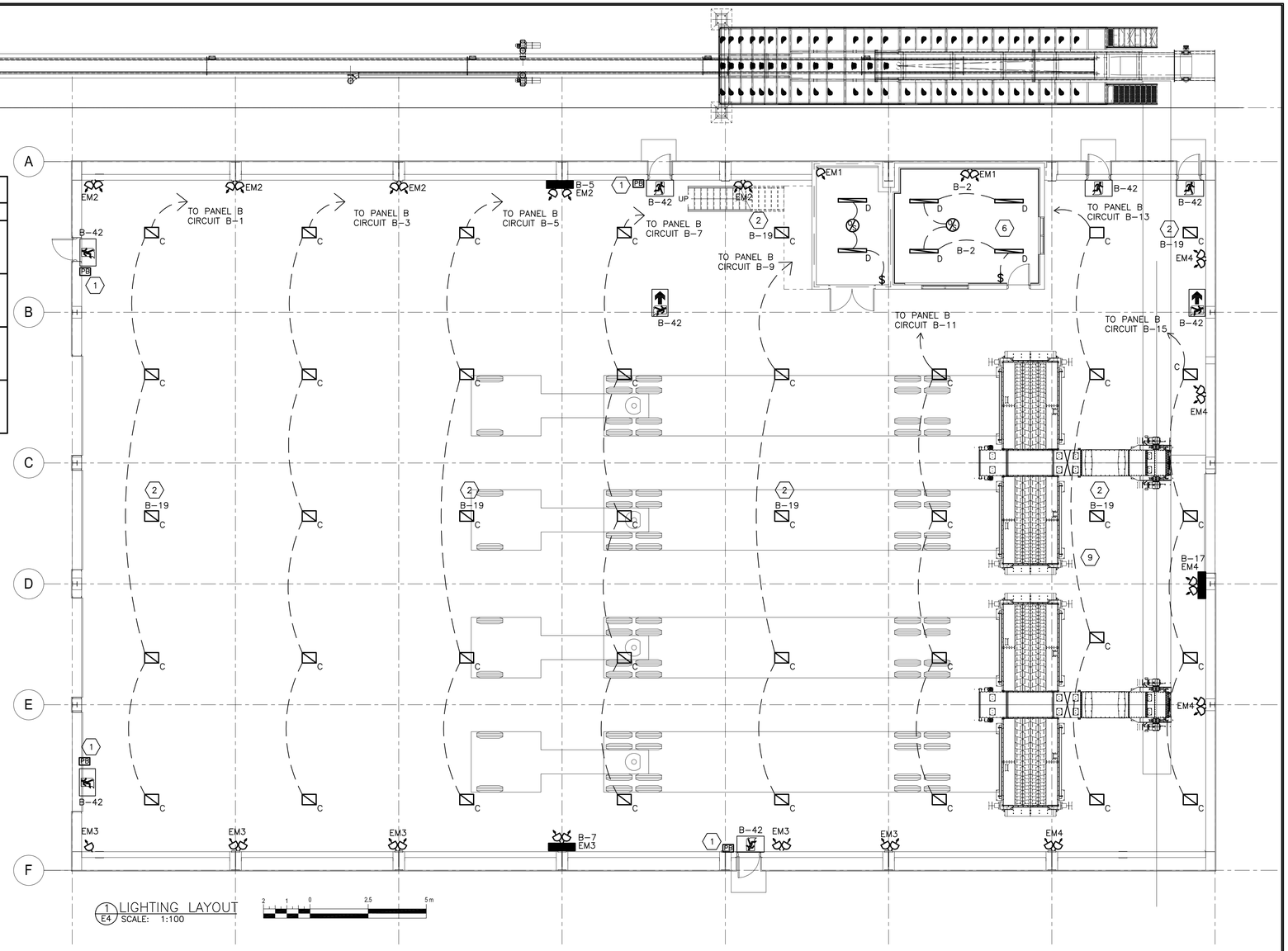
SYMBOL	DESCRIPTION	MANUFACTURER	MODEL No.
A	10 LED WALL MOUNTED FIXTURE WITH 14 INPUT WATTS, APPROXIMATELY 1450 LUMENS, 350 mA DRIVER, 4000K, TYPE II MEDIUM DISTRIBUTION, 120V C/W OCCUPANCY & AMBIENT LIGHT SENSOR, BLACK IN COLOUR.	LITHONIA	DSXW1LED-10C 350-40K-T2M-120-PIR-DBLXD
B	10 LED WALL MOUNTED FIXTURE WITH 27 INPUT WATTS, APPROXIMATELY 2800 LUMENS, 700 mA DRIVER, 4000K, FORWARD THROW MEDIUM DISTRIBUTION, 120V C/W OCCUPANCY & AMBIENT LIGHT SENSOR, WHITE IN COLOUR.	LITHONIA	DSXW1 LED-10C 700-40K-TFTM-120-PIRH-DBLXD
C	LED HIGHBAY FIXTURE WITH TEMPERED GLASS GASKETTED LENS, 212 INPUT WATTS, APPROXIMATELY 24,000 LUMENS, 4000K COLOUR TEMPERATURE, MEDIUM DISTRIBUTION, 120V, WHITE IN COLOUR, C/W 6' CORD WITH TWIST LOCK PLUG.	PHILIPS	HBX24L40-120-M-WT-WP6
D	4' LINEAR LED STRIP, 40W INPUT, 4000 LUMEN OUTPUT, 4000K COLOUR TEMPERATURE, SURFACE MOUNT OR CHAIN HANGERS, LED DRIVERS FOR 120VAC OPERATION.	PHILIPS	LF4FR3940U

4 / E3 LIGHTING SCHEDULE
SCALE: N.T.S.

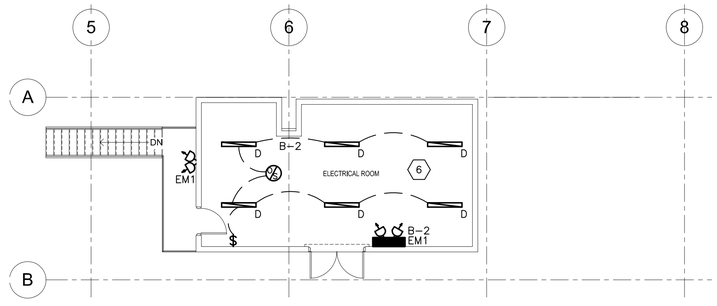
EMERGENCY LIGHTING & EXIT SCHEDULE

SYMBOL	DESCRIPTION	MANUFACTURER	MODEL No.
EMx	HEAVY DUTY INDUSTRIAL RATED EMERGENCY LIGHTING UNIT, 100W, 12VDC, 10 YEAR BATTERY, AUTO-TEST FEATURE, C/W 2 X 12V, 6W LED MR16 HEADS AND MOUNTING SHELF. WHITE FINISH. COLD WEATHER RATED.	LUMACELL OR APPROVED EQUAL	RG12S100DT2WPLD10AT
	DUAL REMOTE HEAD, 12VDC, 6W, MR16 LED, POLYCARBONATE FULLY GASKETED LENS. NEMA 4X RATED, WHITE FINISH. COLD WEATHER RATED.	LUMACELL OR APPROVED EQUAL	MQMP2NX-LD10
	SINGLE REMOTE HEAD, 12VDC, 6W, MR16 LED, POLYCARBONATE FULLY GASKETED LENS. NEMA 4X RATED, WHITE FINISH. COLD WEATHER RATED.	LUMACELL OR APPROVED EQUAL	MQMP1NX-LD10
	SELF POWERED RUNNING MAN EXIT SIGN, SINGLE FACE, ARROWS AS NOTED, LED LAMPS FOR 120VAC, NEMA 4X RATED, CSA-22.2 No.141-10 LISTED & CERTIFIED. COLD WEATHER RATED.	LUMACELL OR APPROVED EQUAL	LN SERIES

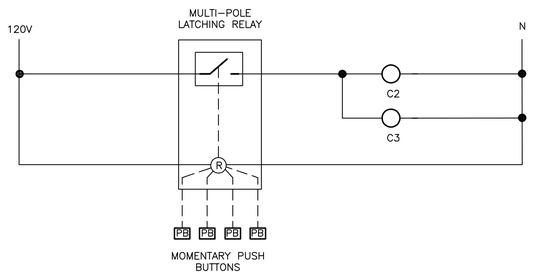
5 / E3 EMERGENCY LIGHTING SCHEDULE
SCALE: N.T.S.

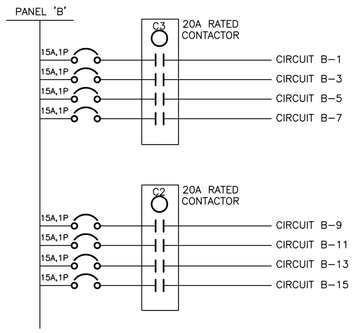


1 / E4 LIGHTING LAYOUT
SCALE: 1:100



2 / E4 ELECTRICAL ROOM LIGHTING LAYOUT
SCALE: 1:100





3 / E4 INTERIOR LIGHTING CONTROL DETAIL
SCALE: N.T.S.

LIGHTING LEGEND

$	SINGLE POLE SWITCH
OS	OCCUPANCY SENSOR ON/OFF TYPE
PB	ON/OFF PUSH BUTTON FOR CONTROL OF LIGHTING CONTACTOR.

NOTES:

1. HIGHBAY LIGHTING, EXCEPT WHERE NOTED, TO BE CONTROLLED BY A MULTI-POLE PERMANENT MAGNET LATCHING RELAY. MOMENTARY PUSH BUTTONS IN THE HIGHBAY AREA ARE TO SEND A CONTROL SIGNAL TO THE RELAY.
2. HIGHBAY FIXTURE TO BE UNSWITCHED AND REMAIN ON, INTENDED FOR 24HOUR USE.
3. VOLTAGE DROP FOR LIGHTING CIRCUITS TO BE KEPT BELOW 2%, WIRE SIZES FOR CIRCUITS SHOWN BELOW ARE BASED ON APPROXIMATE LENGTHS AND TO BE CONFIRMED AND VERIFIED ON SITE.

CIRCUIT	WIRE LENGTH	WIRE SIZE
B-1	200'	#6 AWG
B-3	167'	#8 AWG
B-5	145'	#8 AWG
B-7	130'	#8 AWG
B-9	110'	#10 AWG
B-11	100'	#10 AWG
B-13	110'	#10 AWG
B-15	115'	#10 AWG
B-19	160'	#8 AWG

4. HIGHBAY LIGHTING TO BE MOUNTED SUSPENDED FROM CEILING AT APPROXIMATELY 40' AFF. PROVIDE A TWIST LOCK RECEPTACLE AT THE CEILING FOR CONNECTION OF EACH HIGHBAY FIXTURE.
5. HIGHBAY LIGHTING DESIGNED TO PROVIDE AN AVERAGE OF APPROXIMATELY 45 FOOT CANDLES AT THE FLOOR.
6. LIGHTING IN TOOL ROOM AND ELECTRICAL ROOM TO BE MANUAL ON AND AUTOMATIC OFF AFTER 20 MINUTES OF VACANCY.
7. EXIT SIGNS TO BE MOUNTED ABOVE DOOR AT APPROX 8' AFF
8. EMERGENCY LIGHTING TO BE MOUNTED AT APPROX 15' AFF
9. CONTRACTOR TO SUPPLY AND INSTALL LIGHTING ON EQUIPMENT ACCESS PLATFORMS AS REQUIRED TO MEET DESIGN LUMEN REQUIREMENTS.

NO.	DESCRIPTION	DATE	BY
2	REVISED BUILDING LOCATION	FEB 28/17	MJM
1	ISSUED FOR CONSTRUCTION	SEPT 22/16	MJM
0	ISSUED FOR PERMIT	JUN 24/16	MJM

REVISIONS

REGISTERED PROFESSIONAL ENGINEER
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100208170
FEB 28/17
PROVINCE OF ONTARIO
ELECTRICAL

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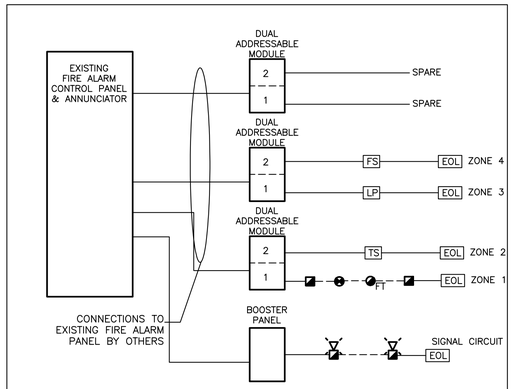
PROJECT
ST. MARY'S ALT FUEL BLDG

400 Waverley Rd South
Bowmanville, Ontario

TITLE
LIGHTING LAYOUT

DESIGN	MJM	SCALE	AS NOTED
DRAWN	MJM	DWG NO.	E3
CHECKED	IMK		
APPROVED	MJM		
PROJECT	5815		

CADD FILE NO. 5815E3.DWG



FIRE ALARM SYSTEM ZONE SCHEDULE

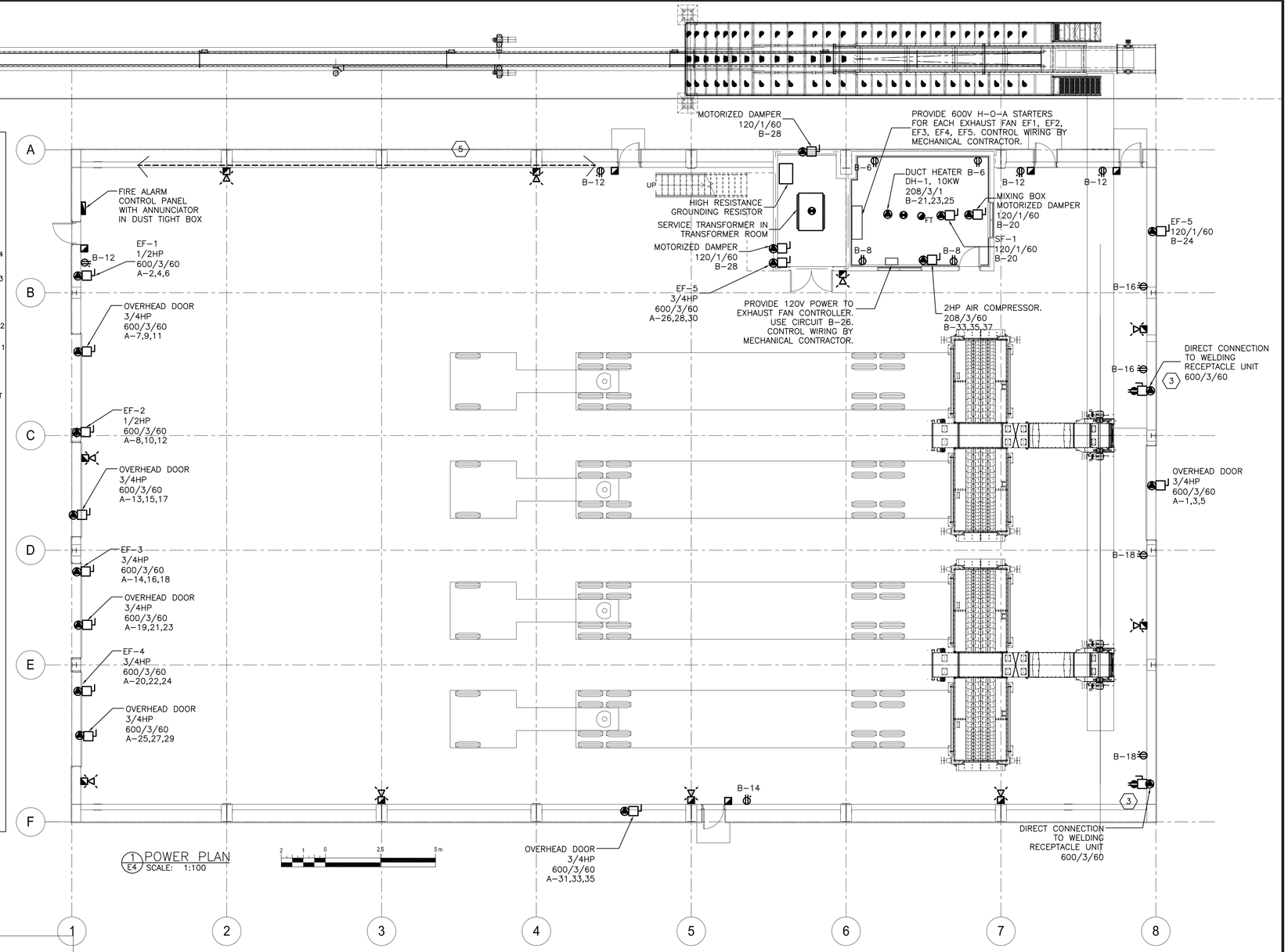
ZONE	TYPE	DESCRIPTION
1	ALARM	PULL STATIONS
2	TROUBLE	SPRINKLER SYSTEM TAMPER
3	TROUBLE	SPRINKLER SYSTEM LOW PRESSURE
4	ALARM	SPRINKLER SYSTEM FLOW

FIRE ALARM LEGEND	
	FIRE ALARM HORN/STROBE
	MANUAL PULL STATION
	SMOKE DETECTOR
FT	HEAT DETECTOR FIXED TEMP
FS	SPRINKLER FLOW SWITCH
TS	SPRINKLER TAMPER SWITCH
LP	SPRINKLER LOW PRESSURE

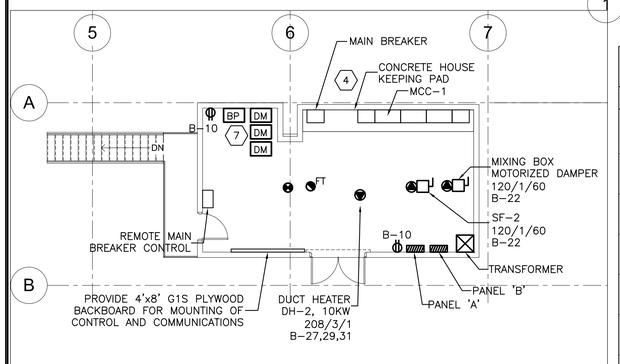
NOTES:

1. PROVIDE AND INSTALL FIRE ALARM FAULT ISOLATION MODULES WHEN ENTERING AND EXITING A FIRE ALARM ZONE ON A DATA COMMUNICATION LINK THAT SERVES FIRE ALARM DEVICES IN MORE THAT ONE ZONE IN ACCORDANCE WITH CAN/ULC-S524-06.
2. PROVIDE SIGNAL BOOSTER PANELS AS REQUIRED.
3. DASHED LINES ON RISER DIAGRAM INDICATE MORE DEVICES PRESENT THAN SHOWN. REFER TO FLOOR DRAWINGS FOR DEVICE COUNTS.
4. SPRINKLER DEVICES SHOWN FOR REFERENCE. ACTUAL SPRINKLER ZONES AND MONITORING DEVICES AND LOCATION TO BE COORDINATED WITH SPRINKLER SYSTEM DESIGNER. INCREASE NUMBER OF ZONES AS REQUIRED TO ACCOMMODATE ACTUAL INSTALLATION. PROVIDE SEPARATE TROUBLE ZONE INPUT FOR EACH MONITORED DEVICE.
5. ENSURE STROBES ARE SYNCHRONIZED THROUGHOUT FLOOR SPACES.

3/E4 FIRE ALARM RISER AND DETAILS
SCALE: N.T.S.



1/E4 POWER PLAN
SCALE: 1:100



2/E4 ELECTRICAL ROOM POWER PLAN
SCALE: 1:100

PANEL 'A'

600V, 3 PHASE, 3 WIRE, 225A BUS, 42 CIRCUIT, BOLT-ON BREAKERS 25KA IC

DESCRIPTION	LOAD	BKR	CCT		CCT	BKR	LOAD	DESCRIPTION
OVERHEAD DOOR	x	15A	1		2	15A	x	EXHAUST FAN EF-1
	x		3		4		x	
	x		5		6		x	
OVERHEAD DOOR	x	15A	7		8	15A	x	EXHAUST FAN EF-2
	x		9		10		x	
	x		11		12		x	
OVERHEAD DOOR	x	15A	13		14	15A	x	EXHAUST FAN EF-3
	x		15		16		x	
	x		17		18		x	
OVERHEAD DOOR	x	15A	19		20	15A	x	EXHAUST FAN EF-4
	x		21		22		x	
	x		23		24		x	
OVERHEAD DOOR	x	15A	25		26	15A	x	EXHAUST FAN EF-5
	x		27		28		x	
	x		29		30		x	
OVERHEAD DOOR	x	15A	31		32	x	x	x
	x		33		34	x	x	x
	x		35		36	x	x	x
x	x	x	37		38	x	x	x
x	x	x	39		40	x	x	x
x	x	x	41		42	x	x	x

PANEL 'B'

120/208V, 3 PHASE, 4 WIRE, 125A BUS, 42 CIRCUIT, BOLT-ON BREAKERS 25KA IC

DESCRIPTION	LOAD	BKR	CCT		CCT	BKR	LOAD	DESCRIPTION
HIGHBAY LIGHTING	x	15A	1		2	15A	x	TOOL RM/ELEC RM LIGHTS
HIGHBAY LIGHTING	x	15A	3		4	15A	x	EXTERIOR LIGHTS
HIGHBAY LIGHTING	x	15A	5		6	15A	x	TOOL ROOM REC
HIGHBAY LIGHTING	x	15A	7		8	15A	x	TOOL ROOM REC
HIGHBAY LIGHTING	x	15A	9		10	15A	x	ELECTRICAL ROOM REC
HIGHBAY LIGHTING	x	15A	11		12	15A	x	NORTH MAN-DOOR RECEPTACLES
HIGHBAY LIGHTING	x	15A	13		14	15A	x	SOUTH MAN-DOOR RECEPTACELS
HIGHBAY LIGHTING	x	15A	15		16	15A	x	EAST WALL REC (NORTH)
SPARE	x	15A	17		18	15A	x	EAST WALL REC (SOUTH)
HIGHBAY NIGHT LIGHTS	x	15A	19		20	15A	x	SUPPLY FAN SF-1 & MIXING BOX
	x		21		22	15A	x	SUPPLY FAN SF-2 & MIXING BOX
DUCT HEATER DH-1	x	40A	23		24	15A	x	EXHAUST FAN EF-5
	x		25		26	15A	x	FAN CONTROL PANEL
	x		27		28	15A	x	TRANSFORMER ROOM DAMPERS
DUCT HEATER DH-2	x	40A	29		30	15A	x	SPARE
	x		31		32	15A	x	SPARE
	x		33		34	15A	x	SPARE
AIR COMPRESSOR, 2HP	x	15A	35		36	15A	x	SPARE
	x		37		38	x	x	x
x	x	x	39		40	x	x	x
x	x	x	41		42	15A	x	EXIT LIGHTS

POWER LEGEND	
	120V, 15A DUPLEX RECEPTACLE IN WEATHER PROOF ENCLOSURE
	120V, 15A DUPLEX RECEPTACLE IN WEATHER PROOF ENCLOSURE MOUNTED AT NON STANDARD HEIGHT
	600V, WELDING RECEPTACLE
	DIRECT CONNECTION TO EQUIPMENT
	WEATHER PROOF DISCONNECT

FIRE ALARM LEGEND	
	FIRE ALARM HORN/STROBE
	MANUAL PULL STATION
	SMOKE DETECTOR
FT	HEAT DETECTOR FIXED TEMP
DM	FIRE ALARM DUAL ADDRESSABLE MODULE
BP	FIRE ALARM BOOSTER PANEL

NOTES:

1. CONTRACTOR RESPONSIBLE FOR ALL GENERAL POWER AND MECHANICAL EQUIPMENT POWER CONNECTIONS AS SHOWN ON DRAWINGS. CONNECTIONS FROM MCC TO PROCESS EQUIPMENT NOT INCLUDED IN SCOPE OF WORK.
2. ALL RECEPTACLES IN MAIN BUILDING AREA ARE TO BE MOUNTED AT 4' AFF. UNLESS NOTED OTHERWISE.
3. WELDING RECEPTACLES ARE TO BE A COMBINATION 60A FUSED DISCONNECT AND RECEPTACLE. HUBBLL PART NO. HBL460MIFS2W. WELDING RECEPTACLES ARE SUPPLIED FROM MCC-1
4. CONTRACTOR TO PROVIDE HOUSEKEEPING PAD FOR MCC, PAD TO BE TWICE THE LENGTH REQUIRED TO ACCOMMODATE FUTURE EQUIPMENT.
5. PROVIDE #2/0 BARE COPPER GROUNDING CONDUCTOR WIRE LOOP EMBEDDED IN BUILDING FOOTINGS. GROUNDING CONDUCTOR TO RUN ENTIRE PERIMETER OF BUILDING AND STUB OUT OF CONCRETE AND CONNECT TO BUILDING BEAMS AT EACH BEAM. CONDUCTOR TO BE CONNECTED TO BEAMS USING CAD WELD.
6. INSTALL FIRE ALARM SYSTEM DEVICES IN ACCORDANCE WITH A 'CONVENTIONAL' FIRE ALARM SYSTEM.
7. PROVIDE 3 DUAL ADDRESSABLE MODULES AND 1 BOOSTER PANEL. ALL ALARM INITIATING DEVICES ARE TO BE RUN BACK TO AN INPUT ON AN ADDRESSABLE MODULE (3 SPINKLER ZONES, 1 DEVICES ZONE, 1 SPARE ZONE). HORN STROBES ARE TO BE RUN BACK TO BOOSTER PANEL. CONNECTIONS OF MODULES AND BOOSTER PANEL TO EXISTING PLANT FIRE ALARM SYSTEM BY OTHERS.

NO.	DESCRIPTION	DATE	BY
2	REVISED BUILDING LOCATION	FEB 28/17	MJM
1	ISSUED FOR CONSTRUCTION	SEPT 22/16	MJM
0	ISSUED FOR PERMIT	JUN 24/16	MJM

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PROJECT
ST. MARY'S ALT FUEL BLDG

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TITLE
POWER PLAN & FIRE ALARM

DESIGN	MJM	SCALE	AS NOTED
DRAWN	MJM	DWG NO.	E4
CHECKED	IMK		
APPROVED	MJM		
PROJECT	5815		

CADD FILE NO. 5815E4.DWG

ELECTRICAL SPECIFICATIONS

1 GENERAL CONDITIONS

.1 DO ALL WORK IN ACCORDANCE WITH ONTARIO ELECTRICAL SAFETY CODE, CURRENT EDITION, BASED UPON THE CANADIAN ELECTRICAL CODE, PART I, CSA STANDARD C22.1, AND ALL BULLETINS TO DATE.
.2 THE QUALITY OF THE MATERIALS AND WORKMANSHIP SHALL BE ACCEPTABLE TO THE ARCHITECT, OWNER AND ENGINEER.

2 SCOPE OF WORK

.1 PROVIDE ALL MATERIALS EQUIPMENT AND LABOUR TO PROVIDE A COMPLETE OPERATING INSTALLATION AS DESIGNATED IN THIS SPECIFICATION AND AS INDICATED ON THE DRAWINGS EXCEPT WHERE OTHERWISE NOTED.
.2 THE SCOPE OF WORK INCLUDES, BUT IS NOT LIMITED TO, SUPPLY AND INSTALLATION OF THE FOLLOWING ITEMS:
.2.1 MAIN SERVICE
.2.2 POWER DISTRIBUTION.
.2.3 INTERIOR LIGHTING AND CONTROLS
.2.4 EXTERIOR BUILDING LIGHTING
.2.5 EMERGENCY LIGHTING AND EXIT SIGNAGE.
.2.6 FEEDERS AND OVER CURRENT PROTECTION FOR MECHANICAL EQUIPMENT.
.2.7 FIRE ALARM SYSTEM

3 EXAMINATION OF SITE

.1 PRIOR TO SUBMITTING TENDERS, THIS CONTRACTOR SHALL VISIT THE SITE TO DETERMINE ALL EXISTING CONDITIONS.
.2 ALLOW FOR ALL COSTS ASSOCIATED WITH COMPLETING THE WORK OF THIS DIVISION IN ACCORDANCE WITH EXISTING SITE AND BUILDING CONDITIONS.
.3 NO ALLOWANCE FOR EXTRA PAYMENTS TO THE CONTRACTOR WILL BE MADE BY THE OWNER FOR FAILING TO VISIT AND EXAMINE SITE CONDITIONS.

4 INSURANCE

MAINTAIN INSURANCE TO FULLY PROTECT THE OWNER, CONTRACTOR AND ENGINEER FROM ANY AND ALL CLAIMS UNDER THE WORKMEN'S COMPENSATION ACT. ALSO ALL INSURANCE AS NOTED WITHIN ARCHITECTURAL GENERAL CONDITIONS. POST PROJECT NOTIFICATION AT THE SITE IN ACCORDANCE WITH MINISTRY OF LABOUR REQUIREMENTS.

5 PERMITS, FEES AND INSPECTION

.1 SUBMIT TO ELECTRICAL SAFETY AUTHORITY NECESSARY NUMBER OF DRAWINGS AND SPECIFICATIONS FOR EXAMINATION AND APPROVAL PRIOR TO COMMENCEMENT OF WORK.
.2 PAY ASSOCIATED FEES, INCLUDING EQUIPMENT APPROVAL INSPECTION FEE.
.3 OWNER WILL PROVIDE DRAWINGS AND SPECIFICATIONS REQUIRED BY ELECTRICAL SAFETY AUTHORITY AT NO COST.
.4 NOTIFY ENGINEER OF CHANGES REQUIRED BY ELECTRICAL SAFETY AUTHORITY PRIOR TO MAKING CHANGES.
.5 FURNISH CERTIFICATES OF ACCEPTANCE FROM ELECTRICAL SAFETY AUTHORITY AND AUTHORITIES HAVING JURISDICTION OF COMPLETION OF WORK TO ENGINEER.

6 DRAWINGS

.1 PREPARE WITHOUT EXTRA COST, ANY LARGE SCALE INTERERENCE DRAWINGS WHICH MAY BE REQUIRED BY THE EXAMINING AUTHORITIES OR THE ENGINEER.
.2 PRIOR TO PROCEEDING WITH THE WORK; EXAMINE DRAWINGS BY OTHER TRADES INCLUDING ARCHITECTURAL AND MECHANICAL.
.3 WHERE DISCREPANCIES ARE NOTED BETWEEN THE DRAWINGS AND/OR SPECIFICATIONS, CONTACT ENGINEER FOR RESOLUTION BEFORE STARTING ON THAT PART OF THE WORK.

7 SHOP DRAWINGS AND PRODUCT DATA

.1 'SHOP DRAWINGS' MEANS DRAWINGS, DIAGRAMS, ILLUSTRATIONS, SCHEDULES, PERFORMANCE, CHARTS, BROCHURES, AND OTHER DATA WHICH ARE TO BE PROVIDED BY CONTRACTOR TO ILLUSTRATE DETAILS OF A PORTION OF THE WORK.
.2 INDICATE MATERIALS, METHODS OF CONSTRUCTION, AND ATTACHMENT OR ANCHORAGE, NECESSARY FOR COMPLETION OF WORK.
.3 ADJUSTMENTS MADE ON SHOP DRAWINGS BY OWNER OR ENGINEER ARE NOT INTENDED TO CHANGE CONTRACT PRICE.
.4 MAKE CHANGES IN SHOP DRAWINGS AS OWNER OR ENGINEER MAY REQUIRE.
.5 SUBMIT 6 COPIES OR 1 GOOD QUALITY DIGITAL COPY OF PRODUCT DATA SHEETS OR BROCHURES FOR LIGHTING FIXTURES, LIGHTING CONTROLS EMERGENCY LIGHTING, EXIT SIGNS, POWER DISTRIBUTION EQUIPMENT AND FIRE ALARM COMPONENTS.
.6 PROVIDE 2 MAINTENANCE MANUALS COMPLETE WITH WARRANTEE, CERTIFICATE OF INSPECTION BY ESA, FIRE ALARM VERIFICATION REPORT, AND COPY OF ALL PRODUCT LITERATURE AND MAINTENANCE INFORMATION.

8 AS BUILT DRAWINGS

MAINTAIN A SEPARATE SET OF WHITE PRINTS ON THE SITE AND NOTE ALL CHANGES AND DEVIATIONS FROM THE ORIGINAL DESIGN. TWO SETS OF THESE DRAWINGS SHOWING ALL AS-BUILT CONDITIONS SHALL BE FORWARDED TO THE ARCHITECT AT THE COMPLETION OF THIS CONTRACT AND BEFORE APPLYING FOR FINAL PAYMENT.

9 REVISIONS AND EXTRAS

ADDITIONAL MONEY OVER THE CONTRACT PRICE SHALL NOT BE PAID UNLESS AN APPROVED CHANGE ORDER IS ISSUED BY THE ARCHITECT. CLAIMS FOR EXTRAS SHALL BE SUBMITTED WITH A COMPLETE BREAKDOWN OF MATERIAL, LABOUR , HOURLY RATES, ETC.

10 CUTTING AND PATCHING

ELECTRICAL CONTRACTOR SHALL PERFORM ALL CUTTING AND PATCHING REQUIRED FOR THE WORK OF THIS DIVISION. CUTTING AND DRILLING SHALL BE PERFORMED IN A MANNER SO AS TO CAUSE LITTLE DAMAGE AS POSSIBLE. ELECTRICAL CONTRACTOR SHALL BE RESPONSIBLE AND PAY FOR ANY DAMAGE CAUSED TO THE BUILDING BY WORK OF THIS DIVISION.

11 CUTTING AND PATCHING

ELECTRICAL CONTRACTOR SHALL PERFORM ALL CUTTING AND PATCHING REQUIRED FOR THE WORK OF THIS DIVISION. CUTTING AND DRILLING SHALL BE PERFORMED IN A MANNER SO AS TO CAUSE LITTLE DAMAGE AS POSSIBLE. ELECTRICAL CONTRACTOR SHALL BE RESPONSIBLE AND PAY FOR ANY DAMAGE CAUSED TO THE BUILDING BY WORK OF THIS DIVISION.

12 RESPONSIBILITY

BE RESPONSIBLE FOR ELECTRICAL WORK UNTIL THE COMPLETION AND FINAL ACCEPTANCE, FOR REPLACING ANY ITEM THAT MAY BE DEFECTIVE, DAMAGED, LOST OR STOLEN WITHOUT ADDITIONAL COST TO THE OWNER OR DELAY TO THE COMPLETION OF THE PROJECT.

13 SUPPORTS AND HANGERS

PROVIDE STRUCTURAL SUPPORTS HANGERS BRACKETS AND INSERTS REQUIRED FOR INSTALLATION OF EQUIPMENT AND CONDUIT. PROVIDE CONDUIT FOR ALL SERVICES PENETRATING THE FLOOR SLAB. SEAL ALL PENETRATIONS THROUGH FIRE WALLS AND FLOOR SLABS WITH AN APPROVED NON-SHRINK, FIREPROOF AND WATERPROOF FIRESTOPPING MATERIAL APPROVED BY THE ARCHITECT.

14 EQUIPMENT AND MATERIAL

ALL MATERIALS USED THROUGHOUT SHALL BE NEW, C.S.A. APPROVED AND OF ONE MANUFACTURE FOR LIKE EQUIPMENT. OBTAIN AND PAY FOR SPECIAL ELECTRICAL SAFETY AUTHORITY INSPECTION OF SPECIFIED NON-C.S.A. ELECTRICAL EQUIPMENT.

15 CARE, OPERATION AND STARTUP

.1 PRIOR TO FINAL INSPECTION DEMONSTRATE OPERATION OF EACH SYSTEM TO OWNER AND ENGINEER.
.2 INSTRUCT PERSONNEL IN OPERATION ADJUSTMENT AND MAINTENANCE OF EQUIPMENT AND SYSTEMS, USING PROVIDED OPERATION AND MAINTENANCE DATA AS BASIS FOR INSTRUCTION.

16 CO-ORDINATION

CO-ORDINATE WITH OTHER TRADES, INCLUDING MECHANICAL SYSTEMS, SO AS NOT TO INTERFERE WITH THE WORK OR SCHEDULE OF OTHER TRADES.

17 IDENTIFICATION

PROVIDE LAMACOID NAMEPLATES AND TYPEWRITTEN DIRECTORIES FOR ALL NEW PANELS.

18 WARRANTY

UPON COMPLETION OF THE WORK, PROVIDE A WRITTEN ONE YEAR GUARANTEE COVERING MATERIALS AND WORKMANSHIP. REPAIR OR REPLACE, WITHOUT COST TO THE OWNER, ANY DEFECTS IN WORKMANSHIP OR MATERIALS WHICH IN THE OPINION OF THE OWNER, ARE NOT DUE TO MISUSE OR NEGLECT.

19 CONDUITS

.1 TECK90 CABLE OR RIGID GALVANIZED STEEL CONDUIT TO BE USED WHERE SUBJECT TO MECHANICAL DAMAGE.
.2 TECK90 CABLE IS PREFERRED THROUGHOUT INSTALLATION.
.3 RIGID PVC CONDUIT OR TECK90 WHERE EMBEDDED IN CONCRETE OR BELOW GRADE.
.4 FOR UNDERGROUND CONDUITS, SLOPE CONDUITS TO PROVIDE DRAINAGE.
.5 FLEXIBLE ALUMINUM CONDUIT WITH WEATHERPROOF COVERING TO BE USED WHERE SUBJECT TO VIBRATION OR STRAIN RELIEF.
.6 INSTALL CONDUITS TO CONSERVE HEADROOM IN EXPOSED LOCATIONS AND CAUSE MINIMUM INTERFERENCE IN SPACES THROUGH WHICH THEY PASS.
.7 MINIMUM CONDUIT SIZE FOR LIGHTING AND POWER CIRCUITS SHALL BE 1/2".
.8 BEND CONDUIT COLD. REPLACE IF KINKED OR FLATTENED MORE THAN 1/10TH OF ITS ORIGINAL DIAMETER.
.9 MECHANICALLY BEND STEEL CONDUIT OVER 3/4" DIA.
.10 FIELD THREADS ON RIGID CONDUIT MUST BE OF SUFFICIENT LENGTH TO DRAW CONDUITS UP TIGHT.
.11 INSTALL FISH CORD IN EMPTY CONDUITS.
.12 REMOVE AND REPLACE BLOCKED CONDUIT SECTIONS.
.13 DRY CONDUITS OUT BEFORE INSTALLING WIRE.
.14 RUN CONDUITS PARALLEL OR PERPENDICULAR TO BUILDING LINES.
.15 GROUP CONDUITS WHEREVER POSSIBLE ON SUSPENDED OR SURFACE CHANNELS.
.16 DO NOT PASS CONDUITS THROUGH STRUCTURAL MEMBERS EXCEPT AS INDICATED.
.17 FOR CONDUITS IN CAST-IN-PLACE CONCRETE, LOCATE TO SUIT REINFORCING STEEL. INSTALL IN CENTRE ONE THIRD OF SLAB.
.18 PROTECT CONDUITS FROM DAMAGE WHERE THEY STUB OUT OF CONCRETE.
.19 INSTALL SLEEVES WHERE CONDUITS PASS THROUGH SLAB OR WALL.
.20 PROVIDE OVERSIZED SLEEVE FOR CONDUITS PASSING THROUGH WATERPROOF MEMBRANE, BEFORE MEMBRANE IS INSTALLED. USE COLD MASTIC BETWEEN SLEEVE AND CONDUIT.
.21 DO NOT PLACE CONDUITS IS SLABS IN WHICH SLAB THICKNESS IS LESS THAN 4 TIMES CONDUIT DIAMETER.
.22 FOR CONDUITS IN CAST-IN-PLACE CONCRETE, ENCASE CONDUITS COMPLETELY IN CONCRETE COVER AND ORGANIZE CONDUITS IN SLAB TO MINIMIZE CROSS-OVERS.
.23 FOR CONDUITS IN CAST-IN-PLACE SLABS ON GRADE RUN CONDUITS 25mm AND LARGER BELOW SLAB AND ENCASED IN 75mm CONCRETE ENVELOPE. PROVIDE 50mm OF SAND OVER CONCRETE ENVELOPE BELOW FLOOR SLAB.

20 SPLITTERS, JUNCTION, PULL BOXES AND CABINETS

.1 INSTALL SPLITTERS AND MOUNT PLUMB, TRUE AND SQUARE TO THE BUILDING LINES.
.2 EXTEND SPLITTERS FULL LENGTH OF EQUIPMENT ARRANGEMENT EXCEPT WHERE INDICATED OTHERWISE.
.3 INSTALL PULL BOXES IN INCONSPICUOUS BUT ACCESSIBLE LOCATIONS.
.4 MOUNT CABINETS WITH NO OVERCURRENT DEVICE OPERATING HANDLE MORE THAN 1.7m ABOVE FINISHED FLOOR.
.5 INSTALL PULL BOXES SO AS NOT TO EXCEED 30m OF CONDUIT RUN BETWEEN PULL BOXES.
.6 SUPPORT PULL BOXES INDEPENDENTLY OF CONDUIT.
.7 BOXES INSTALLED OUTDOORS SHALL BE WEATHERPROOF COMPLETE WITH GASKET.

21. INSTALLATION OF OUTLETS

.1 THE DRAWINGS SHOW APPROXIMATE LOCATION OF OUTLETS, EXACT LOCATION SHALL BE COORDINATED ON THE SITE WITH OTHER TRADES, ARCHITECTURAL DRAWINGS, ETC. OUTLETS INACCURATELY LOCATED SHALL BE READJUSTED OR RELOCATED. THE CONTRACTOR'S EXPENSE.
.2 RACEWAYS SHALL BE EMT UNLESS OTHERWISE NOTED.
.3 MANUAL PULL STATION (47") 1200mm ABOVE FLOOR.

22. MECHANICAL EQUIPMENT

.1 PROVIDE ALL CONDUIT, WIRING, SPLITTERS, OUTLET BOXES AND DISCONNECT SWITCHES AS SHOWN. ALL MOTORS, STARTERS AND CONTROL WIRING PROVIDED UNDER DIVISION 15 UNLESS OTHERWISE NOTED. INSTALL ALL STARTERS AND WIRE COMPLETE. ALL EXTERIOR DISCONNECTS TO BE RAINTIGHT.
.2 THE ELECTRICAL CONTRACTOR SHALL VERIFY ALL MOTOR CONNECTION FOR PROPER PHASE ROTATION, WHERE APPLICABLE.

23 WIRE AND CABLE

.1 MINIMUM SIZE OF CONDUCTORS SHALL BE #12 AWG.
.2 CONDUCTORS SHALL BE COPPER, SIZED AS INDICATED, WITH 600V INSULATION OF CROSS LINKED THERMOSETTING POLYETHYLENE MATERIAL RW90-XLPE.
.3 SIZE OF WIRING FOR BRANCH CIRCUITS GREATER THAN 30m IN LENGTH SHALL BE #10 AWG UNLESS OTHERWISE INDICATED ON THE PLANS.
.4 WIRES TO BE COLOURED AS FOLLOWS:

12V DC BLUE
120V AC NEUTRAL WHITE
120V AC SWITCHED BLACK OR RED
120V AC LINE BLACK.
347/600V LINE BLACK OR RED

.5 USE MATERIALS AND METHODS APPROVED BY THE ONTARIO ELECTRICAL SAFETY CODE FOR USE IN NON-COMBUSTIBLE CONSTRUCTION.
.6 ARMOURED CABLE TYPE AC90 (BX) WITH INTERLOCKING ARMOUR FABRICATED FROM ALUMINUM STRIP C/W COPPER INSULATED CONDUCTORS, SIZE AS INDICATED, TO BE USED IN CONCEALED WALL AND CEILING CAVITIES.

24 GROUNDING

.1 INSTALL COMPLETE PERMANENT, CONTINUOUS GROUNDING SYSTEM INCLUDING, ELECTRODES, CONDUCTORS, CONNECTORS, ACCESSORIES AS INDICATED TO CONFORM TO REQUIREMENTS OF ESA, ENGINEER, AND LOCAL AUTHORITY HAVING JURISDICTION OVER THE INSTALLATION. WHERE EMT IS USED, RUN BOND WIRE IN CONDUIT.
.2 INSTALL CONNECTORS IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.
.3 PROTECT EXPOSED GROUNDING CONDUCTORS FROM MECHANICAL INJURY.
.4 MAKE BURIED CONNECTIONS, AND CONNECTIONS TO ELECTRODES, USING COPPER CAD WELDING PROCESS CONNECTORS.
.5 USE MECHANICAL CONNECTORS FOR GROUNDING CONNECTIONS TO EQUIPMENT PROVIDED WITH LUGS.
.6 SOLDERED JOINTS NOT PERMITTED.
.7 INSTALL BONDING WIRE FOR FLEXIBLE CONDUIT, CONNECTED AT BOTH ENDS TO GROUNDING BUSHING, SOLDERLESS LUG, CLAMP OR CUP WASHER AND SCREW.

25 DISCONNECT SWITCHES

.1 FUSIBLE, AND NON-FUSIBLE, DISCONNECT SWITCH SWITCHES IN ENCLOSURE, SIZE AS INDICATED.
.2 PROVISION FOR PADLOCKING IN OFF SWITCH POSITION BY THREE LOCKS.
.3 MECHANICALLY INTERLOCKED DOOR TO PREVENT OPENING WHEN HANDLE IN ON POSITION.
.4 FUSES: SIZE AS INDICATED. PROVIDE THREE SPARE FUSES OF EACH TYPE AND SIZE INSTALLED ABOVE 600A AND SIX SPARE FUSES OF EACH TYPE AND SIZE INSTALLED UP TO AND INCLUDING 600A. PROVIDE SUITABLE SIZED CABINET TO STORE SPARE FUSES.
.5 FUSEHOLDERS: SUITABLE WITHOUT ADAPTORS, FOR TYPE AND SIZE OF FUSE INDICATED.
.6 QUICK-MAKE, QUICK-BREAK ACTION.
.7 ON-OFF SWITCH POSITION INDICATION ON SWITCH ENCLOSURE COVER.
.8 ENCLOSURES SHALL BE RATED EEMAC 1 EXCEPT FOR WEATHERPROOF ENCLOSURES WHICH SHALL BE EEMAC 3.

26 PANEL BOARDS

.1 PANELBOARDS SHALL BE THE PRODUCT OF ONE MANUFACTURER. SIEMENS, CUTLER HAMMER AND SCHNEIDER ARE ACCEPTABLE.
.2 INSTALL CIRCUIT BREAKERS IN PANELBOARDS BEFORE SHIPMENT.
.3 SEQUENCE PHASE BUSSING WITH ODD NUMBER BREAKERS ON LEFT AND EVEN ON RIGHT, WITH EACH BREAKER IDENTIFIED BY PERMANENT NUMBER IDENTIFICATION AS TO CIRCUIT NUMBER AND PHASE.
.4 PANELBOARDS: MAINS, NUMBER OF CIRCUITS, AND NUMBER AND SIZE OF BRANCH CIRCUIT BREAKERS AS INDICATED ON DRAWINGS.
.5 TWO KEYS FOR EACH PANELBOARD AND KEY PANELBOARDS ALIKE.
.6 ALUMINUM OR COPPER BUS WITH NEUTRAL OF SAME AMPERE RATING AS MAINS.
.7 MAINS: SUITABLE FOR BOLT-ON BREAKERS.
.8 TRIM WITH CONCEALED FRONT BOLTS AND HINGES.
.9 TRIM AND DOOR FINISH: BAKED GREY ENAMEL.
.10 TWO AND THREE POLE BREAKER OPERATION SHALL BE BY MEANS OF A COMMON TRIP AND A SINGLE HANDLE. A TIE HANDLE CONNECTING TWO OR THREE SINGLE POLE BREAKERS WILL NOT BE ACCEPTED.

27 ELECTRIC MOTORS EQUIPMENT AND CONTROLS

.1 CONTROL WIRING AND CONDUIT IS SPECIFIED BY ELECTRICAL EXCEPT FOR CONDUIT, WIRING AND CONNECTIONS BELOW 50V WHICH ARE RELATED TO CONTROL SYSTEMS SPECIFIED BY MECHANICAL AND SHOWN ON MECHANICAL DRAWINGS.
.2 ELECTRICAL SHALL CHECK ALL MOTOR CONNECTION FOR CORRECT PHASE ROTATION, WHERE APPLICABLE.

28 LIGHTING FIXTURES

.1 PROVIDE LIGHT FIXTURES AS SHOWN ON LIGHTING SCHEDULE ON THE DRAWINGS. ENSURE THAT ALL EQUIPMENT IS EQUAL TO THE PRODUCTS SPECIFIED IN ALL RESPECTS.
.2 LOCATE AND INSTALL LUMINAIRES AS INDICATED.
.3 JUNCTION BOXES IN SUSPENDED CEILING SPACES SHALL BE ACCESSIBLE THROUGH THE FIXTURES OR BY REMOVABLE CEILING.
.4 FOR SUSPENDED CEILING INSTALLATIONS SUPPORT LUMINAIRES INDEPENDENTLY OF CEILING BY AIRCRAFT CABLE
.5 ALIGN LUMINAIRES MOUNTED INDIVIDUALLY PARALLEL OR PENDICULAR TO BUILDING GRID.
.6 ALL FIXTURE LIGHT SOURCES SHALL BE 4000K WITH A MINIMUM CRI OF 80.

29 EQUIPMENT FOR EMERGENCY LIGHTING

.1 SUPPLY VOLTAGE: 120V AC
.2 OUTPUT VOLTAGE: 12V DC
.3 OPERATIONS TIME: 30 MINUTES MINIMUM
.4 CABINET: SUITABLE FOR DIRECT OR SHELF MOUNTING TO WALL C/W KNOCKOUTS FOR CONDUIT, REMOVABLE OR HINGED FRONT PANEL FOR EASY ACCESS TO BATTERIES.

30. FIRE ALARM

.1 PROVIDE ALL MATERIAL EQUIPMENT AND LABOUR REQUIRED FOR A COMPLETE AND ADEQUATE INSTALLATION OF THE CONVENTIONAL FIRE ALARM SYSTEM AS SHOWN ON THE DRAWINGS AND AS DESCRIBED HEREIN.
.2 SHOP DRAWINGS FOR THE COMPLETE SYSTEM, INCLUDING LAYOUT OF EQUIPMENT, ZONING AND COMPLETE WIRING DIAGRAMS FOR CONNECTIONS AND DEVICES, AND METHODS OR OPERATION SHALL BE SUBMITTED.
.3 ALL COMPONENTS OF THE SYSTEM, ITS INSTALLATION AND THE SYSTEM AS A WHOLE SHALL BE ULC LISTED AND LABELED AND SHALL MEET THE REQUIREMENTS OF ALL AUTHORITIES HAVING JURISDICTION OF THE APPLICATION. THE ENTIRE INSTALLATION SHALL BE CARRIED OUT IN ACCORDANCE WITH CAN. ULC S524 AND SHALL BE VERIFIED IN ACCORDANCE WITH CAN. ULC S537.
.4 BREAKER FOR FIRE ALARM CONTROL PANEL AND BOOSTER PANELS TO BE LOCKABLE AND CLEARLY IDENTIFIED BY PAINTING IT RED.
.5 PROVIDE SEPARATE CIRCUITS FROM CONTROL PANEL TO EACH ZONE OF INITIATING DEVICES OR IF A SINGLE LOOP ENSURE ISOLATION MODULES ARE INSTALLED AS REQUIRED BY CODE.
.6 SINGLE STAGE OPERATION.
.7 ACTUATION OF ANY SINGLE OPERATION DEVICE TO INITIATE BUILDING EVACUATION ALARM DEVICES TO OPERATE IN TEMPORAL CODE. CONFIRM WITH LOCAL AUTHORITY.
.8 ZONE OF ALARM DEVICE TO BE INDICATED ON CONTROL PANEL.
.9 POWER SUPPLY IS 120VAC, 60Hz INPUT, 24VDC OUTPUT FROM RECTIFIER TO OPERATE ALARM AND SIGNAL CIRCUITS WITH STANDBY POWER GELL CELL BATTERIES. MINIMUM EXPECTED LIFE OF FOUR YEARS, SIZED IN ACCORDANCE WITH OBC.
.10 PROVIDE FIRE ALARM SYSTEM RISER DIAGRAM IN CONTROL PANEL.
.11 ARRANGE AND PAY FOR ON-SITE LECTURE AND DEMONSTRATION BY FIRE ALARM EQUIPMENT MANUFACTURER TO TRAIN OPERATIONAL PERSONNEL IN USE AND MAINTENANCE OF FIRE ALARM SYSTEM.
.12 COORDINATE WITH MANUFACTURER TO PROVIDE STROBE LIGHT SYNCHRONIZATION MODULES AS REQUIRED.
.13 PROVIDE SUFFICIENT OUTPUT MODULES IN FIRE ALARM CONTROL PANEL.
.14 PROVIDE OUTPUT POWER BOOSTERS AS REQUIRED. COORDINATE WITH MANUFACTURER.
.15 ALL FIRE ALARM JUNCTION BOXES SHALL BE PAINTED RED.
.16 FIRE ALARM SYSTEM AND COMPONENTS TO BE MIRCOM AND COMPATIBLE WITH THE EXISTING MIRCOM FIRE ALARM CONTROL PANEL AND SYSTEM.

NO.	DESCRIPTION	DATE	BY
2	REVISED BUILDING LOCATION	FEB 28/17	MJM
1	ISSUED FOR CONSTRUCTION	SEPT 22/16	MJM
0	ISSUED FOR PERMIT	JUN 24/16	MJM

REVISIONS

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100208170
FEB 28/17
PROVINCE OF ONTARIO
ELECTRICAL

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PROJECT
ST. MARY'S ALT FUEL BLDG

400 Waverley Rd South
Bowmanville, Ontario

TITLE
SPECIFICATIONS

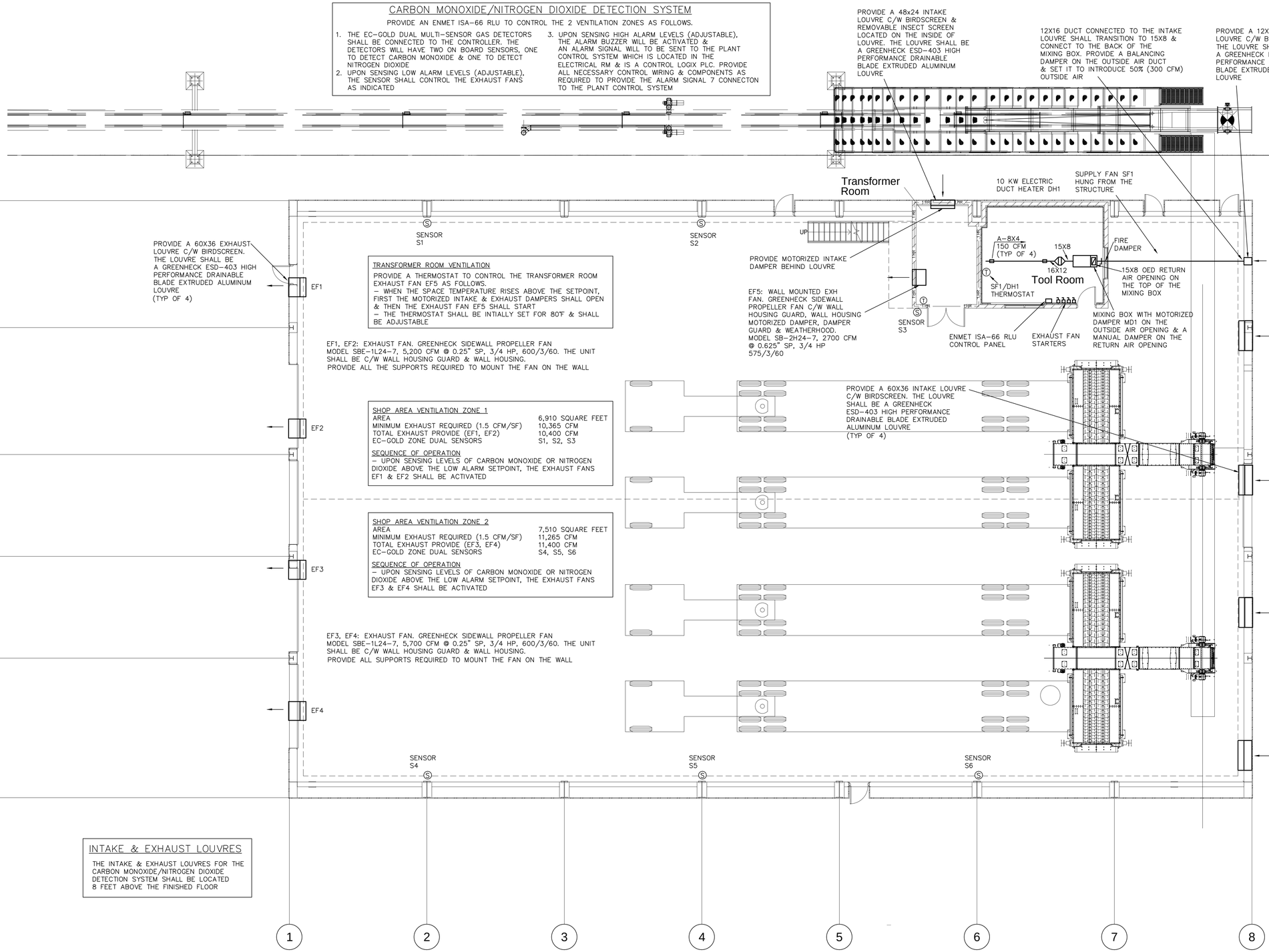
DESIGN	MJM	SCALE	AS NOTED
DRAWN	MJM	DWG NO.	E5
CHECKED	IMK		
APPROVED	MJM		
PROJECT	5815		

CADD FILE NO. 5815E5.DWG

CARBON MONOXIDE/NITROGEN DIOXIDE DETECTION SYSTEM

PROVIDE AN ENMET ISA-66 RLU TO CONTROL THE 2 VENTILATION ZONES AS FOLLOWS.

1. THE EC-GOLD DUAL MULTI-SENSOR GAS DETECTORS SHALL BE CONNECTED TO THE CONTROLLER. THE DETECTORS WILL HAVE TWO ON BOARD SENSORS, ONE TO DETECT CARBON MONOXIDE & ONE TO DETECT NITROGEN DIOXIDE
2. UPON SENSING LOW ALARM LEVELS (ADJUSTABLE), THE SENSOR SHALL CONTROL THE EXHAUST FANS AS INDICATED
3. UPON SENSING HIGH ALARM LEVELS (ADJUSTABLE), THE ALARM BUZZER WILL BE ACTIVATED & AN ALARM SIGNAL WILL TO BE SENT TO THE PLANT CONTROL SYSTEM WHICH IS LOCATED IN THE ELECTRICAL RM & IS A CONTROL LOGIX PLC. PROVIDE ALL NECESSARY CONTROL WIRING & COMPONENTS AS REQUIRED TO PROVIDE THE ALARM SIGNAL 7 CONNECTON TO THE PLANT CONTROL SYSTEM



TRANSFORMER ROOM VENTILATION

PROVIDE A THERMOSTAT TO CONTROL THE TRANSFORMER ROOM EXHAUST FAN EF5 AS FOLLOWS.
- WHEN THE SPACE TEMPERATURE RISES ABOVE THE SETPOINT, FIRST THE MOTORIZED INTAKE & EXHAUST DAMPERS SHALL OPEN & THEN THE EXHAUST FAN EF5 SHALL START
- THE THERMOSTAT SHALL BE INTIALLY SET FOR 80°F & SHALL BE ADJUSTABLE

EF1, EF2: EXHAUST FAN. GREENHECK SIDEWALL PROPELLER FAN MODEL SBE-1L24-7, 5,200 CFM @ 0.25" SP, 3/4 HP, 600/3/60. THE UNIT SHALL BE C/W WALL HOUSING GUARD & WALL HOUSING.
PROVIDE ALL THE SUPPORTS REQUIRED TO MOUNT THE FAN ON THE WALL

SHOP AREA VENTILATION ZONE 1

AREA	6,910 SQUARE FEET
MINIMUM EXHAUST REQUIRED (1.5 CFM/SF)	10,365 CFM
TOTAL EXHAUST PROVIDE (EF1, EF2)	10,400 CFM
EC-GOLD ZONE DUAL SENSORS	S1, S2, S3

SEQUENCE OF OPERATION
- UPON SENSING LEVELS OF CARBON MONOXIDE OR NITROGEN DIOXIDE ABOVE THE LOW ALARM SETPOINT, THE EXHAUST FANS EF1 & EF2 SHALL BE ACTIVATED

SHOP AREA VENTILATION ZONE 2

AREA	7,510 SQUARE FEET
MINIMUM EXHAUST REQUIRED (1.5 CFM/SF)	11,265 CFM
TOTAL EXHAUST PROVIDE (EF3, EF4)	11,400 CFM
EC-GOLD ZONE DUAL SENSORS	S4, S5, S6

SEQUENCE OF OPERATION
- UPON SENSING LEVELS OF CARBON MONOXIDE OR NITROGEN DIOXIDE ABOVE THE LOW ALARM SETPOINT, THE EXHAUST FANS EF3 & EF4 SHALL BE ACTIVATED

EF3, EF4: EXHAUST FAN. GREENHECK SIDEWALL PROPELLER FAN MODEL SBE-1L24-7, 5,700 CFM @ 0.25" SP, 3/4 HP, 600/3/60. THE UNIT SHALL BE C/W WALL HOUSING GUARD & WALL HOUSING.
PROVIDE ALL SUPPORTS REQUIRED TO MOUNT THE FAN ON THE WALL

INTAKE & EXHAUST LOUVRES

THE INTAKE & EXHAUST LOUVRES FOR THE CARBON MONOXIDE/NITROGEN DIOXIDE DETECTION SYSTEM SHALL BE LOCATED 8 FEET ABOVE THE FINISHED FLOOR

This drawing shall not be used for construction purposes unless countersigned by:

JOHN FREDERICK

peak engineering & construction ltd

Revision		Date
5	TRANSFORMER RM ADDED	FEB 28/17
4	REVISED BLDG LOCATION	FEB 8/17
3	ISSUED FOR CONSTRUCTION	SEP 22/16
2	ISSUED FOR BUILDING PERMIT	JUL 7/16
1	ISSUED FOR REVIEW/PERMIT	JUN 11/16

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J. FREDERICK 1635 LICENCE OF ONTARIO

CONSTRUCTION NORTH

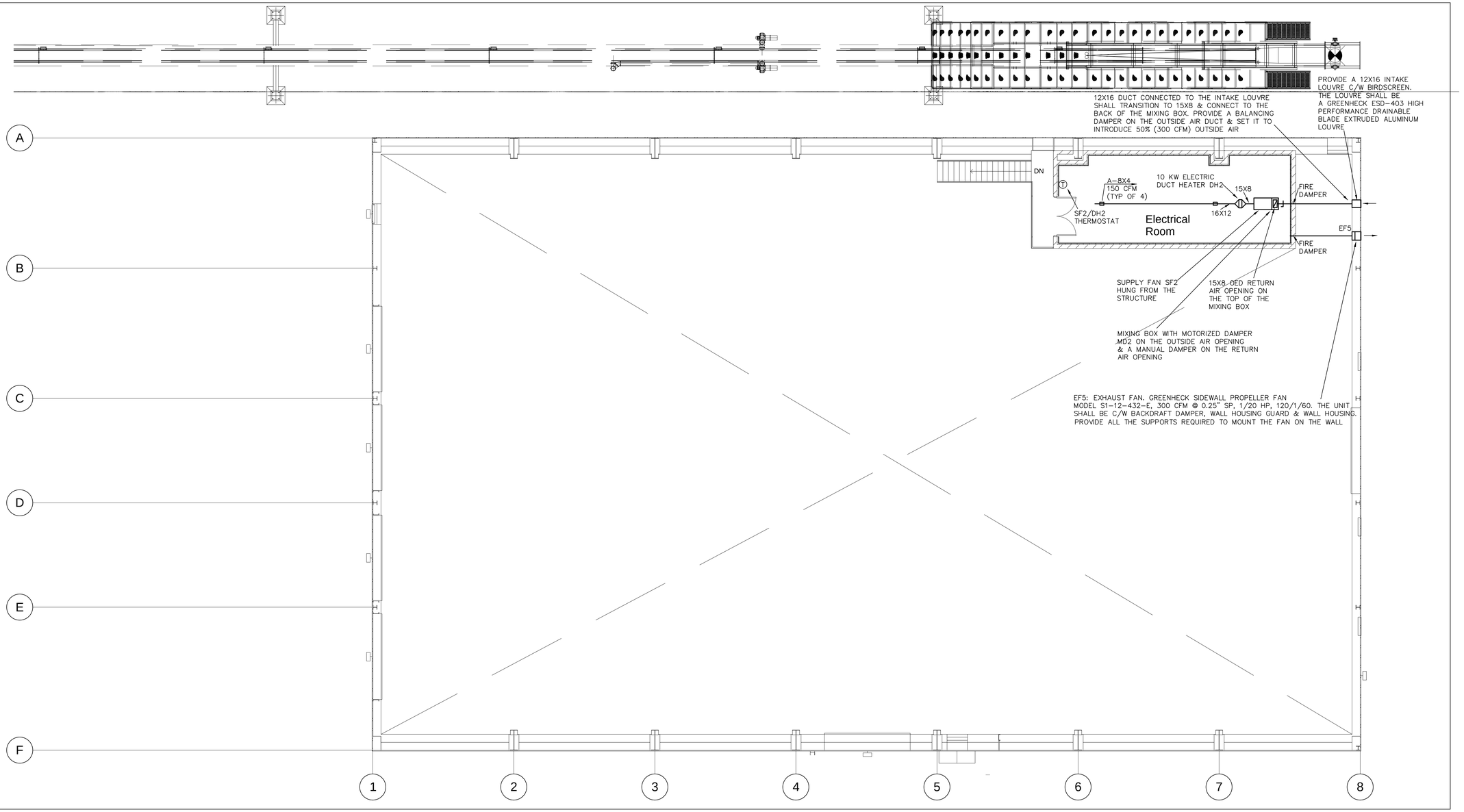
ST. MARYS ALT. FUEL BUILDING

400 WAVERLEY RD. S., MUNICIPALITY OF CLARINGTON

LEVEL 1 MECHANICAL

Project No.:	1635
Scale:	1:100
Date:	JUNE 2016
Drawn by:	JF
Checked by:	JF

M1



MECHANICAL SPECIFICATIONS

1. GENERAL
1.1 PROVIDE ALL LABOUR, MATERIAL, TRANSPORTATION AND WORKING EQUIPMENT TO COMPLETE THE WORK AS INDICATED.
1.2 EXAMINE THE SITE, EXISTING EQUIPMENT AND LOCAL CONDITIONS AFFECTING THE WORK. NO ALLOWANCE WILL BE MADE SUBSEQUENTLY FOR CONSIDERATIONS OVERLOOKED. MAKE ALLOWANCES FOR ADDITIONAL MATERIALS AND LABOUR AS REQUIRED TO RE–ROUTE EXISTING AND/OR NEW SERVICES TO SUIT SITE CONDITIONS.
1.3 IT IS NOT INTENDED THAT THE SPECIFICATION OR THE DRAWING SHOW EVERY DETAIL. THE CONTRACTOR SHALL PRODUCE INTERFERENCE AND INSTALLATION SHOP DRAWINGS SHOULD THEY BE REQUIRED.
1.4 THE WORD 'PROVIDE' MEANS 'SUPPLY, INSTALL AND CONNECT'.
1.5 CARRY OUT THE WORK IN ACCORDANCE WITH THE REQUIREMENTS OF ALL GOVERNING AUTHORITIES, AND LOCAL BY–LAWS.
1.6 APPLY FOR, OBTAIN AND PAY FOR ALL PERMITS, AND INSPECTION REQUIRED.
1.7 COORDINATE WITH OTHER TRADES.
1.8 SUBMIT FOR APPROVAL VIA EMAIL EQUIPMENT SHOP DRAWINGS IN PDF FORMAT. WORK SHALL NOT PROCEED UNTIL APPROVAL IS GIVEN.
1.9 MATERIALS, PRODUCTS AND EQUIPMENT SHALL BE NEW, OF THE BEST QUALITY, AND OF UNIFORM PATTERN. ALL WORK SHALL BE CARRIED OUT BY SKILLED WORKMEN, EXPERIENCED IN THIS TYPE OF WORK TO ENSURE FIRST CLASS INSTALLATION. MATERIAL NOT SPECIFIED SHALL BE SAME AS EXISTING.
1.10 GUARANTEE ALL WORK FOR ONE YEAR AFTER FINAL ACCEPTANCE BY OWNER.
1.11 PROVIDE DAILY CLEANUP OF ALL DEBRIS GENERATED BY OPERATION DURING CONSTRUCTION.
1.12 CORE DRILL HOLES IN CONCRETE WALLS AND FLOORS FOR PIPING WHERE NOT PREVIOUSLY SLEEVED. DO NOT USE MECHANICAL HAMMERS OR DRILLS WITHOUT PRIOR APPROVAL IN WRITING.

2. HVAC
2.1 DUCTWORK & HANGERS SHALL BE FABRICATED TO SMACNA FOR LOW PRESSURE DUCTWORK LATEST EDITION. TAPE & SEAL NEW EXHAUST & SUPPLY DUCTS
2.2 INSTALL DUCTWORK IN ACCORDANCE WITH SMACNA STANDARDS
2.3 PROVIDE AIR BALANCE FOR ALL AIR QUANTITIES SHOWN ON THE DRAWING. PERFORM PRELININARY BALANCE USING BRANCH DAMPERS – FINAL AIR BALANCE TO BE DONE USING GRILLE DAMPERS. SUBMIT REPORT FOR REVIEW
2.4 INSULATE THE OUTSIDE AIR DUCT FROM THE OUTSIDE WALL UP TO THE SUPPLY FANS SF1, SF2 WITH 1" MINERAL FIBREBOARD INSULATION C/W PLENUM RATED VAPOUR BARRIER & FACING MATERIAL
2.5 SUPPLY FANS SF1, SF2 SHALL BE GREENHECK CABINET FAN MODEL BCF–107 BELT–DRIVE THE UNIT SHALL BE C/W HANGING VIBRATION ISOLATORS, SLIDE–OUT FILTER BOX, FILTERS, MIXING BOX WITH MOTORIZED DAMPERS, FLEXIBLE CONNECTIONS AT FAN INLET & OUTLET
PERFORMANCE: 600 CFM @ 0.5", 1/4 HP, 120/1/60
2.6 DUCT HEATER DH1, DH2 SHALL BE NAILOR INDUSTRIES MODEL DHR 10KW, 208/3/60. THE UNIT SHALL BE C/W AIR PRESSURE SWITCH, SCR CONTROLLER.
2.7 PROVIDE ALL THE NECESSARY CONTROL COMPONENTS & WIRING TO CONTROL SUPPLY FAN SF1, DUCT HEATER DH1 & THE SUPPLY SF1 MOTORIZED DAMPERS MD1 AS FOLLOWS.
– OCCUPIED MODE: SUPPLY FAN SHALL RUN, OUTSIDE AIR DAMPER SHALL BE OPEN. THE DUCT HEATER SHALL BE CONTROLLED TO MAINTAIN THE TEMPERATURE SETPOINT
– UNOCCUPIED MODE: SUPPLY SHALL BE OFF, OUTSIDE AIR DAMPER SHALL BE CLOSED. ON A CALL FOR HEAT, THE SUPPLY FAN SHALL START & THE DUCT HEATER SHALL BE CONTROLLED TO MAINTAIN THE TEMPERATURE SETPOINT. THE OUTSIDE AIR DAMPER SHALL REMAIN CLOSED
– PROVIDE A WALL MOUNTED TEMPERATURE SENSOR ON THE WALL ADJACENT THE THERMOSTAT. WHEN THE TEMPERATURE DROPS BELOW THE ALARM SETPOINT, AN ALARM SIGNAL SHALL BE SENT TO THE PLANT CONTROL SYSTEM (CONTROL LOGIX PLC).
– PROVIDE A PROGRAMMABLE THERMOSTAT. SUBMIT CONTROL SHOP DRAWINGS FOR REVIEW
2.8 PROVIDE ALL THE NECESSARY CONTROL COMPONENTS & WIRING TO CONTROL SUPPLY FAN SF2, EXHAUST FAN EF5, DUCT HEATER DH2 & THE SUPPLY FAN SF2 MOTORIZED OUTSIDE AIR DAMPER MD2 & RETURN MOTORIZED DAMPER MD3 AS FOLLOWS.
– HEATING MODE: THE SUPPLY FAN SHALL RUN CONTINUOUSLY, THE OUTSIDE AIR DAMPER SHALL BE OPEN, THE RETURN AIR DAMPER SHALL BE OPEN, THE EXHAUST FAN SHALL BE OFF. THE DUCT HEATER SHALL BE CONTROLLED TO MAINTAIN THE HEATING TEMPERATURE SETPOINT
– COOLING MODE: THE SUPPLY FAN SHALL RUN CONTINUOUSLY, THE OUTSIDE AIR DAMPER SHALL BE OPEN, THE RETURN AIR DAMPER SHALL BE OPEN, THE EXHAUST FAN SHALL BE OFF. WHEN THE ROOM TEMPERATURE RISES ABOVE THE COOLING TEMPERATURE SETPOINT, THE EXHAUST FAN SHALL START & THE RETURN AIR DAMPER SHALL CLOSE
– PROVIDE A PROGRAMMABLE THERMOSTAT. SUBMIT CONTROL SHOP DRAWINGS FOR REVIEW

THE HVAC EQUIPMENT SHALL BE INSTALLED ACCORDING TO THE MANUFACTURER'S RECOMMENDATIONS

HVAC LEGEND

A–8X4 / 150 CFM	DENOTES A SUPPLY GRILLE 150 CFM THRU AN 8X4 EH PRICE 520D/ED/812 (DUCT MOUNTED)
UC	DENOTES A DOOR UNDERCUT
———	NEW RIGID DUCT
T	THERMOSTAT
S	CARBON MONOXIDE/NITROGEN DIOXIDE MULI SENSOR

This drawing shall not be used for construction purposes unless countersigned by:

JOHN FREDERICK

peak engineering & construction ltd

Revision		Date
5	TRANSFORMER RM ADDED	FEB 28/17
4	REVISED BLDG LOCATION	FEB 8/17
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TORONTO, ON M5M 1T2
O 416 484–3714
F 416 484–0206
E jcfrederickltd@rogers.com

LIMITED PROFESSIONAL ENGINEER 1635 J. FREDERICK PROVINCE OF ONTARIO

CONSTRUCTION NORTH

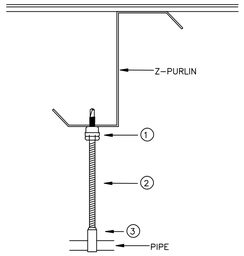
ST. MARYS ALT. FUEL BUILDING

MUNICIPALITY OF CLARINGTON

UPPER LEVEL (ELECT. RM), SPECIFICATIONS MECHANICAL

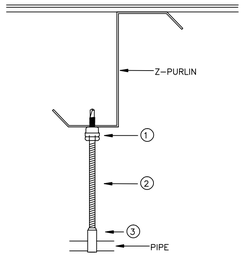
Project No.:	1635
Scale:	1:100
Date:	JUNE 2016
Drawn by:	JF
Checked by:	JF

M2



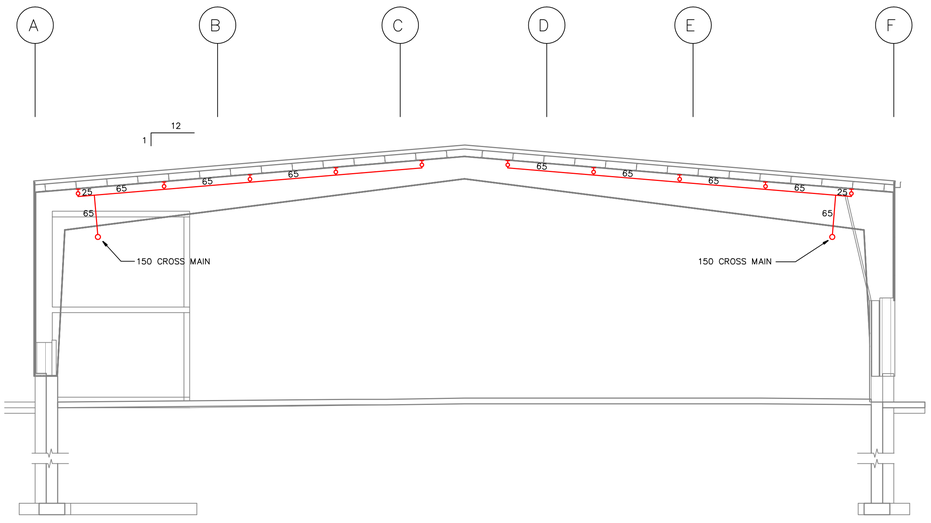
I.D.	MATERIAL	QTY
1	1/2" STEEL SAMMY SCREW	1
2	1/2" THREADED ROD	1
3	SWIVEL RING	1
ALL MATERIAL TO BE PLATED AND OR GALV		

Z-PURLIN HANGER ASSEMBLY
150mm PIPE.

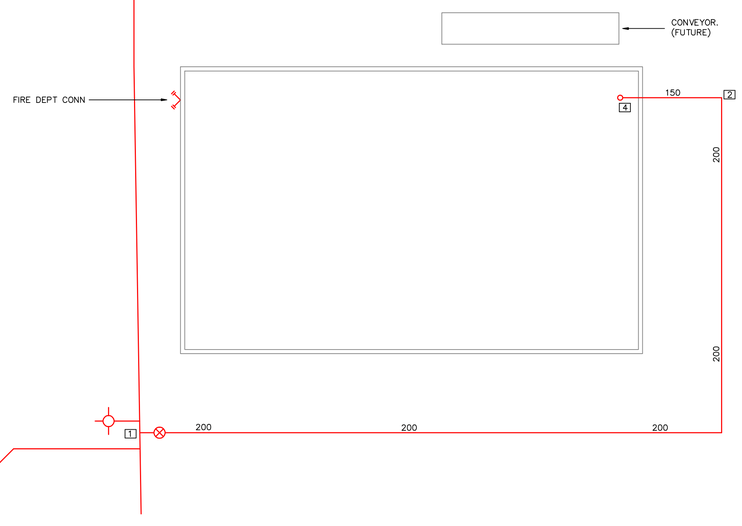


I.D.	MATERIAL	QTY
1	3/8" STEEL SAMMY SCREW	1
2	3/8" THREADED ROD	1
3	SWIVEL RING	1
ALL MATERIAL TO BE PLATED AND OR GALV		

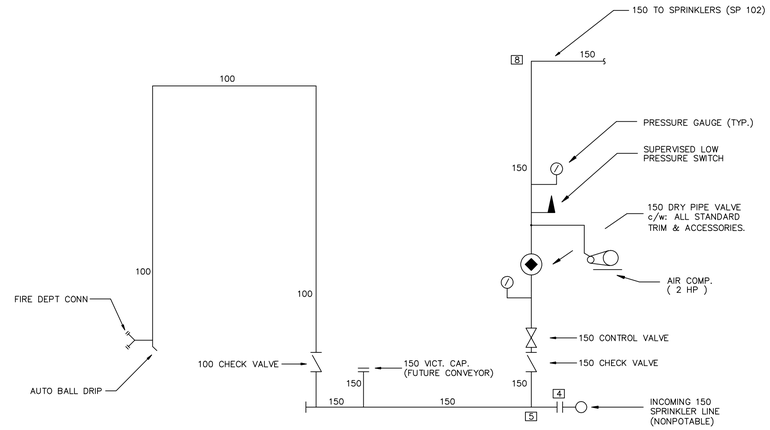
Z-PURLIN HANGER ASSEMBLY
25mm-100mm PIPE.



BUILDING CROSS SECTION
SCALE- 1:100



SITE SERVICE PLAN
SCALE- 1:300



RISER SCHEMATIC
NO SCALE

NOTES:

REFERENCES: O.B.C; NFPA 13.
ENGINEERING DESIGN CRITERIA:
Occupancy:

RECYCLE AREA. (Dry System.)
Piled Storage to 20'-0" Max; Class 3 Commodities.
Density: 0.212 usgpm/sq.ft.
Area: 2600 sq.ft.
Hoses: 250 usgpm

Water Supply: (Jan. 19, 2017)

Static: 105 psi. Flow: 448 usgpm @ 90 psi residual.

NOTE: Refer to sketches within hydraulic calculations for hydraulic reference points.

PRODUCTS:

All components to be NFPA and FM approved.

Pipe and Fittings:
- Blk Sch. 40 steel pipe, threaded.
- Blk C.I. screwed fittings.
- Blk L.W. steel pipe, roll-grooved.
- Grooved couplings and fittings.

Valves:
- All Control Valves to be supervised.
- All Control Valves to be FM approved, ULC listed for fire protection service.
- All Control Valves to be 'Indicating Type'; to NFPA 13 Standards.
- All Drain Valves and miscellaneous trim valves to be brass, threaded.
- All Check Valves to be rubber-faced.

Pipe Hangers:
- All pipe hangers to be FM approved; ULC listed for fire protection service.
- All pipe hanger assemblies to be to NFPA 13 Standards.

Sprinkler Heads:
- All sprinkler heads to be FM approved; ULC listed for fire protection services.
- All sprinkler heads in un-finished areas to be brass finish.

Sprinkler Legend:

⊗ =17/32" (K=8.0) 286°F BRASS UPRIGHT, S.R.

▷ =1/2" (K=5.6) 155°F BRASS SIDEWALL, S.R.

Dry Pipe Valve:
- Dry Pipe Valve to NFPA 13 Standards.
- Dry Pipe Valve to be FM approved, ULC listed for fire protection services.
- Dry Pipe Valve to be installed with all standard trim and accessories.
- Dry Pipe Valve trim to include 2" drain, gauges, and alarm test valve.
- Dry Pipe Valve trim to include alarm switch and low-pressure alarm.
- All supervisory and alarm switches to be to FM approved, ULC listed for fire protection services, with normally open and normally closed contacts and supervisory capability.
- All supervisory wiring and alarm wiring to be completed by others.
- Dry Pipe Valve trim to include Quick Opening Device.
- Capacity of Dry System approx. 1002 us gallons. (Incl Phase Two)

Air Compressor: (2 HP)
- Automatic operation.
- Wiring of air compressor by others.

Water Motor Gong:
- To NFPA 13 Standards, FM approved, ULC listed for fire protection services.

Fire Department Connection:
- 2 1/2 x 2 1/2 x 4 Reg. Mount.

Signs:
- All control valves, switches, drain valves to be equipped with signs, to NFPA 13 standards.

Spare Head Cabinet:
- Spare head cabinet to be installed on wall near Alarm Valve station.
- Spare head cabinet stock (6) spare heads, and wrench.

INSTALLATION:

- All piping and components to be installed to NFPA 13 Standards, and to manufacturers requirements.
- All piping and components to be tested to NFPA 13 Standards.
- All leaks to be repaired and piping re-tested.
- All components failing tests to be replaced.
- Contractors Material and Test Certificate to be completed and submitted to owners representative.

DRY PIPE SLOPE:
- Pitch branch lines @ 1/2 inch / 10 feet.
- Pitch mains @ 1/4 inch / 10 feet.

HYDRAULIC DATA PLATE INFORMATION	
LOCATION:	ROOF
No. of SPKRS:	25
DENSITY:	0.212 usgpm/sq.ft.
DESIGN AREA:	2600 sq.ft.
GPM DISCHARGE:	632.14 usgpm
PSI @ B.O.R:	29.67 psi

REV	DATE	DETAIL

PROJECT:
ST MARYS ALT. FUEL BLDG;
400 WAVERLEY ROAD S;
BOWMANVILLE, ONTARIO.

SPRINKLERS

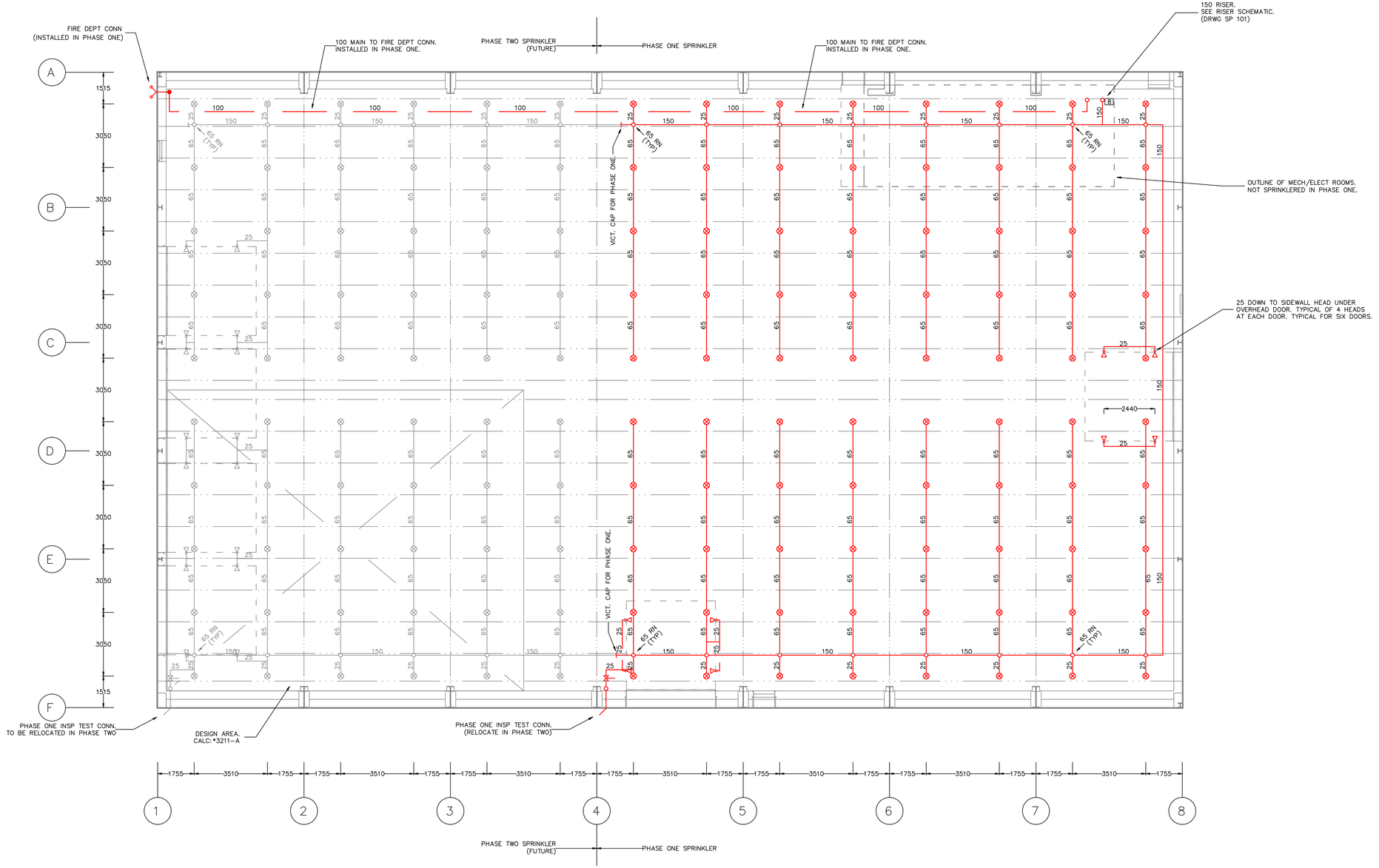
CONTR'T No: B-17-S-3211
SCALE: 1:100
DRWN: BNC
CH'KD: D.J.

TITLE:
NOTES, SITE SERVICE, DETAILS.

DESIGNED:
B T NICHOLL-CARNE
738 MARGARET WAY,
KINGSTON, ONTARIO K7K 0C1
TEL: 1-613-530-2295 FAX: 1-613-530-2296
E-MAIL: barryn@kingston.net

DATE: FEB. 10, 2017.
DRWG No: SP 101
REV: 0

CONTRACTOR:
MITCHELL FIRE PROTECTION
P.O. BOX 1704,
BRIGHTON, ONTARIO K0K 1H0
TEL: 1-613-475-0008 FAX: 1-613-475-0333



PIPING AT ROOF.
SCALE- 1:100

LICENSED PROFESSIONAL ENGINEER
D.H. JANUSZ
21346308
PROVINCE OF ONTARIO

REV	DATE	DETAIL

PROJECT: ST MARYS ALT. FUEL BLDG; 400 WAVERLEY ROAD S; BOWMANVILLE, ONTARIO. SPRINKLERS	CONTR'T No: B-17-S-3211 SCALE: 1:100 DRWN: BNC
TITLE: PIPING AT ROOF	CH'KD: D.J.
DESIGNED: B T NICHOLL-CARNE 738 MARGARET WAY, KINGSTON, ONTARIO K7K 0C1 TEL: 1-613-530-2295 FAX: 1-613-530-2296 E-MAIL: barryn@kingston.net	DATE: FEB. 10, 2017. DRWG No: SP 102 REV: 0
CONTRACTOR: MITCHELL FIRE PROTECTION P.O. BOX 1704, BRIGHTON, ONTARIO K0K 1H0 TEL: 1-613-475-0008 FAX: 1-613-475-0333	

Appendix G

Fugitive Dust Management Procedure

1.0 PURPOSE

1.1 The purpose of this procedure is to ensure that proper control measures to mitigate fugitive dust emissions are implemented in St Marys Cement Bowmanville Plant in order to minimize the impact on the environment, minimize potential nuisance to the community and ensure compliance with environmental legal requirements.

2.0 SCOPE

2.1 This document covers those activities within St Marys Cement Bowmanville Plant's property that generate fugitive dust emissions.

3.0 RESPONSIBILITY

3.1 Employee:

- All employees are responsible to comply and follow the requirements of this procedure.
- All employees are responsible for reporting to the Environmental Manager any emission of fugitive dust that causes or is likely to cause an adverse effect on the environment outside the boundaries of St Marys Cement Bowmanville Plant.

3.2 Dept. Supervisor/Mgr.:

- All supervisors / Managers are responsible to ensure that the requirements of this procedure are followed within their area of responsibility and corrective actions are taken when deviations are identified.

3.3 Environmental Manager:

- The Environmental Manager is responsible to ensure that the requirements of this procedure are followed, identify control measures to mitigate fugitive dust and notify St Marys' personnel of applicable legal requirements.

3.4 Cargo Dockers:

- Cargo Dockers is responsible for dock operations and to ensure compliance with legal requirements.
- Cargo Dockers is responsible to ensure that the requirements of this procedure are followed within their area of responsibility and corrective actions are taken when deviations are identified.

4.0 DEFINITIONS

4.1 Applicable Environmental Legislation: Environmental requirements established by the Ministry of the Environment that regulates the operations of St Marys Cement Bowmanville facility.

4.2 Adverse effect on the environment could be any of the following:

- Impairment of the quality of the natural environment for any use that can be made of it;
- Injury or damage to property or to plant or animal life;
- Harm or material discomfort to any person;
- An adverse effect on the health of any person;
- Impairment of the safety of any person;
- Rendering any property, plant or animal life unfit for human use;
- Loss of enjoyment of normal use of property;
- Interference with the normal conduct of business.

4.3 Muck pile: Broken material after being crushed by blasting.

5.0 PROCEDURE

5.1 Based on the existing and potential impact on the environment by St Marys operations the main activities that need to be controlled to mitigate fugitive dust are:

- Vehicle traffic
- Stockpiles
- Various process locations where material is being transferred/conveyed
- Blasting/Drilling
- Cleaning activities/Vacuum Truck
- Dock unloading

5.2 Vehicle Traffic:

Unpaved Roads:

Watering trucks should be available and operational for mitigating dust as needed.
Written logs are to be kept as to the activity of each watering truck to ensure consistent watering.
Chemical dust suppressants should be applied according to manufacturers' specifications on main unpaved roads
Vehicles should comply with indicated speed limits on post signs.

Paved Roads:

Water flush and/or sweeper should be available and operational for mitigating dust as needed.
Written logs are to be kept to ensure adequate use of the water flush truck and/or sweeper.
Vehicles should comply with indicated speed limits on post signs.
Tanker trucks should drive through the truck wash after loading when possible.

5.3 Stockpiles

Stockpiles of petcoke and salt should be tarped as soon as possible.
When possible the open face of petcoke and coal piles should be treated with dust suppressants at the end of the shift to minimize fugitive dust.
Limit to a minimum the disturbance of the stockpiles.
When using a stacker to build piles limit drop heights to a minimum.
Ensure that the loader bucket is close to the truck to minimize drop height while loading.
When control measures are not effective and handling material activities may cause an adverse effect on the environment, due to high wind speed conditions, activities should be stopped immediately.

5.4 Various process locations where material is being transferred/conveyed:

Free fall of materials should be operated in such a manner as to minimize the free fall distance and fugitive dust emissions.
When applicable install and operate water spray bars to control fugitive dust.

5.5 Blasting/Drilling:

When possible blasting activities should consider weather conditions to diminish fugitive dust.
Ensure that dust collector of driller is operational and maintained.
Muck piles should be watered to diminish fugitive dust by handling activities.

5.6 Cleaning activities/Vacuum Truck:

Ensure that dust collector of vacuum truck is operational and well maintained.
Material from cleaning activities of vacuum truck should be dumped in areas authorized by production supervisor.
When the vacuum truck is used to clean petcoke or coal, the material must be reintroduced into the process without sending the material to the dock.
Vacuumed material such as limestone, waste cement and/or waste clinker should be sent to the quarry for road construction or to be reintroduced into the process.

No waste material should be dumped at the dock area. Material may be dumped at the dock area on an **exceptional basis**, previous authorization from Cargo Dockers. All shipments must be signed in at the office of the dock and initialed by a Cargo Dockers' employee before dumping the material. No material should be left on the dock without authorization of Cargo Dockers.

5.7 Dock unloading:

When unloading, all vessels must apply water at all transfer points and at the end of the boom to control fugitive dust.
Unloading piles should be transferred as soon as possible from unloading area to final storage area at the dock.
When control measures are not effective and handling material activities may cause an adverse effect on the environment, due to high wind speed conditions, activities should be stopped immediately.
Unloading material from vessels should be stopped when wind speeds exceed 40 km/hr.
Cargo Dockers is responsible to notify immediately the Ministry of the Environment and St Marys' personnel when activities at the dock cause or are likely to cause an adverse effect on the environment.

5.8 Alternative fuels:

Alternative fuels must be transported in closed trailers and be unloaded inside the alternative fuel building when the door is closed to avoid dust emissions during transport and unloading.
The alternative fuel conveyor system and the feed to the calciner are connected to a dust collector. This dust collector must be operational. It helps keep a slight negative pressure that prevents fugitive emissions to the environment.

6.0 REFERENCE DOCUMENTS

- PD 00166 Accident Incident and Environmental Nonconformance Reporting
- Environmental Protection Act

Appendix H

Relevant Standard Operating Procedures

SPILL PREVENTION AND CONTINGENCY PLAN

ST. MARYS CEMENT INC., BOWMANVILLE CEMENT PLANT
BOWMANVILLE, ONTARIO

JULY 2018

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TABLE OF CONTENTS

LIST OF FIGURES
(Following Text)

1.0 INTRODUCTION

Regulations that were promulgated pursuant to Bill 133 - Environmental Enforcement Statute Law Amendment Act, often referred to as the "Environmental Penalties Regulations", apply to MISA industries, such as St. Marys Cement Inc. The Ministry of the Environment (MOE) will be enforcing Environmental Penalty Orders to "promote quick and effective action to restore, reduce, or prevent harm to the environment or human health".

These regulations under the Environmental Protection Act, and the Ontario Water Resources Act, require MISA "Regulated Persons" to prepare Emergency Response Plans by September 1, 2008, pursuant to Ontario Regulation (O.Reg.) 224/07 – Spill Prevention and Contingency Plans.

2.0 GENERAL INFORMATION

2.1 FACILITY INFORMATION

Legal Company Name:	St. Marys Cement Inc. (Canada)
Name of Facility:	St. Marys Cement Inc. – Bowmanville Cement Plant
Type of Facility:	Cement Manufacturing Plant
Location of Facility:	400 Waverly Road South, Bowmanville, ON L1C 7B5
Mailing Address of Facility:	400 Waverly Road South, Bowmanville, ON L1C 7B5
Facility Phone Number:	905-623-3341
Facility Fax Number:	905-623-4695

2.2 CONTACT INFORMATION

The following table includes contact information, as required by O.Reg. 224/07:

Title	*Name*	*Email Address*	*Phone Number*
Plant Manager	Jim Storey	Jim.storey@vcimentos.com	905-623-3341 ext. 273
Security Personnel	N/A	N/A	N/A
Environmental Manager:	Luis Urbina	Luis.urbina@vcimentos.com	905-623-3341 ext. 248
Health & Safety Coordinator	Donald Hill	donald.hill@vcimentos.com	905-623-3341 ext. 262
Spill Response Personnel	Shift Supervisor and Luis Urbina	Luis.urbina@vcimentos.com	905-623-3341 ext. 120 or ext. 248
Emergency Services:	Detox	N/A	905-623-1367
OM & M Spill Services: (Detox 24 Hour Emergency Spill Response Service **(905) 623-1367**)			
Compliance w/ O. Reg. 224/07 Personnel:	Luis Urbina	Luis.urbina@vcimentos.com	905-623-3341 ext. 248

Title	*Name*	*Email Address*	*Phone Number*
Designated Person Responsible for Spill Prevention at Facility:			
Name	*E-mail Address*	*Phone Number (working hours)*	*Phone Number (post-working hours)*
Luis Urbina	Luis.urbina@vcimentos.com	905-623-3341 ext. 248	905-259-4531 (cell)

2.3 SUMMARY OF PLANS

On request, St. Marys Cement Inc. Canada (St. Marys) will provide a written summary of the SRCP and of any updates made to the plans to the following:

1. A municipal emergency control group established under Section 12 of Ontario Regulation 380/04 Standards made under the *Emergency Management and Civil Protection Act*;
2. A municipal by-law inspector;
3. The local fire department;
4. The local police department;
5. The medical officer of health; and
6. Environment Canada Environmental Emergencies Officer.

3.0 MANAGEMENT APPROVAL

This Spill Prevention and Contingency Plan (SPCP) is approved by the Plant Manager to ensure that necessary resources are committed to its implementation.

4.0 CERTIFICATION

I hereby certify that I have examined the facility, and being familiar with O.Reg. 224/07, attest that this SPCP has been prepared in accordance with good engineering practices.

Name: Jim Storey / Plant Manager

Date: July 03, 2018

5.0 APPLICABLE ENVIRONMENTAL REGULATIONS

This SPCP complies with both federal and provincial environmental regulations. These regulations contain specific clauses that stipulate the following:

1. Direct prohibitions against the discharge of contaminants;
2. Mandatory reporting to Government Agencies or Police; and
3. Responsibility to minimize the environmental impact.

5.1 FEDERAL AND PROVINCIAL REGULATIONS

The legislative framework that regulates the prevention, preparedness, response, and reporting requirements of the SPCP include:

1. Federal:
   a) Canadian Environmental Protection Act 1999 (CEPA);
   b) Fisheries Act (FA); and
   c) Transportation of Dangerous Goods Act (TDGA).

2. Provincial
   a) Environmental Protection Act (EPA);
   b) Ontario Water Resources Act (OWRA); and
   c) Liquid Fuels Handling Code (LFHC).

The CEPA, 1999, Part 5-95. (1)(b) states that in order to be in compliance, that St. Marys shall "…t*ake all reasonable measures consistent with the protection of the environment and public safety to prevent the release of, if it cannot be prevented, to remedy any dangerous condition or reduce or mitigate any danger to the environment of to human life or health that results from the release or may reasonably be expected to result if the substance is released…*"

5.1.1 O. REG. 224/07

St. Marys is a prescribed Municipal Strategy for Abatement (MISA) plant, as listed under the 'Regulated Persons' Section 3 (1), Table 1 of the O.Reg. 222/07 (Environmental Penalties Act). As such, the Facility has developed this SPCP in compliance with the

Regulation. The Regulation applies to those persons who own or operate an industrial plant that falls within one of nine of the MISA industrial sectors, and that discharge to a surface water body or private sewage works. The Regulation ensures that appropriate prevention and contingency efforts are undertaken in the event of a spill, to reduce or eliminate the potential to cause adverse environmental effects.

5.1.2 O. REG. 222/07

The purpose of O.Reg. 222/07 (Environmental Penalties Act) is to provide for the assessment of environmental penalties, in a manner that encourages regulated persons to adhere to the following:

1. Take steps to prevent contraventions;
2. Take steps to mitigate the effects of contraventions and to prevent their recurrence;
3. Implement environmental management systems; and
4. Enter into agreements under Subsection 182 (9) of the Act to take steps for the protection of the natural environmental beyond the measured required by an Act of Ontario or Canada, by a regulation or instrument under an Act of Ontario or Canada, or by a public body.

5.2 ENVIRONMENTAL APPROVALS

St. Mary's has had issued several environmental approvals for several on-Site Facility operations. The type of approval, approval number, and the location/sector to which the approval applies are summarized below:

Environmental Protection Act

Approval	*Approval Number*	*Location*
ECA (Air)	0469-9YUNSK 4614-826K9W (Trial LCF)	Facility

Ontario Water Resources Act

Approval	*Approval Number*	*Location*
C of A (Industrial Sewage Works)	3638-5LHKE3	Facility storm water management facility
C of A (Industrial Sewage Works)	4-101-67-686	Facility (MISA Discharge)
C of A (Municipal and Private Sewage Works)	7217-4PMJDL	Facility Leaching Bed
ECA Low Carbon Fuels (Waste)	7024-9XUK4C 1255-7QVJ2N (Trial LCF)	Facility
ECA (Air)	6346-9DSL5P	Facility dock
Water Intake (Water)	3556-8SNJB9	Facility lake water intake
Water Intake (Water)	5180-8SRPQJ	Quarry

6.0 FACILITY DESCRIPTION

St. Marys operates a manufacturing facility located at 400 Waverly Road South in Bowmanville, Ontario (Facility). A map of the Facility location is presented as Figure 1.0.

St. Marys manufactures cement, a fine powder that consists primarily of calcium silicates, aluminates, and aluminoferrites. Four main categories of raw materials include calcareous, siliceous, argillaceous, and ferriferous (calcium carbonate, silica, alumina, and iron) which are combined to produce the cement. The process steps include raw materials acquisition and handling, kiln feed preparation, calcination of raw materials through pyroprocessing and subjection to mechanical processing operations to achieve the finished cement product by grinding.

Limestone is obtained on site by excavation in the adjacent quarry and conveyed up to the plant. Other raw materials and fuels are brought to the plant. Raw materials such as stone, gypsum, additive materials (source of iron and silica), coal, petcoke are stored in outdoor storage piles.

7.0 POTENTIAL SPILL SOURCES

The following subsections outline the areas of concern (AOC) at the Facility where, under certain conditions, a spill could conceivably occur. The identification of these AOC will help identify control conditions to prevent or mitigate the potential impacts resulting from a spill.

According to O.Reg. 224/07, during the hazard identification phase, a regulated facility must identify all spills that meet all of the following three criteria:

1. May occur at the plant or relate to the operations of the plant;
2. Are reasonably foreseeable; and
3. Have the potential to cause adverse effects.

For those hazards meeting the three regulatory criteria above, the likelihood of each spill should be considered based on a number of factors, including the following:

1. The properties and characteristics of all pollutants used at the plant and, for each pollutant, the maximum expected quantity of the pollutant that may be at the plant;
2. The manner in which each pollutant is stored, handled, processed and disposed of at the plant;
3. The physical and geographical characteristics of the location at which each pollutant is stored, handled, processed, and disposed of at the plant;
4. Whether there have been previous spills of the pollutant at the plant or relating to its operations; and
5. Any other relevant factors.

7.1 MAIN STORAGE, HANDLING, PROCESSING AND DISPOSAL AREAS

7.1.1 STORAGE AREAS

At the Facility, there are 19 above ground storage tanks (ASTs), at 17 unique locations and one underground storage tank (UST). The contents of the ASTs vary by container. The following table summarizes the AST and UST contents, maximum volumes, location, and secondary tank spill prevention features (if any):

Location	*Tank ID*	*Contents*	*Maximum Volume (litres)*	*Secondary Containment*
West of Plant Service Building	1-110-1 (UST)	Furnace Oil	22,700	Double wall tank
Inside Lake Pumphouse Building – East Wall	1-127 (AST)	Diesel	1,000	Double wall tank
North Armtec Building	1-128 (AST)	Diesel	2,270	Double wall tank
		Gas	2,270	Double wall tank
South of Cooler Electrical Room	1-3-2575 (AST)	Diesel	2,270	Double wall tank and concrete enclosure
Lunchroom West Wall	1-1393 (AST)	Furnace Oil	2,270	Double wall tank
North of Primary Crusher	3-098 (AST)	Diesel	45,400	Double wall tank
North of Kiln Diesel Generator Building	6-310 (AST)	Diesel	2,250	Double wall tank
Building East of Cooler Building	6-3-6063 (AST)	Furnace Oil	50,000	Concrete containment area
Plant Mobile Tank	1-125 (AST)	Diesel	425	Double wall tank
Quarry Mobile Tank	N/A	Diesel	2,200	Double wall tank
South of Lubrication Building	1-126 (AST)	Waste Oil	5,000	Concrete containment area
East of Raw Mill Building (Atox)	6-3-2951 (AST)	Aqua Ammonia (19%)	38,000	Concrete containment area
Northwest Corner of Finish Mill Building	1-2006 (AST)	Ethylene Glycol	7,500	Concrete containment area
East Side of Main Compressor Room	1-3-205 (AST)	Ethylene Glycol	2,850	Concrete containment area
North of Preheater Tower	6-3-413 (AST)	Ethylene Glycol	2,850	Concrete containment area
West Side of Roll Press Building	7-3-255 (AST)	Ethylene Glycol	2,850	Concrete containment area
Finish Mill Building	8-321-1 (AST)	Grinding Aid	8,500	None
	8-321-2 (AST)	Grinding Aid	21,000	None

All double-walled ASTs have their vacuum pressure gauges routinely monitored. The two grinding aid ASTs with no secondary containment are located inside the finish mill building and have high level alarms that activate shut off valves.

At the Facility, there are 10 process equipment pieces that contain significant amounts (i.e., greater than 500 liters) of oil and seven 7 transformers containing oil. The following

table summarizes the maximum volumes and locations of the process equipment and transformers:

Location	*Equipment Number*	*Equipment*	*Contents*	*Maximum Volume (litres)*
Primary Crusher Building	3-101	Primary Crusher Hydraulic & Lube Oil Tanks	Oil	4,000
Raw Mill Building (Atox)	5-3-230	Pump Station for Atox Roller Tube	Oil	1,400
	5-3-240	Atox Mill Table Gear Unit (Flender)	Oil	4,400
	5-3-250	Atox Rollers Hydraulic Pressure Pump	Oil	1,200
Cooler Building	6-3-7361	Cooler Deck 1 – Hydraulic Drive Pump 1	Oil	4,000
Roll Press Building	7-3-260	Roll Press Gear Reducer	Oil	1,500
Finish Mill Building	8-2-301D	Finish Mill 2 Symetro Gear	Oil	1,500
	8-301MD	Finish Mill 1 Symetro Gear	Oil	1,500
	8-3-3015	Mill 3 MAAG Gearbox	Oil	1,500
West of Finish Mill Building	1-202-1	Transformer 1 – 10 MVA-44KV/4160V	Oil	6,461
	1-202-2	Transformer 2 – 10 MVA-44KV/4160V	Oil	6,461
	1-202-3	Main Oil Circuit Breaker (OCB)	Oil	796
West of Cooler Building	1-3-251	Transformer 3 – 15-20 MVA-44KV/4160V	Oil	7,580
	1-3-252	Transformer 4 – 15-20 MVA-44KV/4160V	Oil	7,580
South of Raw Mill Building (Atox)	1-202-5	Spare Transformer	Oil	3,430
Northwest of Quarry Garage	1-3-2566-2	Quarry Garage Transformer	Oil	633
North of Lake Pumphouse Building	1-3-2611-3	Lake Pump Transformer	Oil	1,400

The transformers and process equipment do not contain any secondary spill prevention features. Other storage areas (as well as non-bulk material storage areas) include the following locations and secondary tank spill prevention features:

Location	*Storage Contents*	*Maximum Volume (litres)*	*Secondary Containment*
Stores Lubrication Area	Oil in drums and totes – MS, VV	Drums – 200 Totes – 1,000	Concrete Containment
Waste Storage Area	Liquid waste in drums and totes (oil, solvents, grease, glycol, other) – MS, VV	Drums – 200 Totes – 1,000	Concrete Containment

Notes: MS – multiple sources; VV – variable volumes; MC – multiple chemical types

At the facility there are several silos for storage of solid raw materials and products. There are three silos for storage of solid fuel (petcoke/coal). Due to the characteristics of petcoke/coal these storage silos are considered significant pieces of equipment for spill prevention. Each silo has a maximum capacity of 1,100 tonnes. The silos have a dust collector for controlling emissions and have a double high level alarm.

Location	*Equipment Number*	*Equipment*	*Contents*	*Maximum Capacity (tonnes)*
South of fuel mill building	6-3-630	Solid Fuel Silo	Petcoke Coal	1,100
South of fuel mill building	6-3-632	Solid Fuel Silo	Petcoke Coal	1,100
South of fuel mill building	6-3-634	Solid Fuel Silo	Petcoke Coal	1,100

7.1.1.1 STORAGE CONTENTS CHEMICAL PROPERTIES

A copy of MSDS for each pollutant stored at the Facility, as detailed in Section 7.1.1, has been provided. A copy of the MSDS can be obtained from St Marys Cement MSDS database.

The following tables summarize the pertinent chemical properties of the chemicals listed above. Pertinent properties include composition, flammability, reactivity, and health effects information.

Contents: Aqua Ammonia (19 percent)

Tank ID: 6-3-2951 (AST)

Maximum Volume: 38,000 L

Release Type: Vapor, Liquid

DNAPL/Air Toxics/Toxic Substance: Ammonia as NH3

Composition Information*:*

Ingredient	*CAS#*	*Percent*
Ammonium Hydroxide	1336-21-6	39 – 72%
Water	7732-18-5	28 – 61%

Flammability Information*:*

LEL (% in air)	*UEL (% in air)*	*Autoignition Temperature (°C/°F)*	*Water Solubility*	*Volatility*	*Oxidizing Properties*
15.5%	27.0%	651/1204	N/A	N/A – known to be a very volatile substance	N/A

Notes: N/A - not available

Reactivity Information:

Stable material, hazardous polymerization will not occur. Will liberate ammonia if heated. Decomposition temperature may be lowered to 300°C/575°F by contact with certain metals (such as nickel). Avoid contact with calcium hypochlorite, bleaches, gold, mercury, silvert, iodine, bromine, and chlorine.

Human Health Effects:

May cause caustic injury. Extent of injury may range from mild skin irritation and coughing to severe burns, laryngeal edema and life-threatening pulmonary edema. Corrosive upon contact and inhalation, and toxic for ingestion

Exposure Limits				
Ingredient	***Source***	***TLV (8 hour period)***	***Source***	***PEL (8 hour period)***
Aluminum Hydroxide	N/A	25 ppm	N/A	50 ppm

Acute Toxicity Data	
Route	***LD50***
Oral (Rat)	350 mg/kg bw
Oral (Cat)	750 mg/kg bw
Cyprinus Carpio (Fish)	1.34 – 1.7 mg un-ionized NH3/L

Contents: Furnace Oil

Tank ID: 1-110-1 (UST), 1-1393 (AST), 6-3-6063 (AST)

Maximum Volume: 22,700, 2,270, 50,000, and 4,540 ***L***

Release Type: Vapor, Liquid

DNAPL/Air Toxics/Toxic Substance: Air Toxics

Composition Information:

Ingredient	***CAS#***	***Percent***
Dye D 390	N/A	190 ppm
Sulphur	7704-34-9	0 – 15 ppm
Kerosene (Petroleum), Hydrodesulfurized	64742-81-0	>= 99.93%

Flammability Information:

LEL (% in air)	***UEL (% in air)***	***Autoignition Temperature (°C/°F)***	***Water Solubility***	***Volatility***	***Oxidizing Properties***
0.7% (V)	5% (V)	257/495	Insoluble	100% (V/V)	Reactive with oxidizing agents

Notes: N/A - not available

Reactivity Information:

Avoid heat, flames and sparks. Reactive with oxidizing agents and slightly reactive with metals. Hazardous decomposition products include carbon monoxide and asphyxiants on combustions. Stable under normal conditions.

Human Health Effects:

Causes skin irritation. Inhalation can cause respiratory tract irritation, weakness, dizziness, fatigue, loss of consciousness, central nervous system effects, and in some cases can be fatal. Prolonged exposure can produce target organ damage. Acts as a simple asphyxiant.

Exposure Limits				
Ingredient	***Source***	***TLV (8 hour period)***	***Source***	***PEL (8 hour period)***
Kerosene (Petroleum), Hydrodesulfurized	OEL (ON)	200 mg/m3	N/A	N/A

Acute Toxicity Data	
Route	***LD50***
Oral (Rat) (hydrodesulfurized kerosene)	> 5,000 mg/kg
Oral (Rat) (sulfur)	> 8,437 mg/kg
Dermal (Rabbit) (hydrodesulfurized kerosene)	> 2,000 mg/kg

Contents: Ethylene Glycol
Tank ID: 1-2006 (AST), 1-3-205 (AST), 6-3-413 (AST), and 7-3-255 (AST)
Maximum Volume: 7,500, 2,850, 2,850, and 2,850 L
Release Type: Liquid, Air
DNAPL/Air Toxics/Toxic Substance: Air Toxics

Composition Information:

Ingredient	***CAS#***	***Percent***
Ethylene Glycol	107-21-1	90 – 99%

Flammability Information:

LEL (% in air)	***UEL (% in air)***	***Autoignition Temperature (°C/°F)***	***Water Solubility***	***Volatility***	***Oxidizing Properties***
3.2	15.3	400/752	Complete	N/A – known to have low volatility	N/A

Notes: N/A - not available

Reactivity Information:
Material is stable under normal conditions. Avoid excessive heat and high energy sources of ignition. Avoid strong oxidizers, alkalies, and acids. Material does not decompose at ambient temperatures. Hazardous polymerization will not occur.

Human Health Effects:
May cause harm to an unborn child. Harmful and potentially fatal if swallowed. May cause kidney failure and central nervous system effects if ingested. Prolonged exposure to mists or liquids may cause skin, eye and respiratory irritation. High-pressure injection under skin may cause serious damage.

Exposure Limits				
Ingredient	***Source***	***TLV (8 hour period)***	***Source***	***PEL (8 hour period)***
N/A	N/A	N/A	N/A	N/A

Acute Toxicity Data	
Route	***LD50***
Oral (Rat)	4.7 g/kg
Dermal (Rabbit)	9.53 g/kg

Contents: Chrysocement Grinding Aid 4D
Tank ID: 8-321-1 (AST) and 8-321-2 (AST)
Maximum Volume: 8,500 and 21,000 L
Release Type: Liquid, Air
DNAPL/Air Toxics/Toxic Substance: No

Composition Information:

Ingredient	***CAS#***	***Percent***
Triethanolamine Acetate	14806-72-5	10-70
Diethanolamine Acetate	23251-72-1	0-60
Water	7732-18-5	28-32

Flammability Information:

LEL (% in air)	***UEL (% in air)***	***Autoignition Temperature (°C/°F)***	***Water Solubility***	***Volatility***	***Oxidizing Properties***
N/A	N/A	N/A	Infinite	N/A	N/A

Notes: N/A - not available

Reactivity Information:
Stable under normal conditions. Instability occurs at high temperatures. Hazardous polymerization will not occur. Incompatible with potassium tert-butoxide, acetic anhydride, aldehydes, ketones, acrylates, carbonates, organic anhydrides and halides, hydroxides, strong oxidizing agents and phosphates.

Human Health Effects:
Harmful if inhaled, may cause irritation to eyes and skin upon contact. Moderately toxic if ingested.

Exposure Limits				
Ingredient	***Source***	***TLV (8 hour period)***	***Source***	***PEL (8 hour period)***
N/A	N/A	N/A	N/A	N/A

Acute Toxicity Data	
Route	***LD50***
N/A	N/A
N/A	N/A
N/A	N/A

Contents: Diesel
Tank ID: 1-127 (AST), 1-128 (AST), 1-3-2575 (AST), 3-098 (AST), 6-310 (AST), 1-125 (AST), Quarry Mobile Tank
Maximum Volume: 1,000, 2,270, 2,270, 45,400, 2,250, 425, and 2,200 L
Release Type: Liquid, Air
DNAPL/Air Toxics/Toxic Substance: Air Toxics

Composition Information:

Ingredient	***CAS#***	***Percent***
Fuel Oil No. 2	68476-30-2	>99
Naphthalene	91-20-3	<1

Flammability Information:

LEL (% in air)	***UEL (% in air)***	***Autoignition Temperature (°C/°F)***	***Water Solubility***	***Volatility***	***Oxidizing Properties***
0.7	6.5	N/A	Negligible	N/A	N/A

Notes: N/A - not available

Reactivity Information: Material is stable under normal conditions, but should avoid heat, sparks, open flames, other ignition sources, and strong oxidizers.

Human Health Effects*:* Material is irritating to skin. If swallowed, may be aspirated and cause lung damage. Under conditions of poor personal hygiene and prolonged repeated contact, some polycyclic aromatic compounds (PACs) have been suspected as a cause of skin cancer in humans. May be irritating to the eyes, nose, throat, and lungs. High-pressure injection under skin may cause serious damage.

Exposure Limits				
Ingredient	***Source***	***TLV (8 hour period)***	***Source***	***PEL (8 hour period)***
Fuel Oil No. 2 (aerosol)	N/A	N/A	Imperial Oil	5 mg/m3
Fuel Oil No. 2 (vapour)	N/A	N/A	Imperial Oil	200 mg/m3
Fuel Oil No. 2 (inhalable fraction and vapour)	N/A	N/A	ACGIH	100 mg/m3 (skin)
Naphthalene	N/A	N/A	ACGIH	15 ppm (skin – STEL)
Naphthalene	N/A	N/A	ACGIH	10 ppm (skin)

Acute Toxicity Data	
Route	***LD50***
Inhalation	>5000 mg/m3 (LC)
Ingestion	>2000 mg/kg
Skin	>2000 mg/kg

Contents: Waste Oil (composition assumed same as ESSOTRANS 30 – Machine Oil)
Tank ID: 1-126 (AST)
Maximum Volume: 5,000 L
Release Type: Liquid
DNAPL/Air Toxics/Toxic Substance: NAPL

Composition Information:

Ingredient	***CAS#***	***Percent***
N/A	N/A	N/A

Flammability Information:

LEL (% in air)	*UEL (% in air)*	*Autoignition Temperature (°C/°F)*	*Water Solubility*	*Volatility*	*Oxidizing Properties*
0.9	7.0	N/A	Negligible	N/A	N/A

Notes: N/A - not available

Reactivity Information:

Material is stable under normal conditions and will not undergo hazardous polymerization, but should avoid excessive heat, high energy sources of ignition, and strong oxidizers.

Human Health Effects:

Repeated and/or prolonged exposure may cause irritation to the skin, eyes, or respiratory tract.

Exposure Limits				
Ingredient	*Source*	*TLV (8 hour period)*	*Source*	*PEL (8 hour period)*
Product (mist/aerosol)	ACGIH	5 mg/m3	ACHIG	10 mg/m3 (STEL)

Acute Toxicity Data	
Route	*LD50*
Inhalation	5,000 mg/m3 (LC)
Ingestion	2,000 mg/kg
Skin	2,000 mg/kg

Contents: Unleaded Gasoline
Tank ID: 1-128 (AST)
Maximum Volume: 2,270 L
Release Type: Liquid, Air
DNAPL/Air Toxics/Toxic Substance: Air Toxics, Toxic Substance

Composition Information:

Ingredient	*CAS#*	*Percent*
Gasoline	86290-81-5	>99
Methyl-tert-butyl-ether	1634-04-4	0-15

Flammability Information:

LEL (% in air)	*UEL (% in air)*	*Autoignition Temperature (°C/°F)*	*Water Solubility*	*Volatility*	*Oxidizing Properties*
1.4	7.6	>250/482	Negligible	N/A	N/A

Notes: N/A - not available

Reactivity Information:

Material is stable under normal conditions. Avoid heat, sparks, open flames and other ignition sources, halogens, strong acids, alkalies and strong oxidizers. Material does not decompose at ambient temperatures and hazardous polymerization will not occur.

Human Health Effects:

May cause cancer. Repeated exposure may cause dryness or cracking. If swallowed, may be aspirated and cause lung damage. May irritate eyes, nose, throat and lungs and cause central nervous system depression. High-pressure injection under skin may cause serious damage. Prolonged and repeated exposure may cause serious injury to blood forming organs and is linked with anemia and development of acute myelogenous leukemia.

Exposure Limits				
Ingredient	*Source*	*TLV (8 hour period)*	*Source*	*PEL (8 hour period)*
Benzene	N/A	N/A	ACGIH	2.5 ppm (STEL – skin)
Benzene	N/A	N/A	ACGIH	0.5 ppm (skin)
Cumene	N/A	N/A	ACGIH	50 ppm
Cyclohexane	N/A	N/A	ACGIH	100 ppm
Ethyl benzene	N/A	N/A	ACGIH	125 ppm (STEL)
Ethyl benzene	N/A	N/A	ACGIH	100 ppm
Gasoline	N/A	N/A	Imperial Oil	200 ppm (STEL)
Gasoline	N/A	N/A	Imperial Oil	100 ppm
Gasoline	N/A	N/A	Imperial Oil	100 ppm
Methyl-tert-butyl ether	N/A	N/A	ACGIH	50 ppm
n-Hexane	N/A	N/A	ACGIH	50 ppm (skin)
Naphthalene	N/A	N/A	ACGIH	15 ppm (STEL – skin)

Naphthalene	N/A	N/A	ACGIH	10 ppm
Toluene	N/A	N/A	ACGIH	20 ppm
Xylenes	N/A	N/A	ACGIH	150 ppm (STEL)
Xylenes	N/A	N/A	ACGIH	100 ppm

Acute Toxicity Data	
Route	***LD50***
Ingestion (Rat)	> 2000 mg/kg
Dermal (Rabbit)	> 2000 mg/kg

Contents: Machine Oil (1)
Tank ID: 3-101, 5-3-230, 5-3-240, 5-3-250, 6-3-7361, 7-3-260, 8-2-301D, 8-301MD, and 8-3-3015
Maximum Volume: 4,000, 1,400, 4,400, 1,200, 4,000, 1,500, 1,500, 1,500, and 1,500
Release Type: Liquid
DNAPL/Air Toxics/Toxic Substance: NAPL

Composition Information:

Ingredient	***CAS#***	***Percent***
N/A	N/A	N/A

Flammability Information:

LEL (% in air)	***UEL (% in air)***	***Autoignition Temperature (°C/°F)***	***Water Solubility***	***Volatility***	***Oxidizing Properties***
0.9	7.0	N/A	Negligible	N/A	N/A

Notes: N/A - not available

Reactivity Information:
Material is stable under normal conditions and will not undergo hazardous polymerization, but should avoid excessive heat, high energy sources of ignition, and strong oxidizers.

Human Health Effects:
Repeated and/or prolonged exposure may cause irritation to the skin, eyes, or respiratory tract.

Exposure Limits				
Ingredient	***Source***	***TLV***	***Source***	***PEL***

		(8 hour period)		*(8 hour period)*
Product (mist/aerosol)	ACGIH	5 mg/m3	ACHIG	10 mg/m3 (STEL)

Acute Toxicity Data	
Route	***LD50***
Inhalation	5,000 mg/m3 (LC)
Ingestion	2,000 mg/kg
Skin	2,000 mg/kg

Contents: Machine Oil (2)
Tank ID: 3-101, 5-3-230, 5-3-240, 5-3-250, 6-3-7361, 7-3-260, 8-2-301D, 8-301MD, and 8-3-3015
Maximum Volume: 4,000, 1,400, 4,400, 1,200, 4,000, 1,500, 1,500, 1,500, and 1,500
Release Type: Liquid
DNAPL/Air Toxics/Toxic Substance: NAPL

Composition Information:

Ingredient	*CAS#*	*Percent*
N/A	N/A	N/A

Flammability Information:

LEL (% in air)	*UEL (% in air)*	*Autoignition Temperature (℃/℉)*	*Water Solubility*	*Volatility*	*Oxidizing Properties*
N/A	N/A	N/A	Negligible	N/A	N/A

Notes: N/A - not available

Reactivity Information:
Material is stable under normal conditions and will not undergo hazardous polymerization, but should avoid excessive heat, high energy sources of ignition, and strong oxidizers.

Human Health Effects:
Negligible hazards at normal temperatures (up to 38 degrees Celsius). Elevated temperatures or mechanical action may form vapours, mists or fumes, which may be irritating to eyes, nose, throat, and lungs.

Exposure Limits				
Ingredient	***Source***	***TLV***	***Source***	***PEL***

		(8 hour period)		*(8 hour period)*
Product (mist/aerosol)	N/A	N/A	ACHIG	5 mg/m3 (STEL)

Acute Toxicity Data	
Route	***LD50***
Inhalation	5,000 mg/m3 (LC)
Ingestion	5,000 mg/kg
Skin	3,160 mg/kg

Contents: Petroleum Coke (pet coke)
Silo ID: 6-3-630, 6-3-632 and 6-3-634
Maximum Capacity: 1,100 tonnes each
Release Type: Solid dust
DNAPL/Air Toxics/Toxic Substance: NAPL

Composition Information:

Ingredient	*CAS#*	*Percent*
Petroleum Coke	64741-79-3	100%

Flammability Information:

LEL (% in air)	*UEL (% in air)*	*Autoignition Temperature (°C/°F)*	*Water Solubility*	*Volatility*	*Oxidizing Properties*
N/A	N/A	N/A	Negligible	N/A	N/A

Notes: N/A - not available

Reactivity Information:
Material is stable under normal conditions and will not undergo hazardous polymerization, but should avoid strong oxidizers.

Human Health Effects:
Negligible hazards at normal temperatures (up to 38 degrees Celsius). Dust may be irritating to eyes, nose, throat, and lungs.

Exposure Limits				
Ingredient	*Source*	*TLV (8 hour period)*	*Source*	*PEL (8 hour period)*

Petroleum Coke	NA	10 mg/m3	NA	5 mg/m3

Acute Toxicity Data	
Route	***LD50***
Ingestion	> 2000 mg/kg
Skin	> 2000 mg/kg

Contents: Coal
Silo ID: 6-3-630, 6-3-632 and 6-3-634
Maximum Capacity: 1,100 tonnes each
Release Type: Solid dust
DNAPL/Air Toxics/Toxic Substance: NAPL

Composition Information:

Ingredient	***CAS#***	***Percent***
Coal	NA	100%

Flammability Information:

LEL (% in air)	***UEL (% in air)***	***Autoignition Temperature (°C/°F)***	***Water Solubility***	***Volatility***	***Oxidizing Properties***
N/A	N/A	Above 704°C ***/1299°F***	Negligible	N/A	N/A

Notes: N/A - not available

Reactivity Information:
Material is stable under normal conditions, but should avoid strong oxidizers.

Human Health Effects:
Negligible hazards at normal temperatures. Airborne respirable dust may cause irritation to the nose, throat and lungs. Dust particles may mechanically irritate the eyes and impair vision. Prolonged and or repeated exposure via inhalation may result in progressive and permanent lung disorders and damage.

Exposure Limits				
Ingredient	***Source***	***TLV (8 hour period)***	***Source***	***PEL (8 hour period)***
Coal	NA	2 mg/m3	NA	2.4 mg/m3

Acute Toxicity Data	
Route	***LD50***
NA	NA
NA	NA

7.1.2 HANDLING AREAS

The primary handling areas for the chemicals, as listed in Section 7.1.1, are the same as the storage areas listed above. St. Marys has in place several procedures in place for the handling of the pollutants at the Facility, such as:

- Standard Operating Procedures (SOP) for the proper handling and disposal of general waste and recyclable material. The purpose of this SOP is to minimize/eliminate the spilling of fuel into the natural environment (ground, drains, natural waterways, etc.), as well as maintain a safe working environment in that area. Please refer to PD 00266 Waste Management Procedure.
- SOP for spill response in the event that a material release occurs. The purpose of this SOP is to ensure efficiency in containing and reporting spills. Please refer to PD 00788 Spill Response Procedure.

7.1.3 PROCESSING AREAS

The processing of the chemicals of concern, as listed in Section 7.1.1, are primarily limited to their use as a fuel, heating source, or process aid (i.e., furnace oil, gasoline, diesel, pet coke, and hydraulic oils). The Aqua Ammonia (19%) and grinding aids are used in the Atox Mill Building as additives. The ethylene glycol is used as a non-contact cooling agent for processes at the Facility.

7.1.4 DISPOSAL AREAS

There are not active disposal areas at the Facility. Cement kiln dust (CKD) generated at the Facility is stored at the facility and sold to companies for the production of fertilizers or soil stabilization. Wastes are temporarily stored in specific areas pending off-Site disposal by an appropriately licensed contractor. Waste storage areas include areas for the storage of waste oils, chemicals, and oily rags. Locations of the disposal areas are as follows:

- **Waste oils:** are contained in AST 1-126, south of the Lubrication Building. Waste oils are also stored within storage drums and placed in a temporary storage area, south of the lubricant storage building (below grade concrete pad).
- **Waste chemicals:** waste ethylene glycol and chemicals are contained within storage drums and placed in a temporary storage area, south of the lubricant storage building (below grade concrete pad).
- **Oily rags:** contained within storage drums and placed in a temporary storage area, south of the lubricant storage building (below grade concrete pad).

7.2 PHYSICAL AND GEOGRAPHICAL CHARACTERISTICS

Physical and geographical characteristics of concern would include such things as roadways, forklift traffic, vicinity to actual work areas, etc. The following table lists any factors that could contribute to the possibility of a spill occurring at any of the locations listed in Section 6.1.1:

Tank ID/Location	*Contents*	*Physical or Geographical Characteristics*
1-110-1 (UST)	Furnace Oil	None; tank out of main roadway, below ground surface, and not within a work area.
1-127 (AST)	Diesel	None; tank out of main roadway and not within a work area.
1-128 (AST)	Diesel and gas	None; tank out of main roadway and not within a work area.
1-3-2575 (AST)	Diesel	None; tank out of main roadway, within protective concrete barrier, and not within a work area.

Tank ID/Location	*Contents*	*Physical or Geographical Characteristics*
1-1393 (AST)	Furnace Oil	None; tank out of main roadway and not within a work area.
3-098 (AST)	Diesel	None; tank out of main roadway, within protective caged area, and not within a work area.
6-310 (AST)	Diesel	None; tank out of main roadway, within protective concrete barrier, and not within a work area.
6-3-6063 (AST)	Furnace Oil	None; tank adjacent to main roadway, but within protective concrete barriers, and not within a work area.
1-125 (mobile)	Diesel	Storage tank part of a mobile vehicle, moving between work areas for the purpose of refueling other equipment and vehicles within the Facility. When not in use, vehicle is parked out of main roadway and work areas.
Quarry Mobile Tank	Diesel	Storage tank part of a mobile vehicle, moving between work areas for the purpose of refueling other equipment and vehicles within the Facility quarry. When not in use, vehicle is parked out of main roadway and work areas.
1-126 (AST)	Waste Oil	None; tank out of main roadway, within a below-grade, protective concrete pad/caged area, and not within a work area.
6-3-2951 (AST)	Aqua Ammonia (19%)	None; tank out of main roadway, within protective concrete barriers, and not within a work area.
1-2006 (AST)	Ethylene Glycol	None; tank within a work building (Finish Mill Building), but not within immediate work area.
1-3-205 (AST)	Ethylene Glycol	None; tank out of main roadway and not within a work area.

Tank ID/Location	*Contents*	*Physical or Geographical Characteristics*
6-3-413 (AST)	Ethylene Glycol	None; tank out of main roadway and not within a work area.
7-3-255 (AST)	Ethylene Glycol	None; tank out of main roadway and not within a work area.
8-321-1 (AST)	Grinding Aid	None; tank within a work building (Finish Mill Building), but not within immediate work area.
8-321-2 (AST)	Grinding Aid	None; tank within a work building (Finish Mill Building), but not within immediate work area.
Oil Containing Transformers	Oil	None; tank out of main roadway and not within a work area.
Hydraulic Oil Containing Process Equipment	Hydraulic Oil	Most of the process equipment are inside buildings.
Stores Lubrication Area	Oil in drums and totes	None; liquid out of main roadway, within a below-grade, protective concrete pad/caged area, and not within a work area.
Waste Storage Area	Liquid waste in drums and totes (oil, solvents, grease, glycol, other)	None; liquid wastes out of main roadway, protective concrete pad/caged area, and not within a work area.
6-3-630 6-3-632 6-3-634 Silos for solid fuel	Pet Coke Coal	None; solid fuel, silos out of main roadway, structure protects silos against vehicle impact.

7.3 SPILL HISTORY

The details of the spills since 2004 are as follows:

Date	*Description*	*Corrective Action/Prevention*

Date	*Description*	*Corrective Action/Prevention*
June 4, 2004	Oil spill from primary crusher, leak of oil from broken hose spilled inside the primary crusher and then transported by conveyor belt, oil impacted the area along the conveyor belt.	Cleaned area impacted by the spill. Low level alarm was installed to detect possible leaks from primary crusher.
June 4, 2004	Failure of heat exchanger from the finish mill building allowed water enter the holding tank for glycol, causing the tank to overflow and reach the water drain.	Cleaned spill with absorbent material and vacuum truck. Containment area was constructed around glycol tank.
June 17, 2004	Valve was left open by operator and the grinding aid main tank overflowed mixing tank. Spill was contained inside finish mill building	Cleaned spill. Level alarms were installed that trigger shut off valve between main tank and mixing tank.
February 4, 2005	Quarry fuel tank overfilled by fuel supplier.	Spill was contained in containment area. Spill was cleaned. Procedure reviewed with supplier.
June 7, 2005	Leak in insulator bushing from transformer T4 caused by over temperature.	Oil spill was cleaned, reviewed level switch settings. Evaluated construction of spill containment for transformers.
June 17, 2005	Failure in one compressor of main compressor room caused to overload the oil separator for condensates. Oil spilled on the floor reaching a drain inside the compressor room.	Spill was cleaned and drains inside the compressor room were sealed or isolated by a curb.
July 6, 2005	Spill of oil from the cement finish mill number 2. The finish mill has an oil tank for the lubrication system that had a small leak that dripped oil into the water trough of the cement cooler. The water from the cooler is drained into the plant sewer and discharged to Darlington Creek.	Spill was cleaned, review incident with maintenance personnel to avoid overfilling the oil tank. Oil separator was installed at final discharge to capture oil spills at the plant.

Date	*Description*	*Corrective Action/Prevention*
October 20, 2005	Overflow lubrication tank from primary crusher. Oil screen was pluged causing oil spill. Oil reached sump pump but was contained in quarry sump.	Clean spill. Maintenance created a checklist to clean oil screen. Oil interceptor was installed to capture oil spills from primary crusher.
September 21, 2006	Failure in lubrication line from vacuum truck.	Spill was contained and cleaned. Review maintenance program with supplier (Scott services). Equipment was repaired by supplier.
June 3, 2009	Petcoke emissions from hopper servicing dust collectors of petcoke silos.	Spill cleaned. Production reviewed cleaning procedures for hopper.
June 10, 2009	Emissions of limestone dust from air ducts (preheater tower)	Process back to stable operation and reviewed control settings of ID fan.
January 30, 2012	Oil spill quarry garage. Impacted soil in front of garage but didn't reach water ways. Leak of oil from a coupling from oil storage tote.	Repaired coupling, install manual shut off valve. Spill was cleaned.
July 6, 2012	Spill of oily water from power washing equipment (trunion housing) in finish mill area. The spill reached a storm water ditch, but was contained before reaching the creek.	Revised procedure with contractor. Spill was cleaned and impacted soil was sent for disposal
July 9, 2013	Spill of raw feed from kiln feed baghouse. Flush of material while poking plugged hopper. Visible fugitive dust.	Revised procedure with production to clean up material in the hopper before poking.
November 27, 2014	Spill of dust from coal bag house due to explosion of the baghouse.	Revised procedure with production and modifications to equipment
January 27, 2015	Leak of fuel from underground tanks from Hutton Transport operation	Contaminated soil with fuel was found when removing fuel tanks. Clean up was done and contaminated material was sent for disposal

Date	*Description*	*Corrective Action/Prevention*
April 15, 2015	Leak heat exchanger raw mill (Atox)	Two oil interceptors were cleaned and small amount of oil that went to the creek was cleaned.
June 27, 2015	Oil spill, 1000 litre oil tote drained inside the quarry garage and flow outside the building.	Oil was cleaned and changed connectors of the totes to avoid possible re-occurrence.
March 14, 2016	Emissions of dust from bypass baghouse while doing annual PM	Material was cleaned and practice reviewed to ensure clean up is done before closing damper
March 31, 2016	Spill of water with solids from underground water pipe.	Due to warm weather water underground pipe broke. Soil carried with the water entered the drain system and discharged to Darlington Creek. Water pipe was closed and repaired

- **7.4 POTENTIALLY AFFECTED PARTIES**

A zoning map for the area surrounding the Facility has been included as Figure 1. The zoning map was provided through the Municipality of Clarington. According to the map, the Facility is zoned as a general industrial and aggregate extraction area. Portion of the Facility is also zoned as waterfront greenway. The eastern extents of the Facility is zoned as an environmental protection area. To the area immediately north of the Facility, it is zoned as waterfront greenway, environmental protection area, and green space. Visually, to the north of the Facility is a hotel, several residences, storage facilities, and several small businesses. To the east of the Facility is a marsh and a marina. Beyond this area is a residential community. To the south of the Facility is Lake Ontario. To the south of the quarry area, several residences could be seen. To the west of the Facility is the Darlington Nuclear Power Plant. Transportation corridors (or streets/roadways) around the Facility include Holt Road (west), South Service Road, Symons Road, and Highway 401 (north), and Waverly Road (east). Of the residents to the south and east of the Facility, many have water wells, some using the groundwater for consumption.

The primarily affected parties in the event of a spill therefore, include:

- Residential zoned areas to south and east;
- Places of business (north);
- Roadways - Holt Road (west), South Service Road, Symons Road, and Highway 401 (north), and Waverly Road (east);
- Wells and intakes of drinking water systems (residential area to the east and south);
- Surface water bodies – Darlington creek running adjacent to the quarry (ultimately discharging to Lake Ontario), and Lake Ontario;
- Fish habitats - Lake Ontario.

7.5 DISCHARGE POINTS

Discharges from the Facility are regulated under an Act of Ontario or Canada or by-law, both for air and surface water discharges. In accordance with Section 26 of Ontario Regulation (O.Reg.) 419/05, St. Marys is required to obtain a Certificate of Approval (C of A)(Air), for the release of criteria air contaminants to the atmosphere. A full assessment of discharges to the air as a result of processes at the Facility is detailed as part of St. Marys Application for C of A (Air).

The Facility has one major surface water discharge point at the site that is regulated under O.Reg. 561/94, Effluent Monitoring and Effluent Limits - Industrial Minerals Sector, also referred to as the Municipal/Industrial Strategy for Abatement (MISA) program. The MISA Station 0100 handles the stormwater and process water discharge from the Facility and outlets into a creek, which then drains into Lake Ontario.

7.6 LOADING AND UNLOADING AREAS

Loading of the finished product at the Facility occurs at the north side of the Facility, from the cement storage silos, located adjacent to the on-Site railway tracks. Loading of barges for shipment of cement and clinker occurs at the south side of the Facility at the pier. Liquid fuels and all other chemicals are unloaded directly into the ASTs or other storage areas as indicated in Section 7.1.1.

7.7 WATER SUPPLY SYSTEMS

The water for domestic purposes for the Facility is supplied from the municipality. The Facility draws is process water, such as non-contact cooling water, from Lake Ontario.

7.8 PIPELINES

Pipelines at the Facility are used for cooling water, lubrication systems and fuel systems and all other chemicals indicated in Section 7.1.1. Final product is moved through conveyors and airslides to storage silos, where they await for final distribution. Water used for the processes at St. Marys is ultimately discharged to MISA Station 0100.

8.0 SPILL POTENTIAL AND EXTENT OF IMPACTS

For those potential spill sources/locations identified in Section 7.1.1, the following is an analysis of the potential for spills to occur at these sources. The likelihood of each spill being based on the following criteria:

1. The properties and characteristics of all pollutants used at the plant and, for each pollutant, the maximum expected quantity of the pollutant that may be at the plant;
2. The manner in which each pollutant is stored, handled, processed and disposed of at the plant;
3. The physical and geographical characteristics of the location at which each pollutant is stored, handled, processed, and disposed of at the plant;
4. Whether there have been previous spills of the pollutant at the plant or relating to its operations; and
5. Any other relevant factors.

In the MOE guidance document "Guideline for Implementing Spill Prevention and Contingency Plans Regulatory Requirements (O.Reg.224/07)" (May 2007) (Guidance Document), it is suggested that spill probability at each location be determined using common scale approach, such as the following:

Very Unlikely	Less than 1 event every 200 years
Unlikely	At least 1 event every 200 years
Possible	At least 1 event every 30 years
Very Possible	At least 1 event every 10 years
Certain	1 or more event every year

The Guidance Document also suggests that the following factors be considered, to assist in categorizing the likelihood of each spill event:

- Historical weather date;
- Equipment failure rates;
- Preventative maintenance data;
- Professional judgment; and
- Human error analysis.

Based on considerations mentioned in Section 7.0, a qualitative approach was taken in determining the likelihood of a spill occurring.

In assessing potential adverse effects for each potential spill the suggested approach discussed in the Guidance Document was followed. Specifically, the following criteria were considered in estimating potential adverse effects:

- Physical and chemical characteristics of the pollutant;
- Which media the pollutant would be released to in the event of a spill (i.e., air, land, or water);
- Known human health and environmental threats posed by pollutant;
- Professional judgment; and
- Characteristics of the receptor.

Once the estimate of the adverse effect was determined, the scale of the adverse effect was categorized using the following table:

Impact	***Description***
Catastrophic	May cause fatalities
Severe	Impacts to health (non-fatal) or widespread injury or damage to the environment that is difficult to remediate
Moderate	Material discomfort or localized impacts to property or the natural environment that can be remediated
Low	Easily remediated impacts to individual property
None	No impact

The following sections discuss the spill potential and impacts extents for each source.

Source: 1-110-1 (UST)
Location: West of plant service building
Volume: 22,700 litres
Contents: Furnace Oil

Spill Probability (Unlikely): tank has secondary containment measures to ensure containment of the furnace oil. The tank is buried below the ground surface, and is a double walled tank. The double wall tank has an alarm in case that the vacuum of the interstitial space is lost. The tank is also out of the way of any main roadways, work areas, or any other factors that could contribute to the possibility of a spill occurring

from the tank. There are also no historical records to suggest a spill is likely to occur from this tank.

Based on secondary containment measures and the absence of any major factors promoting spill potential, it is believed that this tank and its contents present a low or unlikely spill potential.

Potential Impact (Low): In a worst-case scenario, assuming all of the furnace oil leaked, it would leach into the surrounding soil pack, and potentially beneath the service building/maintenance shop (due to its relatively close proximity). It is most likely that any potential spill would be contained on the Facility property and would not migrate off-Site given the distance between the UST and the on-Site creek and the property line.

As spill would be contained within the subsurface, no adverse health affects due to exposure would be anticipated for Facility personnel. However, exposure to furnace oil vapours is possible immediately adjacent to the UST in the event of a spill, and proper PPE would be required during cleanup activities. Exposure is unlikely further from the UST and even more unlikely off-Site due to the spill occurring within the subsurface. Exposure to furnace oil, causes skin irritation. Inhalation can cause respiratory tract irritation, weakness, dizziness, fatigue, loss of consciousness, central nervous system effects, and in some causes can be fatal. Impacted soils would be remediated by St. Marys to prevent ongoing contamination.

Source: 1-127 (AST)
Location : Lake pumphouse
Volume: 1,000 litres
Contents: Diesel

Spill Probability (Unlikely): AST 1-127 is a double walled tank. Pressure monitoring is conducted regularly on all double walled tanks at the Facility to ensure tank content containment. The tank is also out of the way of any main roadways, work areas, or any other factors that could contribute to the possibility of a spill occurring from the tank. There are also no historical records to suggest a spill is likely to occur from this tank.

Based on secondary containment measures and the absence of any major factors promoting spill potential, it is believed that this tank and its contents present a low or unlikely spill potential.

Potential Impact (Moderate): In a worst-case scenario (failed secondary containment), assuming all of the diesel drained to the paved ground surface, it could run off to the outside ground surface and infiltrate to the overburden and/or evaporate, some of the fuel could run off to the pumphouse wet well and reach the process water drain system to a maximum of 1,000 litres. It is most likely that most of the fuel in any potential spill would be contained on the Facility property and would not migrate off-Site given the distance between the AST and Lake Ontario and the property line. Impacted soils would be remediated by St. Marys to prevent ongoing contamination.

Given the spill would occur from an above ground storage tank (AST), Facility personnel may be exposed to the diesel. Material is irritating to skin. If swallowed, may be aspirated and cause lung damage. May be irritating to the eyes, nose, throat, and lungs. It is unlikely that personnel exposure would go beyond risk associated with inhalation or dermal contact (i.e., ingestion of liquid). Exposure to diesel vapours is possible immediately adjacent to the AST in the event of a spill, and proper PPE would be required during cleanup activities. Exposure is unlikely further from the AST and even more unlikely off-Site due to the relatively low volume of diesel.

Source: 1-128 (AST)
Location: North Armtec building
Volume: 4,540 litres
Contents: Diesel and Gasoline

Spill Probability (Unlikely): AST 1-128 is a double walled tank. Pressure monitoring is conducted regularly on all double walled tanks at the Facility to ensure tank content containment. The tank is also out of the way of any main roadways, work areas, or any other factors that could contribute to the possibility of a spill occurring from the tanks. There are also no historical records to suggest a spill is likely to occur from these tanks.

Based on secondary containment measures and the absence of any major factors promoting spill potential, it is believed that this tank and its contents present a low or unlikely spill potential.

Potential Impact (Moderate): In a worst-case scenario (failed secondary containment), assuming all of the diesel and gasoline drained to the paved ground surface, it could run off to an unpaved ground surface and infiltrate to the overburden and/or evaporate, to a maximum of 5,540 litres. Some of the fuel could run to a storm drain located west of the primary crusher. It is most likely that most of the fuel in any potential spill would be contained on the Facility property and would not migrate off-Site given the distance

between the AST and the on-Site creek and the property line. Impacted soils would be remediated by St. Marys to prevent ongoing contamination.

Given the spill would occur from an above ground storage tank (AST), Facility personnel may be exposed to the diesel or gasoline. Material is irritating to skin. If swallowed, may be aspirated and cause lung damage. May be irritating to the eyes, nose, throat, and lungs. It is unlikely that personnel exposure would go beyond risk associated with inhalation or dermal contact (i.e., ingestion of liquid). Exposure to diesel and gasoline vapours is possible immediately adjacent to the AST in the event of a spill, and proper PPE would be required during cleanup activities. Exposure is unlikely further from the AST and even more unlikely off-Site due to the relatively low volume of diesel and gasoline.

Source: 1-3-2575 (AST)
Location : South of cooler electrical room
Volume: 2,270 litres
Contents: Diesel

Spill Probability (Unlikely): AST 1-3-2575 is a double walled tank within a concrete enclosure. Pressure monitoring is conducted regularly on all double walled tanks at the Facility to ensure tank content containment. Visual inspection of the concrete enclosure indicated that the enclosure is likely of adequate volume to contain the tank contents in the event of a spill. The tank is also out of the way of any main roadways, work areas, or any other factors that could contribute to the possibility of a spill occurring from the tank. There are also no historical records to suggest a spill is likely to occur from this tank.

Based on secondary containment measures and the absence of any major factors promoting spill potential, it is believed that this tank and its contents present a low or unlikely spill potential.

Potential Impact (Low): In a worst-case scenario (failed secondary containment), assuming all of the diesel drained to the paved ground surface, it could run off to the outside ground surface and infiltrate to the overburden and/or evaporate, to a maximum of 2,270 litres. It is most likely that any potential spill would be contained on the Facility property and would not migrate off-Site given the distance between the AST and Lake Ontario and the property line. Impacted soils would be remediated by St. Marys to prevent ongoing contamination. In all likelihood however, as the tank is within a concrete enclosure, in the event of a spill, all liquids would be contained.

Given the spill would occur from an above ground storage tank (AST), Facility personnel may be exposed to the diesel. Material is irritating to skin. If swallowed, may be aspirated and cause lung damage. May be irritating to the eyes, nose, throat, and lungs. It is unlikely that personnel exposure would go beyond risk associated with inhalation or dermal contact (i.e., ingestion of liquid). Exposure to diesel vapours is possible immediately adjacent to the AST in the event of a spill, and proper PPE would be required during cleanup activities. Exposure is unlikely further from the AST and even more unlikely off-Site due to the relatively low volume of diesel.

Source: 1-1393 (AST)
Location : West of employees lunchroom
Volume: 2,270 litres
Contents: Furnace Oil

Spill Probability (Unlikely): AST 1-1393 is a double walled tank with surrounding concrete barriers. Pressure monitoring is conducted regularly on all double walled tanks at the Facility to ensure tank content containment. The tank is also out of the way of any main roadways, work areas, or any other factors that could contribute to the possibility of a spill occurring from the tank. There are also no historical records to suggest a spill is likely to occur from this tank.

Based on secondary containment measures and the absence of any major factors promoting spill potential, it is believed that this tank and its contents present a low or unlikely spill potential.

Potential Impact (Low): In a worst-case scenario (failed secondary containment), assuming all of the furnace oil drained to the ground surface, it could infiltrate to the overburden and/or evaporate, to a maximum of 2,270 litres. It is most likely that any potential spill would be contained on the Facility property and would not migrate off-Site given the distance between the AST and Lake Ontario, the creek, and the property line. Impacted soils would be remediated by St. Marys to prevent ongoing contamination.

Given the spill would occur from an above ground storage tank (AST), Facility personnel may be exposed to the furnace oil. Furnace oil causes skin irritation. Inhalation can cause respiratory tract irritation, weakness, dizziness, fatigue, loss of consciousness, central nervous system effects, and in some cases can be fatal. It is unlikely that personnel exposure would go beyond risk associated with brief inhalation

or dermal contact (i.e., ingestion of liquid). Exposure to furnace oil vapours is possible immediately adjacent to the AST in the event of a spill, and proper PPE would be required during cleanup activities. Exposure is unlikely further from the AST and even more unlikely off-Site due to the relatively low volume of furnace oil.

Source: 3-098 (AST)
Location : North of primary crusher
Volume: 45,400 litres
Contents: Diesel

Spill Probability (Possible): AST 3-098 is a double walled tank within a caged area within the quarry. There is an earth berm surrounding the tank to limit the area impacted by a possible spill. Pressure monitoring is conducted regularly on all double walled tanks at the Facility to ensure tank content containment. The tank is also out of the way of any main roadways, work areas, or any other factors that could contribute to the possibility of a spill occurring from the tank. There is one historical records to suggest that a spill is possible to occur from this tank.

Based on secondary containment measures and the absence of any major factors promoting spill potential, it is believed that this tank and its contents present a low or unlikely spill potential.

Potential Impact (Moderate): In a worst-case scenario (failed secondary containment), assuming all of the diesel drained to the ground surface, it could run off to the outside ground surface and infiltrate to the overburden and/or evaporate, to a maximum of 45,400 litres. Impacted soils would be remediated by St. Marys to prevent ongoing contamination.

Given the spill would occur from an above ground storage tank (AST), Facility personnel may be exposed to the diesel. Due to the volume of diesel that could be spilled, there is an increased exposure risk to Facility personnel. Material is irritating to skin. If swallowed, may be aspirated and cause lung damage. May be irritating to the eyes, nose, throat, and lungs. It is unlikely that personnel exposure would go beyond risk associated with inhalation or dermal contact (i.e., ingestion of liquid). Exposure to diesel vapours is likely immediately adjacent to the AST in the event of a spill, and proper PPE would be required during cleanup activities. Exposure is unlikely further from the AST and off-Site.

Source: 6-310 (AST)

Location : North of kiln diesel generator building
Volume: 2,250 litres
Contents: Diesel

Spill Probability (Unlikely): AST 6-310 is a double walled tank with concrete barriers surrounding it. Periodic inspections are performed to ensure the integrity of the double wall. The tank is also out of the way of any main roadways, work areas, or any other factors that could contribute to the possibility of a spill occurring from the tank. There are also no historical records to suggest a spill is likely to occur from this tank.

Based on secondary containment measures and the absence of any major factors promoting spill potential, it is believed that this tank and its contents present a low or unlikely spill potential.

Potential Impact (Low): In a worst-case scenario (failed secondary containment), assuming all of the diesel drained to the surrounding ground surface, it could run off to the outside ground surface and infiltrate to the overburden and/or evaporate, to a maximum of 2,250 litres. It is most likely that any potential spill would be contained on the Facility property and would not migrate off-Site given the distance between the AST and the creek, Lake Ontario, and the property line. Impacted soils would be remediated by St. Marys to prevent ongoing contamination.

Given the spill would occur from an above ground storage tank (AST), Facility personnel may be exposed to the diesel. Material is irritating to skin. If swallowed, may be aspirated and cause lung damage. May be irritating to the eyes, nose, throat, and lungs. It is unlikely that personnel exposure would go beyond risk associated with inhalation or dermal contact (i.e., ingestion of liquid). Exposure to diesel vapours is possible immediately adjacent to the AST in the event of a spill, and proper PPE would be required during cleanup activities. Exposure is unlikely further from the AST and even more unlikely off-Site due to the relatively low volume of diesel.

Source: 6-3-6063 (AST)
Location : Kiln preheating oil, east of cooler building.
Volume: 50,000 litres
Contents: Furnace Oil

Spill Probability (Unlikely): AST 6-3-6063 is contained within a concrete containment area, which is within a building. In the event of a spill from the tank, contents would be contained within this concrete containment area. The tank is also out of the way of any

main roadways, work areas, or any other factors that could contribute to the possibility of a spill occurring from the tank. There are also no historical records to suggest a spill is likely to occur from this tank.

Based on secondary containment measures and the absence of any major factors promoting spill potential, it is believed that this tank and its contents present a low or unlikely spill potential.

Potential Impact (Low): In a worst-case scenario of the failure of the integrity of the tank all of the furnace oil drained would be captured in the concrete secondary containment. Spilled material would be recovered from the containment area.

Given the spill would occur from an above ground storage tank (AST) contained within a building, the likelihood that Facility personnel may be exposed to the furnace oil is very low. Due to the volume of furnace oil that could be spilled, there is an increased exposure risk to Facility personnel tasked with correcting the problem and cleaning up the spill. Material is irritating to skin. If swallowed, may be aspirated and cause lung damage. May be irritating to the eyes, nose, throat, and lungs. Exposure to diesel vapours is very likely immediately adjacent to the AST in the event of a spill, and proper PPE would be required during cleanup activities. Exposure is unlikely further from the AST and off-Site.

Source: Quarry Mobile Tank
Location : Mobile source
Volume: 2,200 litres
Contents: Diesel

Spill Probability (Unlikely): truck mounted tank is a double walled tank. Periodic inspections are conducted to ensure the integrity of the double wall. The tank is used within the Facility quarry to provide fuel to equipment and machinery, so is driven along the main roadways on-Site, and is used within or by work areas; when parked/not in use, vehicle is moved off the main roadways and not within any work areas. No other factors were determined that could contribute to the possibility of a spill occurring from the tank. There are also no historical records to suggest a spill is likely to occur from this tank.

Based on secondary containment measures and the absence of any major factors promoting spill potential, it is believed that this tank and its contents present a low or unlikely spill potential.

Potential Impact (Low): In a worst-case scenario (failed secondary containment), assuming all of the diesel drained to the surrounding ground surface, it could infiltrate to the overburden and/or evaporate to a maximum of 2,200 litres. It is most likely that any potential spill would be detected by St Marys personnel and contained on the Facility property and would not migrate off-Site given the very small volume of diesel within this tank. Impacted soils would be remediated by St. Marys to prevent ongoing contamination should the diesel infiltrate to the overburden. If any diesel were to the storm drain, the diesel-impacted water could be pumped out from the oil-water separator installed west to the MISA sampling point.

Given the spill would occur from an above ground storage tank (AST), Facility personnel may be exposed to the diesel. Material is irritating to skin. If swallowed, may be aspirated and cause lung damage. May be irritating to the eyes, nose, throat, and lungs. It is unlikely that personnel exposure would go beyond risk associated with inhalation or dermal contact (i.e., ingestion of liquid). Exposure to diesel vapours is possible immediately adjacent to the AST in the event of a spill, and proper PPE would be required during cleanup activities. Exposure is unlikely further from the AST and even more unlikely off-Site due to the relatively low volume of diesel.

Source: 1-126 (AST)
Location: Subject waste storage area
Volume: 5,000 litres
Contents: Waste Oil

Spill Probability (Unlikely): AST 1-126 is stored in a containment concrete area (enclosure). The tank is adjacent to, but out of the way of a main roadway, and is out of the way of work areas, or any other factors that could contribute to the possibility of a spill occurring from the tank.

Based on secondary containment measures and the absence of any major factors promoting spill potential, it is believed that this tank and its contents present a low or unlikely spill potential.

Potential Impact (Low): In a worst-case scenario of the failure of the integrity of the tank all of the waste oil drained would be captured in the concrete secondary containment. Spilled material would be recovered from the containment area.

Given the spill would occur from an above ground storage tank (AST), Facility personnel may be exposed to the waste oil. Repeated and/or prolonged exposure may cause irritation to the skin, eyes, or respiratory tract. It is unlikely that personnel exposure would go beyond risk associated with brief inhalation or dermal contact (i.e., ingestion of liquid). Exposure to the waste oil vapours is possible immediately adjacent to the AST in the event of a spill, and proper PPE would be required during cleanup activities. Exposure is unlikely further from the AST and even more unlikely off-Site due to the relatively low volume of the waste oil.

Source: 6-3-2951 (AST)
Location : East of raw mill (Atox) building
Volume: 38,000 litres
Contents: Aqua Ammonia (19%)

Spill Probability (Unlikely): AST 6-3-2951 is stored in a concrete enclosure. The tank is adjacent to, but out of the way of a main roadway, and is out of the way of work areas, or any other factors that could contribute to the possibility of a spill occurring from the tank. There are also no historical records to suggest a spill is likely to occur from this tank.

Based on secondary containment measures and the absence of any major factors promoting spill potential, it is believed that this tank and its contents present a low or unlikely spill potential.

Potential Impact (Moderate): In a worst-case scenario of the failure of the integrity of the tank all of the aqua ammonia (19%) drained would be captured in the concrete secondary containment. Spilled material would be recovered from the containment area.

Given the spill would occur from an above ground storage tank (AST), Facility personnel in the immediate area may be exposed to the ammonia vapour. The ammonia may cause caustic injury. The extent of injury may range from mild skin irritation and coughing to severe burns, laryngeal edema and life-threatening pulmonary edema. It is corrosive upon contact and inhalation, and toxic for ingestion. It is unlikely that personnel exposure would go beyond risk associated with inhalation or dermal contact (i.e., ingestion of liquid), though given the severity of health effects to humans, proper

PPE would be required during cleanup activities and all other non-essential personnel removed from the area. Exposure is possible further from the AST and though unlikely off-Site as the ammonia vapour becomes diluted as it disperses to the surrounding areas.

Source: 1-2006 (AST)
Location : Compressor room finish mill building
Volume: 7,500 litres
Contents: Ethylene Glycol

Spill Probability (Possible): AST 1-2006 is stored in a concrete enclosure. The tank is located within the Finish Mill Building, within an active work area though with no significant foot traffic or mobile vehicles.

Based on secondary containment measures and the absence of any major factors promoting spill potential, it is believed that this tank and its contents present a possible spill potential.

Potential Impact (Low): In a worst-case scenario of the failure of the integrity of the tank all of the ethylene glycol would be captured in the concrete secondary containment. Spilled material would be recovered from the containment area.

Given the spill would occur from an above ground storage tank (AST), Facility personnel may be exposed to the ethylene glycol. Harmful and potentially fatal if swallowed. May cause kidney failure and central nervous system effects if ingested. Prolonged exposure to mists or liquids may cause skin, eye and respiratory irritation. It is unlikely that personnel exposure would go beyond risk associated with dermal contact (i.e., inhalation of vapour or ingestion of liquid). Exposure to ethylene glycol is possible for those containing and recovering the spilled material and as such, proper PPE would be required during cleanup activities. Exposure is unlikely further from the AST and even more unlikely off-Site due to the relatively low volume and low volatility of the ethylene glycol.

Source: 1-3-205 (AST)
Location : Main compressor room
Volume: 2,850 litres
Contents: Ethylene Glycol

Spill Probability (Unlikely): AST 1-3-205 is stored in a concrete enclosure. The tank is located within the Main Compressor Building, within an active work area though with

no significant foot traffic or mobile vehicles. There are also no historical records to suggest a spill is likely to occur from this tank.

Based on secondary containment measures and the absence of any major factors promoting spill potential, it is believed that this tank and its contents present a low or unlikely spill potential.

Potential Impact (Low): In a worst-case scenario of the failure of the integrity of the tank all of the ethylene glycol would be captured in the concrete secondary containment. Spilled material would be recovered from the containment area.

Given the spill would occur from an above ground storage tank (AST), Facility personnel may be exposed to the ethylene glycol. Harmful and potentially fatal if swallowed. May cause kidney failure and central nervous system effects if ingested. Prolonged exposure to mists or liquids may cause skin, eye and respiratory irritation. It is unlikely that personnel exposure would go beyond risk associated with dermal contact (i.e., inhalation of vapour or ingestion of liquid). Exposure to ethylene glycol is possible for those containing and recovering the spilled material and as such, proper PPE would be required during cleanup activities. Exposure is unlikely further from the AST and even more unlikely off-Site due to the relatively low volume and low volatility of the ethylene glycol.

Source: 6-3-413 (AST)
Location : Kiln lubrication room, north of preheater tower
Volume: 2,850 litres
Contents: Ethylene Glycol

Spill Probability (Unlikely): AST 6-3-413 is stored in a concrete enclosure. The tank is located within the kiln lubrication room, within an active work area. There are also no historical records to suggest a spill is likely to occur from this tank.

Based on secondary containment measures and the absence of any major factors promoting spill potential, it is believed that this tank and its contents present a low or unlikely spill potential.

Potential Impact (Low): In a worst-case scenario of the failure of the integrity of the tank all of the ethylene glycol would be captured in the concrete secondary containment. Spilled material would be recovered from the containment area.

Given the spill would occur from an above ground storage tank (AST), Facility personnel may be exposed to the ethylene glycol. Harmful and potentially fatal if swallowed. May cause kidney failure and central nervous system effects if ingested. Prolonged exposure to mists or liquids may cause skin, eye and respiratory irritation. It is unlikely that personnel exposure would go beyond risk associated with dermal contact (i.e., inhalation of vapour or ingestion of liquid). Exposure to ethylene glycol is possible for those containing and recovering the spilled material and as such, proper PPE would be required during cleanup activities. Exposure is unlikely further from the AST and even more unlikely off-Site due to the relatively low volume and low volatility of the ethylene glycol.

Source: 7-3-255 (AST)
Location : Roll press building
Volume: 2,850 litres
Contents: Ethylene Glycol

Spill Probability (Unlikely): AST 7-3-255 is stored in a concrete enclosure. The tank is located within the Roll Press Building, within an active work area though with no significant foot traffic or mobile vehicles. There are also no historical records to suggest a spill is likely to occur from this tank

Based on secondary containment measures and the absence of any major factors promoting spill potential, it is believed that this tank and its contents present a low or unlikely spill potential.

Potential Impact (Low): In a worst-case scenario of the failure of the integrity of the tank all of the ethylene glycol would be captured in the concrete secondary containment. Spilled material would be recovered from the containment area.

Given the spill would occur from an above ground storage tank (AST), Facility personnel may be exposed to the ethylene glycol. Harmful and potentially fatal if swallowed. May cause kidney failure and central nervous system effects if ingested. Prolonged exposure to mists or liquids may cause skin, eye and respiratory irritation. It is unlikely that personnel exposure would go beyond risk associated with dermal contact (i.e., inhalation of vapour or ingestion of liquid). Exposure to ethylene glycol is possible for those containing and recovering the spilled material and as such, proper PPE would be required during cleanup activities. Exposure is unlikely further from the AST and even more unlikely off-Site due to the relatively low volume and low volatility of the ethylene glycol.

Source: 8-321-1 (AST) and 8-321-2 (AST)
Location: Finish mill building
Volume: 29,500 litres
Contents: Grinding Aid

Spill Probability (Possible): ASTs 8-321-1 and 8-321-2 have no form of secondary containment. The tanks are located within the Finish Mill Building, within an active work area with no mobile vehicles.

Based on the lack of secondary containment measures and the absence of any major factors promoting spill potential, it is believed that these tanks and their contents present a possible spill potential.

Potential Impact (Low): In a worst-case scenario, assuming all of the grinding aid drained to the surrounding area. It is most likely that any potential spill would be contained within the building, on the Facility property, and would not migrate off-Site.

Given the spill would occur from ASTs, Facility personnel may be exposed to the grinding aid. The product is harmful if inhaled, and may cause irritation to eyes and skin upon contact. Moderately toxic if ingested. It is unlikely that personnel exposure would go beyond risk associated with inhalation or dermal contact (i.e., ingestion of liquid). Exposure to grinding aid is possible for those containing and recovering the spilled material and as such, proper PPE would be required during cleanup activities. Exposure is unlikely further from the AST and even more unlikely off-Site due to the relatively proximity of the spill location to the property boundary.

Source: On-Site Transformers
Location : Various
Volume: Variable
Contents: Transformer Oil

Spill Probability (Possible): There are no secondary containment measures in place for any of the on-Site transformers. All transformers are away from the main roadways, work areas, or any other factors that could contribute to the possibility of a spill occurring from the equipment.

Based on the lack of secondary containment measures and the absence of any major factors promoting spill potential, it is believed that these transformers and its contents present a possible spill potential.

Potential Impact (Moderate): In a worst case scenario, the hydraulic oil may leak and drain to the ground, it would infiltrate to the overburden. It is most likely that any potential spill would be contained within the Facility property, and would not migrate off-Site. Impacted soils would be remediated by St. Marys to prevent ongoing contamination should the transformer oil infiltrate to the overburden.

Facility personnel may be exposed to the transformer oil in the event of a spill. At elevated temperatures, the transformer oil may form vapours, mists or fumes, which may be irritating to eyes, nose, throat, and lungs. It is unlikely that personnel exposure would go beyond risk associated with inhalation or dermal contact (i.e., ingestion of liquid). Exposure to the transformer oil is possible for those containing and recovering the spilled material and as such, proper PPE would be required during cleanup activities. Exposure is unlikely further from the process equipment and even more unlikely off-Site due to the relatively proximity of the spill location to the property boundary.

Source: On-Site Process Equipment
Location: Various
Volume: Variable
Contents: Hydraulic Oil

Spill Probability (Possible): There are no secondary containment measures in place for any of the on-Site process equipment containing hydraulic oil of volumes greater than 1,000 litres. All process equipment are away from the main roadways, but located within and are part of specific work areas. Factors that could contribute to the possibility of a spill occurring from the equipment include normal wear and tear (i.e., hoses and connection seals). There are several historical spills (although infrequent) that suggest a spill is possible to occur from these sources.

Based on the lack of secondary containment measures and the historical evidence of spills from process equipment, it is believed that these process equipment and its contents present a possible spill potential.

Potential Impact (Low): St. Marys has installed an oil interceptor that is located at the final discharge point for discharges from collected on-Site surface water or building sump collection areas. In a worst case event where the oil spills and enters a drain, it would go through the oil interceptor prior to discharge to the creek. In another worst case scenario, the hydraulic oil may leak and drain to the outside of the building in which the process equipment is located. In the event that the product drains outside of the building, it would potentially infiltrate to the overburden. It is most likely that any potential spill would be contained within the building, on the Facility property, and would not migrate off-Site given the proximity of the buildings to the property boundary. Impacted soils would be remediated by St. Marys to prevent ongoing contamination should the hydraulic oil infiltrate to the overburden.

Facility personnel may be exposed to the hydraulic oil in the event of a spill. At elevated temperatures or mechanical action, the hydraulic oil may form vapours, mists or fumes, which may be irritating to eyes, nose, throat, and lungs. It is unlikely that personnel exposure would go beyond risk associated with inhalation or dermal contact (i.e., ingestion of liquid). Exposure to the hydraulic oil is possible for those containing and recovering the spilled material and as such, proper PPE would be required during cleanup activities. Exposure is unlikely further from the process equipment and even more unlikely off-Site due to the relatively proximity of the spill location to the property boundary.

Source: Stores Lubrication Area
Location: Stores
Volume: Variable
Contents: Oil in Drums and Totes

Spill Probability (Very possible): oil is stored in a below-grade concrete area (enclosure). The drums and totes are adjacent to, but out of the way of a main roadway. It is within working areas and exposed to the operation of the lift truck.

Based on secondary containment measures but due to the possibility of a spill caused by the lift truck operator, it is believed that this area and its contents present a very possible spill potential.

Potential Impact (Low): In a worst-case scenario of the failure of a drum or tote all of the oil would be captured in the concrete secondary containment. Spilled material would be recovered from the containment area.

Facility personnel may be exposed to the oil. Repeated and/or prolonged exposure may cause irritation to the skin, eyes, or respiratory tract. It is unlikely that personnel exposure would go beyond risk associated with brief inhalation or dermal contact (i.e., ingestion of liquid). Exposure to the oil vapours would be negligible at low temperatures and would likely only be possible immediately adjacent to the area in the event of a spill; proper PPE would be required during cleanup activities. Exposure is unlikely further from the area and even more unlikely off-Site due to the relatively low volumes of the waste oil in the drums and totes.

Source: Waste Storage Area
Location: Subject waste storage area north of lubrication building
Volume: Variable
Contents: Liquid Waste in Drums (oil, solvents, grease, ethylene glycol, other)

Spill Probability (Very possible): wastes in this area are stored in a concrete area (enclosure). The drums are adjacent to, but out of the way of a main roadway. It is within working areas and exposed to the operation of the lift truck.

Based on secondary containment measures but due to the possibility of a spill caused by the lift truck operator, it is believed that this area and its contents present a very possible spill potential.

Potential Impact (Low): In a worst-case scenario of the failure of a drum all of the liquid waste would be captured in the concrete secondary containment. Spilled material would be recovered from the containment area.

Facility personnel may be exposed to the waste liquids spilling from one of these drums. Hazards due to exposure would vary based on content, but it is believed that exposure to the waste liquid vapours would be limited to those immediately adjacent to the spill location; based on the drum contents, proper PPE would be required during cleanup activities. Exposure is unlikely further from the storage area and even more unlikely off-Site due to the relatively low volume of the waste liquids stored in this area.

Source: Petcoke /Coal silos
Location: South of fuel mill building
Volume: 1,100 tonnes/silo
Contents: Solid fuel petcoke /coal

Spill Probability (Possible): petcoke or coal is stored in three enclosed silos of 1,100 tonnes each. The silos are adjacent to, but out of the way of a main roadway, and are within work areas. There is one historical record to suggest that a spill is possible to occur from this area.

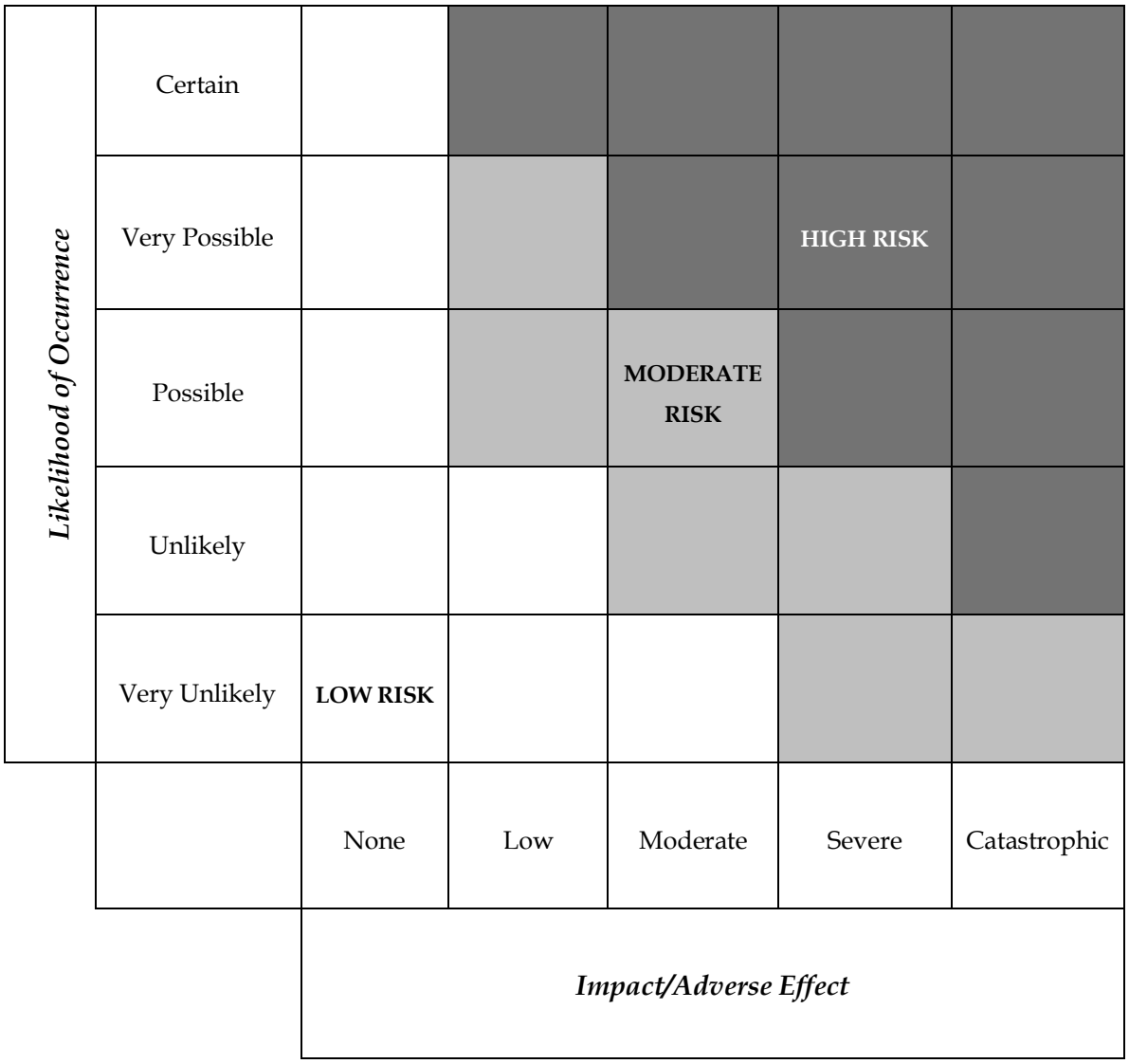
Based on that the material is enclosed in the silos and that the silos have a double high level alarm and a dust collector for control of emissions it is believed that the silos in this area and its contents present a possible spill potential.

Potential Impact (Moderate): In a worst-case scenario of the failure of the storage system, fuel dust could become airborne and impact residents on the surrounding areas. Impacted houses from residents would be cleaned.

Residents and personnel may be exposed to the solid fuel from one of these silos. Hazards due to exposure would vary based on content, but it is believed that exposure to the solid fuel would be low due to air dispersion and low concentration of the fuel. The major impact will be visual on the houses of residents.

8.1 RISK ANALYSIS - PRIORITY RANKING

Below is a priority ranking matrix, which aids in the determination of the overall risk of spill occurrences based on the likelihood of occurrence and impact/adverse effect ranking provided in Section 8.0.



A summary of the priority rankings of potential spills at the Facility is provided in the table below:

	Spill Priority Ranking		
Source	***Low Risk***	***Moderate Risk***	***High Risk***
1-110-1 (UST)	X		
1-127 (AST)		X	
1-128 (AST)		X	
1-3-2575 (AST)	X		
1-1393 (AST)	X		
3-098 (AST)		X	
6-310 (AST)	X		

6-3-6063 (AST)	X		
1-125 (mobile)	X		
Quarry Mobile Tank	X		
1-126 (AST)	X		
6-3-2951 (AST)		X	
1-2006 (AST)		X	
1-3-205 (AST)	X		
6-3-413 (AST)	X		
7-3-255 (AST)	X		
Grinding Aid 8-321-1 (AST) 8-321-2 (AST)		X	
Oil Containing Transformers		X	
Hydraulic Oil Containing Process Equipment		X	
Stores Lubrication Area		X	
Waste Storage Area		X	
Pet coke silos 6-3-630 6-3-632 6-3-634		X	

8.2 SIGNIFICATION SPILL RISK - PREVENTION AND MITIGATION

For the sources presenting a moderate spill risk an analysis must be conducted, identifying steps that could be taken to prevent or reduce the risk of the spill occurring (O. Reg. 224/07 Section 5 (1) Subsection 7-9).

Source	*Prevention/Mitigation Steps*	*Procedures to Ensure Steps are Maintained*
Diesel lake pump house tank 1-127 (AST)	• Placing a spill kit specific to tank contents near potential spill location • Inspection of tank, including assessment of tank integrity and connection wear	• Spill prevention procedure • Train designated Facility workers in spill prevention
Fuel tanks north Armtec building 1-128 (AST)	• Placing a spill kit specific to tank contents near potential spill location • Inspection of tank, including assessment of tank integrity and connection wear	• Spill prevention procedure • Train designated Facility workers in spill prevention
Quarry Diesel Tank 3-098 (AST)	• Placing a spill kit specific to tank contents near potential spill location • Earth berm around fuel tank • Alarm for interstitial space • Overfill alarm • Overfill shut off valve • Inspection of tank, including assessment of tank integrity and connection wear	• Spill prevention procedure • Train designated Facility workers in spill prevention
Aqua Ammonia (19%) tank 6-3-2951 (AST)	• Ammonia detection system with alarm • High level alarms • Concrete secondary containment • Inspection of tank, including assessment of tank integrity and connection wear	• Spill prevention procedure • Train designated Facility workers in spill prevention • Aqua ammonia safety procedure
Glycol tank Finish Mill 1-2006 (AST)	• Placing a spill kit specific to tank contents near potential spill location • Concrete secondary containment • Inspection of tank, including assessment of tank integrity and connection wear	• Spill prevention procedure • Train designated Facility workers in spill prevention

Grinding aid tanks Finish Mill 8-321-1 8-321-2 (AST)	• Placing a spill kit specific to tank contents near potential spill location • High level alarms • Shut off valves for overfill protection • Inspection of tank, including assessment of tank integrity and connection wear	• Spill prevention procedure • Train designated Facility workers in spill prevention
Oil from transformers	• Inspection of transformers	• Spill prevention procedure • Train designated Facility workers in spill prevention
Process equipment containing oil	• Placing a spill kit specific to tank contents near potential spill location • Oil interceptor at the final discharge	• Spill prevention procedure • Train designated Facility workers in spill prevention
Drums and totes of lubricants in stores area	• Placing a spill kit specific to tank contents near potential spill location • Concrete secondary containment • Routine inspection of waste storage area	• Spill prevention procedure • Train designated Facility workers in spill prevention
Drums and totes in subject waste storage area	• Placing a spill kit specific to tank contents near potential spill location • Concrete secondary containment • Routine inspection of storage area	• Spill prevention procedure • Train designated Facility workers in spill prevention

9.0 SPILL PREVENTION MEASURES AND CONTROLS

9.1 SUMP PUMPS

There are a total of twenty-seven sump pumps at the Facility. The sump identifications and locations (Figure 3D) are listed below:

Sump ID	*Location*
3-108	Primary crusher
3-208-1	Secondary crusher (reclaim tunnel)
3-306	Secondary crusher
5-3-0614	Atox bucket elevator
6-2-226-3	Lube transfer room
6-2-332	Office building bottom of ramp
6-2-422	N.W. corner office building
6-3-0101	Cooler basement
6-3-0102	N.W. of cooler building
6-3-0103	S.W. of cooler building
6-3-0104	Electrical room #1 basement
6-3-0105	N.W. of preheater tower
6-3-509	Coal unloading dump hopper
6-314-1	N.E. of cooler
7-108	Clinker reclaim tunnel
7-149	Clinker reclaim system under stair well south wall
7-212	Gypsum unloading hopper building
7-3-219	North clinker storage silo
7-419	North 3 bank clinker storage silo west
7-433	South 3 bank clinker storage silo
7-434	North 3 bank clinker storage silo east
8-329	Sump pump manhole #12; Finish Mill Utility
9-211-1	Scale pit sump north
9-211-2	Scale pit sump south
9-3-211	Scale pit
N/A	Oil storage area (stores)
N/A	Waste oil storage area

9.2 CONTAINMENT, CAPTURE AND REMOVAL EQUIPMENT

Removal of equipment is done on a case by case basis. Removal of fuel tanks are done when required and with compliance with environmental regulations.

9.3 STORM WATER MANAGEMENT

9.3.1 COLLECTION

Storm water (including from storm water accumulation in the quarry) and process cooling water from the Facility enters MISA Station 0100, is discharged to Darlington Creek, and then discharged into Lake Ontario. Prior to water entering MISA Station 0100, the water enters an oil/water separator. Figure 3A shows the drainage system of the plant.

There are several storm water ditches that collect water from the facility and discharge to Darlington Creek which discharges to Lake Ontario.

9.3.2 TRANSMISSION

The combined discharge from the MISA Station 0100 and storm water ditches flow into Darlington Creek that runs south across the Site, that ultimately discharges into Lake Ontario.

9.3.3 TREATMENT

Storm water (including from storm water accumulation in the quarry) and process water from the Facility enters an oil/water seperator.

9.3.5 DISPOSAL

Storm water and non-contact cooling water is discharged to MISA Station 0100, storm water ditches discharge to Darlington Creek and is not disposed of.

9.4 INSPECTIONS

All ASTs are inspected regularly to observe the integrity of the tanks and prevent any potential spills. Double walled ASTs are also inspected to monitor the vacuum pressure in the tanks. Bulk storage areas are also inspected regularly to monitor for issues such as (though not limited to) container leaks, improper storage or stacking of containers, and water infiltration.

Inspections and monitoring requirements as part of the MISA program (as detailed in O. Reg. 561/94) include (though is not limited to) the following:

- collect a MISA Station discharge (process effluent and cooling water effluent) sample once a week, to be analyzed for total suspended solids, and pH;
- as required, quarterly samples for acute lethality testing for rainbow trout and *daphnia magna* shall be collected and analyzed;
- as required, semiannual samples for chronic toxicity of fathead minnow and *ceriodaphnia dubia* Shall be collected and analyzed; and
- collection of effluent volume measurements on days where sampling activities are conducted.

9.5 TRAINING

All employees at St. Marys receive training specific to the mitigation and management of spills, including an annual refresher course to reinforce familiarity with the procedures in place, as well as to introduce new procedures that may have been recently established. The Standard Operating Procedures (SOPs) that employees are trained in include the emergency response plans outlined in Section 9.8 below.

9.6 SECURITY

Security measures at the St. Marys Facility fall under employee recognition and reporting (in the case of intruders).

9.7 EXISTING EMERGENCY / SPILL RESPONSE PLANS

A Fugitive Dust Management Procedure also exists for the St. Marys Facility. It is intended that this report be a living document and be updated, as necessary, in response to dusty conditions that are not adequately controlled (i.e., a dust discharge) using the existing control techniques.

St. Marys has several procedures associated with emergency/spill response SOPs in place, including the following:

- Emergency Planning and Preparedness;
- Spill Response Procedure; and
- Accident, Incident, and Environmental Non Conformance Reporting.

9.8 REPORTING AND NOTIFICATION

St. Marys current listing of those who are required to be notified in the event of a spill is detailed in Section 2.2 of this report.

9.8.1 NEED FOR NOTIFICATION

O.Reg. 675/98, Classification and Exemption of Spills, details the classification of spill types at facilities, and states under what conditions that spill may be exempt from reporting, as defined under the Environmental Protection Act, R.S.O. 1990, c. E.19, Section 92. This section is presented below:

Notice of spills
92. (1) Every person having control of a pollutant that is spilled and every person who spills or causes or permits a spill of a pollutant shall forthwith notify the following persons of the spill, of the circumstances thereof, and of the action that the person has taken or intends to take with respect thereto,
(a) the Ministry;
(b) any municipality within the boundaries of which the spill occurred or, if the spill occurred within the boundaries of a regional municipality, the regional municipality;
(c) where the person is not the owner of the pollutant and knows or is able to ascertain readily the identity of the owner of the pollutant, the owner of the pollutant; and

(d) where the person is not the person having control of the pollutant and knows or is able to ascertain readily the identity of the person having control of the pollutant, the person having control of the pollutant. R.S.O. 1990, c. E.19, s. 92 (1); 2002, c. 17, Sched. F, Table; 2005, c. 12, s. 1 (15).

When duty effective

(2) The duty imposed by subsection (1) comes into force in respect of each of the persons having control of the pollutant and the person who spills or causes or permits the spill of the pollutant immediately when the person knows or ought to know that the pollutant is spilled. R.S.O. 1990, c. E.19, s. 92 (2); 2005, c. 12, s. 1 (16).

Additional information to Director

(3) The person required by subsection (1) to give notice and the owner of the pollutant shall give to the Director such additional information in respect of the pollutant, the source of the pollutant and the spill of the pollutant as may be required by the Director. R.S.O. 1990, c. E.19, s. 92 (3).

Notice to Ministry by person investigating

(4) A member of a police force or an employee of a municipality or other public authority who is informed of or who investigates the spill of a pollutant shall forthwith notify the Ministry of the spill of the pollutant unless he or she has reasonable grounds for believing that such notice has been given to the Ministry by another person. R.S.O. 1990, c. E.19, s. 92 (4).

Same

(5) The notices required by subsections (1) and (4) shall be given in accordance with any requirements prescribed by the regulations. 2005, c. 12, s. 1 (17).

Under O.Reg. 675/98 the following are the maximum discharge allowances, under which St. Marys may be exempt from reporting in the event of a spill (as defined above). In the event that a limit was not available through O.Reg. 675/98, the United States Environmental Protection Agency (USEPA) Reportable Quantities (RQs) for Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 102(a) Hazardous Substances, 40 CFR 302.4 (July 1, 2001), was reviewed.

Tank ID/ Location	*Contents*	*O.Reg. 675/98 Clause*	*Discharge Allowance (litres)*
1-110-1 (UST)	Furnace Oil	Section 8	100
1-127 (AST)	Diesel	Section 6 or 8	100
1-128 (AST)	Diesel and gas	Section 6 or 8	100
1-3-2575 (AST)	Diesel	Section 6 or 8	100
1-1393 (AST)	Furnace Oil	Section 8	100

Tank ID/ Location	*Contents*	*O.Reg. 675/98 Clause*	*Discharge Allowance (litres)*
3-098 (AST)	Diesel	Section 6 or 8	100
6-310 (AST)	Diesel	Section 6 or 8	100
6-3-6063 (AST)	Furnace Oil	Section 8	100
1-125 (mobile)	Diesel	Section 6 or 8	100
Quarry Mobile Tank	Diesel	Section 6 or 8	100
1-126 (AST)	Waste Oil	Section 8	100
6-3-2951 (AST)	Aqua Ammonia (19%)	N/A	*100
1-2006 (AST)	Ethylene Glycol	N/A	*100
1-3-205 (AST)	Ethylene Glycol	N/A	*100
6-3-413 (AST)	Ethylene Glycol	N/A	*100
7-3-255 (AST)	Ethylene Glycol	N/A	*100
8-321-1 (AST)	Grinding Aid	N/A	*100
8-321-2 (AST)	Grinding Aid	N/A	*100
Oil Containing Transformers	Oil	Section 8	100
Hydraulic Oil Containing Process Equipment	Hydraulic Oil	Section 8	100
Stores Lubrication Area	Oil in drums and totes	Section 8	100
Waste Storage Area	Liquid waste in drums and totes (oil, solvents, grease, glycol, other)	Section 8, N/A	100 (oil), *100 (ethylene glycol)

Notes: * - denotes a RQ limit; N/A - not applicable. Figure 3C shows location of storage tanks.

For all spills that fall under O.Reg. 675/98, a record shall be taken and made available for inspection upon the request of a provincial officer. The record shall include:

- the date, time, location and duration of the release of the pollutant;
- the identity of the pollutant released;
- the quantity of the pollutant released;
- the circumstances and cause of the spill;
- details of the containment and clean-up efforts;
- an assessment of the success of the containment and clean-up efforts;

- the method used, in accordance with subsection 96 (1) of the Act, to dispose of or use the pollutant or any matter, thing, plant or animal or any part of the natural environment that is affected by the spill and the location of the disposal site; and
- any adverse effects observed as a result of the spill. O. Reg. 675/98, s. 12 (2).

Circumstances under which a spill would be immediately reportable under O.Reg. 675/98 would include the following:

- the quantity of the spill is more than what is specified in the plan as non-reportable;
- the spill was deliberate;
- the spill causes adverse effects aside from those readily remediated through cleanup and restoration of paved, gravelled or sodded surfaces;
- any remediation that is required is not undertaken immediately; and
- the spill enters waters, as defined under the OWRA.

9.8.2 INTERNAL NOTIFICATION PROCEDURES

The following is a summary of St. Marys' internal notification procedures in the event of a spill:

Environmental Spill

- Stop product flow;
- Remove all sources of ignition;
- Contain spill by blocking off drains and surrounding the product with sorbent;
- Notify the MOE and municipality if required;
- Contact Shift Production Supervisor and Environmental Manager;
- Contact local spill response contractor (Detox) if required.

Contact information for those mentioned in the emergency response is as follows:

- Ambulance/Fire Department/Police **Central Control Room Ext 292 or 905 623-7073**
- MOE (Spill Action Centre) **1-800-268-6060**
- Municipality of Clarington **905-623-3379**
- Shift Supervisor **905-623-3341 Ext 247 or 120**
- Central Control Room Operator **905-623-3341 Ext 239 or 124**
- Spill Response Personnel; Luis Urbina **905-259-4531 (cell)**
- Detox 24 hr Emergency Spill Response **905 623-1367**

10.0 SPILL PREVENTION MEASURES AND CONTROLS

In the determination of whether adequate spill prevention and controls exist at the Facility exist, the following factors were considered:

- Secondary containment measures for storage containers for the chemicals of concern at the Facility,
- The presence or absence of any major contributing factors for a spill;
- The vicinity of storage areas to potentially affected parties; and
- The adequacy of other spill prevention/mitigation measures in place.

The initial three points were considered during the risk analysis presented in Section 8.0 of this report. Description of spill prevention/mitigation measures in place were described in Section 9.0 of this report.

Through the analysis of the likelihood of a spill occurrence, adverse effects, risk analysis and priority ranking, it was determined that there exists a low to moderate risk potential for spills to occur at the Facility. Through the review of spill prevention plans currently in place at the Facility, it was determined that the following should be considered as part of strengthening spill prevention and mitigation:

For those spill sources identified in Section 8.1 as a moderate spill risk, the actions considered to mitigate the risk were described in section 8.2

1. OBJECTIVE

The purpose of this procedure is to ensure that appropriate actions are taken to respond to any spill within the property of St Marys Cement Bowmanville Plant in order to comply with all applicable environmental regulations and minimize its potential adverse effect.

2. REFERENCES

Environmental Protection Act

Ontario Water Resources Act

Spills O.Reg 360/90

Classification and Exemption of Spills O.Reg 675/98

Spill Prevention and Contingency Plans O. Reg 224/07

Accident Incident and Environmental Non-Conformance Reporting Procedure PD00166

3. DEFINITIONS

Spill: A discharge of a pollutant into the natural environment from or out of a structure, vehicle or other container, that is abnormal in quality or quantity.

Reportable spill: A spill that **causes** or **may cause** any of the following adverse effects:

Impairment of the quality of the natural environment for any use that can be made of it;

Injury or damage to property, plant or animal life;

Harm or material discomfort to any person;

An adverse effect on the health of any person;

Impairment of the safety of any person;

Rendering any property, plant or animal life unfit for human use;

Loss of enjoyment of normal use of property;

Interference with the normal conduct of business;

If a spill enters or is likely to enter any waters

Or if it is an uncontained spill and the volume meets or exceeds the volumes in the table listed below.

Contaminant	Quantity
Diesel Fuel	100 liters
Gasoline	100 liters
Solvents	100 liters
Lubricant Oils	100 liters
Grinding Aid	100 liters
Glycol	100 liters
Refrigerant	100 Kg
Cement	If dust leaves site in quantities sufficient to cause an adverse effect.
Stone Dust	If dust leaves site in quantities sufficient to cause an adverse effect.
Yard Dust	If dust leaves site in quantities sufficient to cause an adverse effect.

Uncontained spill: A spill that is not contained by a structure such as a dike or a building that prevents the spill to enter the natural environment.

Natural environment: Means the air, land and water, or any combination or part thereof, of the Province of Ontario.

Air: Means open air not enclosed in a building, structure, machine, chimney, stack or flue.

Land: Means surface land not enclosed in a building, land covered by water and all subsoil, or any combination or part thereof.

Water: Means surface water and ground water, or either of them.

Pollutant: Means a contaminant other than heat, sound, vibration or radiation, and includes any substance from which a pollutant is derived.

Contaminant: Means any solid, liquid, gas, odour, heat, sound, vibration, radiation or combination of any of them resulting directly or indirectly from human activities that causes or may cause an adverse effect.

CAR: Corrective Action Request, form to perform root cause analysis with the purpose to avoid reoccurrence.

4. STANDARD ITEMS DESCRIPTION

4.1 General Spill Response:

Spill response, as outlined in the following, should be initiated for any spill regardless of size:

- Ensure your personal safety and the safety of those around you;
- Clear the area, where and as appropriate;
- Notify your supervisor and Shift Production Supervisor;
- The Shift Production Supervisor will notify the Environmental Manager or Safety and Health representative;
- Determine the nature of the spill, identify the substance, source and volume of the spill, and area of impact;
- If unsure about how to handle the substance refer to the MSDS for information about clean up and disposal;
- Make sure to use proper personal protective equipment;
- If possible shut off or eliminate the source;
- Contain the material in the smallest possible area;
- If there is the possibility of a oil/fuel spill entering into the natural watercourse, the installation of oil booms across the creek should be conducted immediately;
- If the spill is larger than you can handle get assistance, otherwise initiate clean up.

4.2 Spill Clean up:

Spill clean up should be initiated as soon as possible to diminish its environmental risk:

- Place absorbent material on the spill, starting from the outer edges
- If necessary build berms below the area where the spill is spreading
- Attempt to keep the spill from reaching water, sanitary and storm sewers. Cover all drains to basins, ditches and storm sewers with drain cover or diking material;
- Place saturated material in a drum or other liquid tight container;
- Label the container indicating the type of material;
- Place drum in designated waste storage area;
- Notify the Environmental Manager when the clean up has been completed.

4.3 Spill Notification:

- All employees must report a spill immediately to their supervisor and the Shift Production Supervisor.
- The Shift Production Supervisor will report the spill to the Environmental Manager and in the absence of the Environmental Manager the spill must be reported to the Safety and Health Representative.

4.3.1 Reportable Spill:

The Environmental Manager or Safety and Health representative will report immediately those spills that meet the definition of reportable spill to the **Spill Action Center of the Ministry of The Environment. (Ph. #: 1-800-268-6060) and the Municipality of Clarington (Ph. #: 905-623-3379).**

In the absence of the Environmental Manager and the Safety and Health representative; the Production Shift Supervisor will make the appropriate notifications.

Cargo Dockers is responsible for dock operations and to ensure compliance with legal requirements within their area of responsibility.

Cargo Dockers is responsible to notify immediately the Ministry of the Environment, the Municipality of Clarington and St Marys' personnel when a reportable spill occurs at the dock.

The person reporting the spill should be prepared to provide the following information:

- Type of material released;
- Time, location, and duration of the release;
- Estimate of the quantity of the spill;
- Description of the circumstances and cause of the spill;
- Description of actions taken to contain the spill and clean up efforts.

Write the name of the person of the Ministry of the Environment and the time that the spill was reported, this information should be included in the associated Corrective Action Request form (CAR).

4.3.2 In case that the spill is larger than St Marys' personnel can handle the Environmental Manager, the Safety and Health Representative, or the Shift Production Supervisor should contact immediately **DETOX emergency spill response service (Ph.#: 905-623-1367)** to handle the spill.

4.3.3 All reportable spills, are considered non-conformances and a CAR should be issued to avoid reoccurrence. The Environmental Manger will decide whether a CAR is required for spills that are not reportable.

5. APPENDICES

NA

1.0 PURPOSE

1.1 The purpose of this procedure is to describe the proper handling and disposal of general waste and recyclable material generated by St. Marys Cement Bowmanville Plant.

2.0 SCOPE

2.1 This procedure applies to the operations and activities within ST. Marys Bowmanville Plant related to the generation, handling, disposal and recycling of waste.

3.0 RESPONSIBILITY

3.1 Employee:

All employees are responsible to comply and follow the requirements of this procedure.

3.2 Dept. Supervisor/Mgr.:

All supervisors / Managers are responsible to ensure that waste is handled and disposed according to the requirements of this procedure within their area of responsibility.

3.3 Environmental Manager/ Safety and Health Representative:

The Environmental Manager and the Safety and Health Representative are responsible to identify and communicate applicable regulatory legal requirements.

4.0 DEFINITIONS

4.1 Applicable Health Safety and Environment Legal Requirements: Requirements established by a proper Government Agency that regulates the operations of St Marys Bowmanville Plant regarding Heath Safety & Environment.

4.2 **Proper Government Agency:**

Government Agency with authority or power to issue Health, Safety and Environmental regulations. Examples of proper government agencies are the Ministry of the Environment, Environment Canada, and the Ministry of Labor.

5.0 PROCEDURE

5.1 Drummed Waste

5.1.1 Empty drums are available from stores; all drummed waste must have a waste label affixed to the outside prior to filling.

5.1.2 Labels are available from stores and must have the type of waste and the date the waste drum became full.

5.1.3 Examples of wastes that should be handled in drums are the following:

- Used oil
- Ethylene Glycol
- Used grease
- Solvents

- Contaminated fuel (diesel/gasoline)
- Grinding aid
- Absorbent material contaminated with any of the wastes listed above

5.1.4 Liquid waste should be placed in a closed top, bung type drum wherever possible.
5.1.5 Used oil should be placed in a black plastic closed top, bung type drum wherever possible.
5.1.6 Solid waste should be placed in an open top drum.
5.1.7 All bungs on closed top drums or rims on open top drums must be securely in place prior to moving the drum.
5.1.8 Full waste drums must be moved inside the waste storage compound located south of the plant lubrication building.
5.1.9 Waste drums should not be moved if the drum is not labeled and properly closed. Waste drums should be moved in a safe manner to minimize the risk of spills or leaks; caution should be taken to avoid denting or damaging the drum while is handled.
5.1.10 If the drum is leaking transfer the waste to another drum or place the drum in an overpack drum and clean up any spilled material. Use appropriate personal protective equipment.
5.1.11 If there is a doubt on how to handle a waste contact your supervisor or the Environmental Manager.
5.1.12 The Environmental Manager is responsible to contact a company as required for the pick up of drummed waste and to ensure that waste drums are not stored more than three months in the waste storage compound.

5.2 Used Oil & Oily Waste

5.2.1 Used oil should be handled in a black plastic closed top, bung type drum wherever possible. If smaller containers are required to collect used oil ensure that the container is transferred to a proper drum, to the used oil tank located at the south of the lubricant building or to the designated tote for used oil located in the quarry maintenance building. Do not mix oil with other materials.
5.2.2 Drums with oil should be transferred to the used oil tank located at the south of the lubricant building. The lift truck operator should place the filled drums with used oil on top of the used oil tank. The lift truck operator is responsible to place the drums on top of the used oil tank and the lubrication crew will be responsible to drain the drums into the used oil tank, close the empty drums and put them on the floor of the waste storage compound.
5.2.3 When 5 to 10 empty drums are generated the lift truck operator should transfer the empty drums to Stores for return or recycling.
5.2.4 Oil saturated wastes such as absorbents should be placed in open top drums, labeled and transferred to the waste storage compound.
5.2.5 Oil and oily waste should not be disposed in the dumping hoppers.
5.2.6 The Environmental Manager will contact a waste disposal company as required for the pick up of used oil and oily waste.

5.3 Used Oil Filters

5.3.1 Used oil filters should not be disposed of in the regular plant waste
5.3.2 Used oil filters should be collected in the black totes located in the waste storage compound and in the quarry maintenance building.
5.3.3 The Environmental Manager will contact a waste disposal company as required for the pick up of used oil filters.

5.4 Fluorescent tubes

5.4.1 Fluorescent tubes, high intensity discharge lamps (HID) and high pressure sodium lamps contain mercury mainly in vapor form.

5.4.2 Spent fluorescent tubes, HID lamps and high pressures sodium lamps should be repackaged in their original packaging when available or use the packaging material provided by the waste disposal company. Reasonable effort should be made to prevent breakage.

5.4.3 Spent lamps should be stored in the metallic container located inside on the west side of the main floor of the old burner building.

5.4.4 Environmental Manager will contact a waste disposal company as required for the pick up of spent lamps.

5.5 Lead Acid Batteries

5.5.1 Lead acid batteries contain hazardous and corrosive substances and should not be disposed of in the regular plant waste.

5.5.2 Spent lead acid batteries should be collected in the quarry maintenance shop or in the waste storage compound at the south of the plant lubrication building.

5.5.3 Take the necessary precautions to prevent damage or leakage of lead acid batteries. Damaged or leaking batteries should be placed in a drum and labeled. Contact the Environmental Manager for their disposal.

5.5.4 Environmental Manager will contact a recycling or waste disposal company as required for the pick up of spent lead acid batteries.

5.6 Small Batteries

5.6.1 Alkaline batteries should be collected for recycling or proper disposal

5.6.2 Used batteries should be collected by each department and placed in the waste storage compound in the container labeled “used batteries.”

5.6.3 Environmental Manager will contact a recycling or waste disposal company as required for the pick up of spent batteries.

5.7 Computers / Electronic equipment

5.7.1 Computers and electronic equipment should not be placed with garbage. It should be collected for recycling or proper disposal.

5.7.2 Contact the Environmental Manager or Electrical Supervisor to arrange for recycling or disposal of computers or other electronic equipment such as televisions, monitors, printers, telephones, cellular phones, VCRs, cameras and radios.

5.8 Laboratory Waste

5.8.1 Spent chemical solutions and obsolete chemicals should be collected and labeled for disposal.

5.8.2 Spent chemical solutions and obsolete chemicals should be handled according to their MSDS and appropriate personal protective equipment should be used.

5.8.3 The Quality Control Laboratory Supervisor is responsible for the temporary storage of spent solutions and obsolete chemicals.

5.8.4 The Quality Control Laboratory Supervisor will coordinate with the Environmental Manager the pick up of spent solutions and obsolete chemicals as required.

5.9 Aerosol Cans Disposal

5.9.1 Used aerosol cans should be punctured using the equipment for can disposal located in the mechanical maintenance shop or the quarry garage in order to remove any remaining material.

5.9.2 The aerosol punctured cans should be placed in the recycling containers for metal.

5.10 Equipment Containing Refrigerant

5.10.1 Equipment containing refrigerant should not be disposed of unless the equipment is tagged by a certified technician who determines that the equipment no longer contains any refrigerant.
5.10.2 The department responsible of the equipment containing refrigerant is responsible to contact a certified technician to ensure that the equipment does not contain refrigerant before its disposal.
5.10.3 Only certified technicians should service equipment containing refrigerants to ensure proper handling of the refrigerant and to diminish the risk of possible leaks of refrigerant.

5.11 Rubber Belt Conveyors

5.11.1 Rubber belt conveyors should be sent back to the manufacturer for recycling when possible.
5.11.2 If rubber belt conveyors cannot be sent to manufacturer an alternative method for reuse should be evaluated. The last option to be considered will be disposal in a landfill.

5.12 Tires

5.12.1 Waste tires should not be placed with garbage.
5.12.2 The department that is arranging to change a tire or tires should also arrange with the company that is replacing the tires for the disposal of the waste tires.
5.12.3 Tire supplier should be contacted to collect and dispose waste tires.

5.13 Used Personal Protection Equipment

5.13.1 Used personal protection equipment can be disposed in garbage containers if it is not contaminated with hazardous materials.
5.13.2 Used personal protection equipment contaminated with hazardous materials should be disposed in the same manner as the hazardous material.

5.14 Asbestos

5.14.1 Take all precautions necessary to prevent asbestos waste from becoming airborne.
5.14.2 Project work involving asbestos removal should be co-ordinated with the environmental manager and the safety and health representative for proper disposal and handling.
5.14.3 Personnel should use proper PPE to avoid inhalation of asbestos.
5.14.4 Bags or liners should be used to dispose asbestos in order to prevent asbestos from becoming airborne.
5.14.5 Containers used for disposal of asbestos should be properly labeled.
5.14.6 Environmental Manager will contact a waste disposal company as required for the pick up of asbestos waste.

5.15 General Recycling

5.15.1 Where practicable, aluminum and plastic beverage containers, paper, cardboard, metal and wood should be recycled.
5.15.2 Recyclable material should be placed in the labeled containers located throughout the plant and office buildings.
5.15.3 Cleaning workers are responsible for emptying personal recycling material from office buildings.

5.15.4 Lift truck operators are responsible to collect the dumping hoppers throughout the plant and disposing the material in the proper central containers.
5.15.5 Used office printer cartridges should be sent back to the supplier for recycling or refilling when possible.

5.16 General Waste

5.16.1 General waste should be placed in the labeled containers located throughout the plant and office buildings.
5.16.2 Cleaning workers are responsible for emptying general waste from office buildings.
5.16.3 Lift truck operators are responsible to collect the dumping hoppers throughout the plant and dispose the general waste in the proper central container.
5.16.4 General waste will be disposed by a waste management company as required.

5.17 Signing Waste Manifest

5.17.1 Only St. Marys personnel trained in the Transportation of Dangerous Goods Act shall complete and sign waste manifests.
5.17.2 Contact the Environmental Manager to verify list of people trained in Transportation of Dangerous Goods

6.0 REFERENCE DOCUMENTS

- Waste Management Ontario Regulation 347
- St. Marys Bowmanville Plant Asbestos Survey
- PD 00617 Refrigerant and Ozone Depleting Substance Management

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SECTION 1 - THE QUALITY ASSURANCE PLAN

1.1. QUALITY ASSURANCE POLICY AND OBJECTIVES

The objective of this Quality Assurance / Quality Control (QA/QC) plan for the St. Marys Cement Plant Bowmanville (SMC Bowmanville) is to ensure that the desired quality of emissions data collected and archived from the Continuous Emission Monitoring (CEM) system is achieved by performing the necessary quality assurance and quality control activities.

The quality control section details the procedures required for operation and maintenance of the system, including preventive and corrective maintenance and calibration of the CEM. The document control procedures ensure that adequate information is available to personnel carrying out specific activities. The training program ensures that qualified and trained personnel are available to perform these activities.

Important principles of the SMC Bowmanville Quality Assurance / Quality Control program include:

- *Integrity of Data* - To ensure that data reported to the Ministry of Environment is accurate and complete by performing preventative and corrective maintenance and conducting procedural and performance audits;
- *Responsibility* - Provision of maintenance services to define who is responsible for maintaining and making decisions concerning the CEM systems;
- *Training* - Proof of qualifications or training for persons carrying out specific maintenance activities;
- *Communication* - Management responsibility for defining responsibilities and communicating such to appropriate personnel.

Site-specific objectives of the SMC Bowmanville facility quality assurance program are:

- Adhere to the mass emission requirements of the Environmental Protection Act Ontario Regulation 194/05.
- Avoid “Out-of-Control” conditions, defined as time periods when emission data is unavailable or unacceptable in compliance with section 6.2.1.6 of EPS PG/7 2005

Excess Emissions and “Out-of-Control” periods will be minimized through:

Daily Calibration Drift Check: As stated in section 6.2.1 of EPS PG/7 2005 “Determine the drift of each gas analyzer and flow monitor at least once daily, at 24-hour intervals. A gas analyzer, flow monitor or moisture monitor must be adjusted whenever the daily low- or high-level calibration drift exceeds the following specifications:

Pollutant gas (SO_2 and NO_X) analyzer:

Low level: 2.0% of the FS setting or 2.5 ppm, whichever is greater
High level: 2.5% of the FS setting or 2.5 ppm, whichever is greater

Flow Monitor

Low level: 3.0% of FS setting or 0.6 m/s, whichever is greater
High level: 3.0% of FS setting or 0.6 m/s, whichever is greater

Moisture Monitor (dry O_2 – wet O_2 systems)

Low level: 0.5% H_2O (24 hours)
High level[1]

Cylinder Gas Test: As section 6.3.1 of EPS PG/7 2005 states, "This test is to be performed on all gas analyzer ranges used during the previous quarter….. Perform a three level cylinder gas test in each quarter of the calendar year, with tests being no closer than thirty (30) days for two (2) adjacent quarters, using the following test gases and procedures." Also involved in this requirement is the completion of a Stack Gas Flow Test. As per section 6.3.1 the [gas] calibration drift must not exceed:

Pollutant gas SO_2 and NO_X analyzer:

Low level: 4.0% of the FS setting or 5 ppm absolute difference
Mid-level: 4.0% of the FS setting or 5 ppm absolute difference
High-level: 5.0% of the FS setting or 5 ppm absolute difference

The Stack Gas Flow Test must be:

Data Availability: Data availability for the system and each individual component must be:

> 90% availability in the first year of operation and
> 95% availability in years thereafter[2]

Semiannual Performance Evaluations: Semiannual Performance Evaluations are performed in accordance with Quality Assurance procedures detailed in section 6.4 of the EPS 1/PG/7. "Two (2) tests procedures are involved in the semiannual performance evaluation: a relative accuracy test and a bias test (details for the bias test are shown in section 1.9.2.2 of the QA/QC plan). These are carried out for each pollutant gas measured, as well as the stack gas flow. The following performance specifications must be met:

The relative accuracy for an SO_2 and NO_X monitor must not exceed 10%, or 8 ppm average absolute difference (|d|), whichever is greater

[1] EPS 1/PG/7 allows for the monitoring of moisture with a method other than a wet O_2/dry O_2 system. The MCS 100 E HW monitors the unconditioned stack gas wet and reports moisture. Due to the lack of a suitable recognized standard for daily calibration of a moisture channel span value – the moisture monitor will be calibrated during a RATA. See also section 1.3 of the QA portion of the manual.

[2] See Section 1.6.1 of this manual for availability calculations and further information.

The relative accuracy for a stack gas flow monitor must not exceed 10%, or 0.6 m/s average absolute difference (|d|), whichever is greater.

The relative accuracy for the moisture monitor must not exceed 10% for (100-B_{ws}) "

The annual performance evaluation includes review of the Quality Assurance/Quality Control Manual.

The quality control section of the manual details the procedures required for operation and maintenance of the system, including preventative and corrective maintenance, and calibration of the CEM. The Quality Control Procedures section ensures that appropriate information is available to personnel carrying out specific activities.

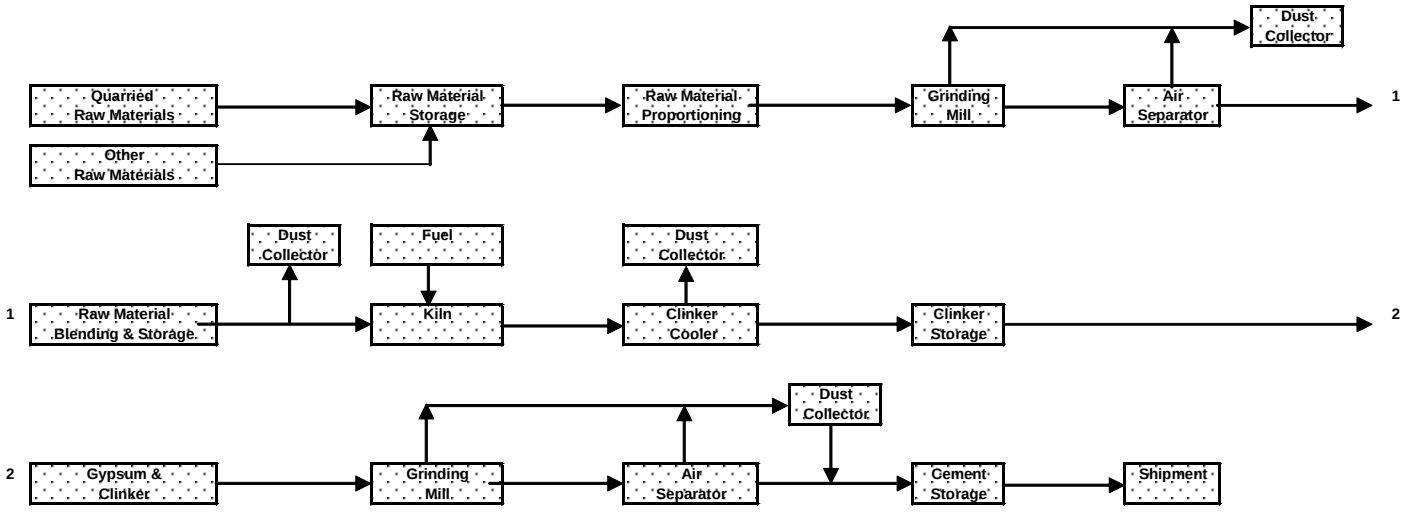
These requirements are implemented in response to Ontario Regulation 194/05 as it applies to St. Marys Cement Inc. for the facility located at 400 Waverly Road South Bowmanville, Ontario. The QA/QC plan is also written in accordance with the guidelines specified in EPS 1/PG/7.

1.2. CEM SYSTEM DESCRIPTION AND DESIGN CONSIDERATION

1.2.1. PLANT PROCESS DESCRIPTION

St. Marys Cement Company operates one rotary kiln at its facility in Bowmanville, Ontario. The average production of the facility is 5,900 tonnes clinker/day and the maximum production rate is 6,500 tonnes clinker/day.

The SMC Bowmanville cement plant has a modern pre-heater/pre-calciner kiln. In this type of kiln, the thermal efficiency of the process is increased by using hot exhaust gases to preheat the raw feed in a series of cyclones. Raw materials are finely ground in a vertical roller mill and fed into the pre-heater cyclones. The material exiting the pre-heater cyclones is heated to temperatures of 950-1100°C in the precalciner. Calcium carbonate in the limestone raw material is converted to lime (calcium oxide) in a process known as calcination. Calcined materials are fed into the elevated end of a rotary kiln which is inclined at a few degrees to the horizontal. Clinker is formed in the kiln burning zone at a temperature of approximately 1400°C. To achieve this temperature, a flame temperature of over 2000°C is needed. The clinker is discharged at the lower end of the kiln and cooled. Clinker is subsequently ground with gypsum to produce cement. Fuels are injected at the discharge end of the kiln and combustion gases flow up through the kiln counter-current to material flow. Gases from the kiln are directed through fabric filter dust collectors and exhausted through the main stack. Below is a process description flowchart.



L. Davidson (11.26.98)
Version 1.0

Figure 1 – Process Description Flowchart

1.2.2. GENERAL SYSTEM DESCRIPTION

The fully extractive continuous emissions monitoring system is comprised of six (6) main components:

- a heated gas sample probe;
- a heated sample umbilical;
- an analyzer for measurement of nitrogen oxides (NO_X), sulphur dioxide (SO_2), and water (H_2O);
- an opacity monitor[3];
- a flow and temperature monitor; and
- a data acquisition system.

Other equipment is included in the system scope of supply and is listed as ancillary equipment to the main six (6) components.

The system is designed to be operated at an elevated temperature (max. 225°C) to minimize sampling artifacts due to the possible presence of ammonium sulphate. This configuration is beneficial for CEM systems installed at cement plants.

The following subsections describe the hardware items included in the scope of supply.

[3] Please note that any and all reporting for opacity is outside the scope of regulatory demands for the QA/QC Manual. Therefore opacity information included in this manual is strictly for reference purposes.

1.2.3. GAS SAMPLING EQUIPMENT

Gas sampling equipment specified and installed at the SMC Bowmanville site consists of a heated gas sample probe and a heated sample umbilical.

1.2.3.1. HEATED GAS SAMPLE PROBE

The SICK UPA heated gas sample probe is installed on the stack above the main silo above the 9th floor of the pre-heat tower. A twenty (20) micron stainless steel probe tip filter is mounted on a one (1) metre in-situ unheated stainless steel probe tube.

The probe includes heated gas connections with integrated check valves and filters for injection of calibration gases, filter blow back and system purge. The probe isolation valve improves efficiency of removal of particulates from the filter during blow back and minimizes calibration gas losses to the stack during calibration. A heated fitting is also included for connection of the sample line. Instrument air is used for filter blow back and system purge modes of operation. Temperature at the heated filter housing is controlled via an adjustable thermostat built into the probe. This temperature is maintained at 195°C.

Probe/filter materials of construction are stainless steel, ceramic, PTFE and Viton®[4]. The probe is designed to operate on 115 VAC. An insulated weather cover protects the probe assembly from the elements and personnel working on the stack platform. The following diagram illustrates the primary components of a standard heated probe assembly. The design drawing shown in Figure 2 shows a typical probe installation. The internal parts of the probe are shown in Figure 3. Table 1 gives the probes technical specifications.

Figure 2 - Photo of the Probe Installation at Bowmanville

[4] Viton® is a registered trademark of DuPont Dow Elastomers.

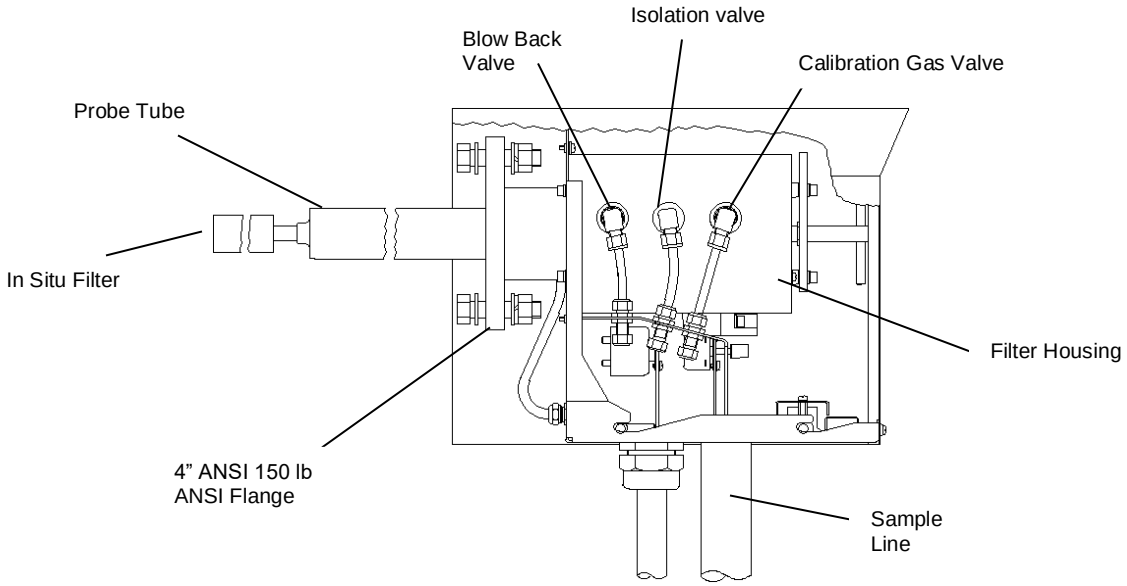


Figure 3 - Design of Gas Sampling Probe

Table 1 - Technical Specifications Heated Gas Sample Probe

PARAMETER	SPECIFICATION
Operating Conditions	Ambient temperature -20°C to 60°C (-4°F to 140°F); relative humidity max. 80 % without condensation
Storage Conditions	Ambient temperature -20°C to 60°C (-4°F to 140°F); relative humidity max. 80 % without condensation
Temp of Measuring Medium	Max. 250°C (482°F)
Thermostat Functions	Capillary Controller, Measuring Resistor
Protection Shield	A stainless steel 1.4404 shape protection shield or baffle plate is fitted to the end of the probe tube to protect the insitu pre-filter from direct impaction of particulates.
Probe Pre-filter	A sintered stainless steel 1.4404 filter (insitu), rated at 20 microns (20 μm) is fitted to the end of the probe tube for primary removal of particulates.
Probe Tube	The unheated probe tube is 1 metre in length, stainless steel 316.
Secondary Internal Filter	A secondary stainless steel filter rated at 2 microns (2 μm) is contained in the heated housing, stainless steel 316, mounted to the duct flange.
Calibration Gas Valve	Check valve, cracking pressure > 0.7 bar. Connection: 8mm threaded hose coupling

Isolation Valve	Bellow valve with pneumatic actuator. Control pressure 3-10 bar. Connection: 8mm threaded hose coupling
Blow-back Valve	High flow rate check valve, cracking pressure > 0.7 bar. Recommended pressure: 3-6 bar. Connection: 8mm threaded hose coupling
Probe Flange	The sample probe is attached to a 4", 150 lbs. ANSI flange at the duct platform.
Probe Materials	Probe – high grade steel 1.4529; Housing – A1 (hard-coated); Housing extension parts – high grade steel 1.4541 bzw.1.4301; Fittings – high grade steel ANSI 316 (V4A); Gasket Materials – PTFE, FKM, FFKM
Filter Housing	The electrically heated filter housing consists of hard-coated aluminum with polyamide lining for insulation.
Weather Cover	The weather protection cover is made of powder-coated steel sheet and can be removed.
Power Consumption of Heating Cartridge	115/230V, 60 Hz, 660 VA
Heat up Time	Approx. 30 min (Observe the heat up time to avoid measurement errors)
Weight	20 kg (44 lbs.)

1.2.3.2. HEATED SAMPLE UMBILICAL

The heated sample umbilical provides a conduit for the sample gases and system support gases to travel between the heated probe and analyzer cabinets. Four (4) Teflon®[5] tubes are included: one (1) heated 3/8" O.D. tube is used for the sample gas, one (1) unheated 1/4" O.D. tube is used for calibration gas and purge air, one (1) unheated 1/4" O.D. tube for air operation of the solenoid valve and one (1) unheated 3/8" O.D. tube for probe blow back air.

The Teflon® sample gas tube is wrapped with an electric heating element to maintain the tube at the required temperature (approx. 195°C) above the acid dew point. The other three (3) Teflon® tubes are placed in close proximity to the heat-wrapped tube for maximum temperature protection. The sample umbilical is rated for general purpose outdoor application.

A special thermal insulation wrap around the heating element reduces thermal losses to ambient. Two (one spare) PT100 RTD units are seated inside the tube bundle at the umbilical mid-point. The spare sensor can be used for maintenance checks and/or troubleshooting. Nominal operating temperature will be approximately 195°C.

[5] Teflon® is a registered trademark of DuPont.

The sample line is supported in by an angle bracket and ties at several points along its length. Short, unheated sections of Teflon® tube at the ends of the umbilical are insulated to minimize thermal losses. The umbilical is connected directly to the analyzer system at the heated pump.

Specifications for the heated sample umbilical are given in Table 2:

Table 2 - Technical Specifications 210 Series Sample Umbilical

PARAMETER	SPECIFICATION
Teflon® Tubing	(1) heated 0.375" O.D. x 0.062" wall, (1) unheated 0.375" O.D. x 0.062 wall (2) unheated 0.250" O.D. x 0.052" wall all tubes have a tinned copper reinforcing braid with 85% coverage
Maximum Temperature Rating	232°C (450°F)
Desired Tube Maintenance Temperature	195°C (383°F)
Control Sensor	Two (2) 100 Ohm, 2 wire RTDs, one as spare
Thermal Insulation and Jacket	1/2" Fiberglass insulation with flame retardant, black extruded polyurethane outer jacket
End Connections	1.83 metres (6') bare tubing on both ends
Nominal O.D.	5.33 cm (2.1")
Minimum Bend Radius	45.72 cm (18")
Maximum Operating Pressure	300 PSI
Communication Wires	Three (3) 14 Ga. Messenger wires Four (4) 18 Ga. Messenger wires
Length of Sample Umbilical	25 ft
Operating Voltage	220 VAC, 60 Hz

1.2.4. MCS 100 E HW MULTI-COMPONENT ANALYZER

The SICK UPA MCS 100 E HW (Hot/Wet) multi-component gas analyzer consists of: a heated sample pump; a heated flow meter; a heated measurement cell; an infrared light source; a detector and industrial computer control; and a data acquisition sub-system. Details on these system components are presented in the following subsections and the operation and maintenance manuals appended to this QA/QC Manual. The table below displays the configuration of the MCS 100 E HW installed on the Main Stack.

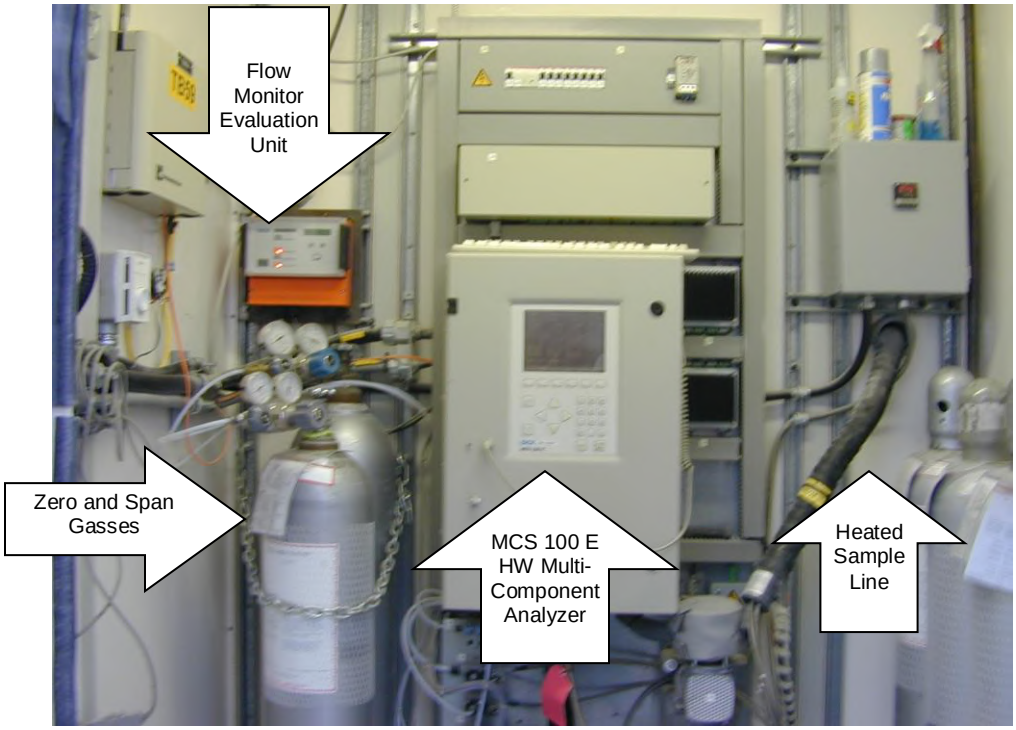


Figure 4 – Interior Photograph of the Bowmanville Shelter

Table 3 - Technical Specifications MCS 100 E HW

PARAMETER	SPECIFICATION
NO Channel low Measurement by IR Analysis	0 - 500 ppm (programmable)
NO Channel high Measurement by IR Analysis	0 - 700 ppm (programmable)
NO_2 Channel Measurement by IR Analysis	0 – 100 ppm (programmable)
SO_2 Channel low Measurement by IR Analysis	0 - 450 ppm (programmable)
SO_2 Channel high Measurement by IR Analysis	0 - 750 ppm (programmable)
CO_2 Channel Measurement by IR Analysis	0- 20% (programmable)
O_2 Channel Measurement by IR Analysis	0-25% (programmable)
H_2O Channel	0 - 20% (v/v) (programmable)
THC (as Methane) Channel	0 - 150 ppm (programmable)

Signal Outputs	4-20 mA (corrected)
Digital Outputs	Fiber Optic (RS 232)
Connection for I/O	Fiber Optic Cable
Sample Cell	Six (6) metre path length made of aluminum with special hard coating on internal surfaces and heated up to 240°C
Temperature Controllers	Internal Temperature controllers for cell, detector and oxygen sensor. External temperature controllers for sample pump, sample umbilical, vent line and sample probe via PT 100 sensors
Enclosure	IP 54 (NEMA 12) enclosure with ventilation fan and filter and Plexiglas viewing door
Heated Gas Sample Pump	Thermal Protection on Motor, Pump head SS 1.4571, Diaphragm and valves PTFE
Solenoid Valves	Solenoid valves for zero gas, calibration gas, probe blowback, isolation valve and system purge

The analyzer is connected to the CEMView Data Acquisition System, for display of the measured concentrations and data logging via RS-232 communication protocol, in accordance with PG/7 requirements.

1.2.4.1. OPTICAL BENCH

MCS 100 E is a single-beam photometer that works on the basis of the transmitted light measuring technique.

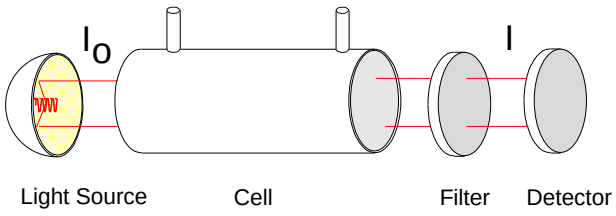


Figure 5 - Photometric Measurement

Determinations of concentrations with photometric methods are based on the Beer Lambert Law:

$$A = \log I_o / I = e * c * d$$

A = Attenuation of light intensity through the measuring component (absorbance)
I_o = Intensity of non-attenuated radiation
I = Intensity of attenuated radiation

e = Absorbance coefficient
c = Concentration of the measured component
d = Transmitted path length

To calculate the concentration of a component, the non-attenuated (I_o) and attenuated (I) intensities must be detected within the range of the absorption wavelength.

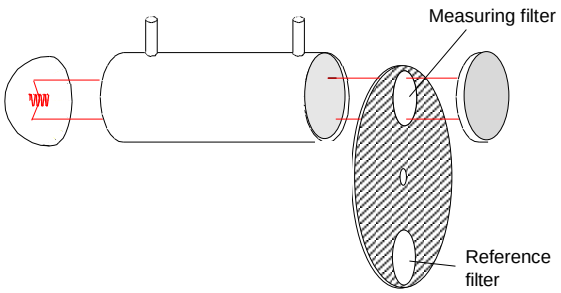


Figure 6 - Single Beam Dual-Wavelength Method

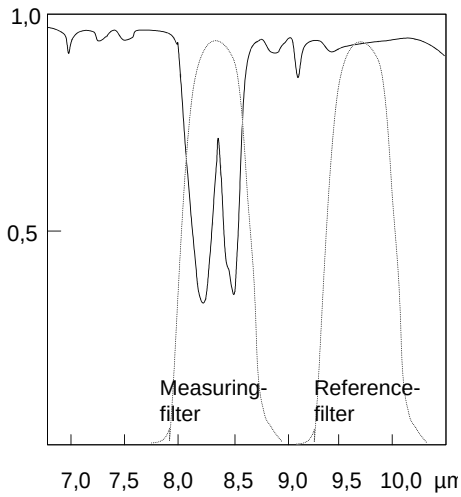


Figure 7 - Spectrum Indicating the Positions of Measuring and Reference Filters

The spectral ranges are selected by alternately slewing-in the interference filters for absorption (measuring filter I) and non-absorption (reference filter I_o). The electronics of the MCS 100 calculates I and I_o with the absorbance value A and determines the concentration value.

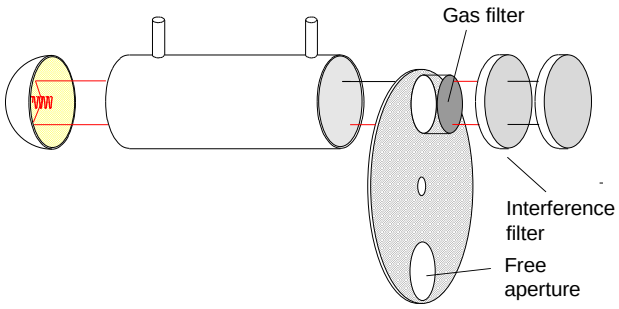


Figure 8 - Gas Filter Correlation Method

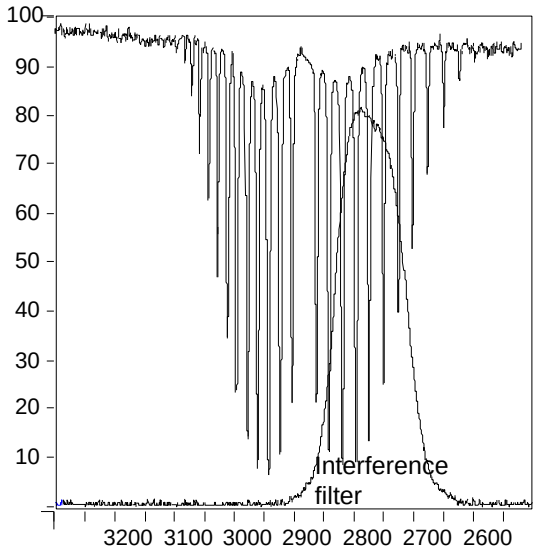


Figure 9 - Spectrum and Position of the Interference Filter

When the gas filter correlation method is employed, the reference signal I_o, which is independent of the concentration, is generated by slewing-in a gas filter. This gas filter is a miniature cell filled with the measuring component under high partial pressure. Measuring signal I, which is dependent on the concentration, is obtained by slewing a vacant filter wheel aperture into the beam path.

In order to be able to restrict the spectral range to the absorption band of the measuring component, an additional interference filter is slewed-in on the second filter wheel during both measurements. The values of I and I_o are calculated with the absorbance value of A as described in the single-beam dual-wavelength method.

The broad band light beam is chopped at a frequency of 100 Hz and sent to the measurement cell where it is directed by fixed mirrors to achieve the six (6) metre path length. After passing through the measurement cell the light beam passes through one or two filter wheels containing optical interference filters. Typically, a measured component includes one measuring filter and one reference filter. The measuring filter

selects the spectral range of an absorption band for the measured component. The reference filter selects a spectral region where no absorption of the measured substance and interference occurs.

Both filter wheels are driven by a stepper motor. When the measuring filter is positioned in the light beam a signal, I_M, is received by the detector. This signal depends on the concentration of the measured component in the cell. When the reference filter is inserted into the light beam a second signal, I_R, which is independent of the measured concentration, is received by the detector. The extinction is then calculated as follows:

$$Ext = \log \frac{I_M}{I_R}$$

In the case of gas filter correlation the second filter wheel containing the component gas is placed in the light beam to completely absorb the light energy.

A unique feature of the MCS 100 E analyzer is the capability to measure water content in the sample gas stream. The analyzer automatically computes the absorbance due to water and corrects the component gas signal to output a dry reference concentration.

1.2.4.2. MCS 100 E COMPUTER

The MCS 100 E analyzer system uses an industrial computer with features including the following:

- No moving parts;
- Flashover voltage 5000V;
- EMV radiation protection according to NAMUR and CE;
- Very high temperature threshold (up to 50°C);
- Black / white liquid crystal display (LCD).

The MCS 100 E uses an IBM compatible industrial computer which controls all of the analyzer functions. It utilizes a passive backplane with a 386 computer board and associated interface cards. The LPX 2 board is used for optical interface to the OPTO box for control of analyzer relays and solenoids. The MCS 100 E software uses the MS-DOS operating system.

The standard storage capacity is at least 4 megabytes which is sufficient to hold about one (1) month of data based on the measured components with a two (2) minute data storage frequency.

A front panel display, keyboard and function keys serve as the user interface to the computer. Software is menu-driven with several user levels utilizing password access

protection. The front panel display is an illuminated liquid crystal display (black and white) with 640 x 480 pixel resolution.

The menu structure of the software has one (1) main menu and several sub-menus. Time and logic programs control analyzer functions. The software features two (2) measuring ranges that are user programmable. Full system diagnostics are software accessible in the computer. A modem is installed to allow remote access. Fiber optics are used for the interface between the computer and OPTO relay boxes and as the interface to the modem.

The MCS 100 E computer provides control and processing for all analyzer functions including self-check features and alarming on fault detection.
Diagnostic functions built into the system are features which enhance the overall reliability and fail-safe functions of the system. For example, in the event of a low or high temperature condition, the computer places the system into STAND-BY MODE and purges the complete system with instrument air. The following is a list of diagnostic features included for the Bowmanville application:

- High or low temperature condition at heated components
- Low sample flow
- Insufficient calibration gas pressure
- Insufficient purge, blow back and instrument air pressure
- Excessive calibration drift
- Low reference energy (light source decay, soiled optics, detector).

The MCS 100 E computer controls calibration and probe blowback cycles based on time programs. Time and logic based programs can be activated automatically by defining a start and cycle time, or manually by pressing an appropriate button on the keypad.

1.2.4.3. MCS 100 E MODES OF OPERATION

There are five (5) main modes of operation for the MCS 100 E analyzer system. These modes of operation are: MEASURING (including PRE-MEASURE), STAND-BY, MAINTENANCE, CALIBRATION and BLOWBACK.

Solenoids are used for most of the control functions of the MCS 100 E analyzer system. The following solenoids are utilized:

Y1	For back purging the filter unit
Y2	Controls the main valve in the filter unit
Y3	For purging the system
Y5	For zero gas
Y6	For span gas SO_2, NO_X, (high span value)
Y7	For span gas SO_2, NO_X, (low span value)

There is also a needle valve that controls the instrument air through the system, both for purging and for calibration.

Y4 For adjustment of the zero gas flow (set to around 500 l/h)

All exhaust is vented from the CEM system via one (1) heated temperature controlled vent umbilical.

Table 4 shows how function keys are utilized for primary system functions and diagnostics.

Table 4 - Technical Specifications MCS Function Keys

FUNCTION KEY	DESCRIPTION SUMMARY (Available Selections)
"F3" START/STOP	►Start System ►Stop System ►Leak Test ►Manual Maintenance
"F4" RESET al/ca	►Reset Error / Caution ►Reset Temperature Controller
"F5" START ZERO	►Start Zero
"F6" Calib Autom	►Calib Automatic ►Calib Stop
"F7" SPAN Manual	► Span Stop ►Zero Gas Open ►NO/SO_2 high open ►NO/SO_2 low open ►NO/SO_2 high set factor ►NO/SO_2 low set factor ►Zero Point set

MEASURING MODE (INCLUDES PRE-MEASURE MODE)

When power to the analyzer is switched on, the MCS 100 E analyzer initializes in STAND-BY MODE and performs a series of self-diagnostics. While heating up, the analyzer is in PRE-MEASURE MODE. Provided the diagnostic analysis is acceptable, the analyzer will automatically begin MEASURING MODE. The analyzer cycles through the components to be measured. This data is then sent to CEMView via the fiber optic output.

To manually change the instrument to MEASURING MODE, use the following keystrokes:

► Press Function Key "F3", <Enter>
► Toggle to "Start Measure", <Enter>
The system will start MEASURING MODE if there are no system errors.

STAND-BY / MAINTENANCE MODE

The “F3” Function key is responsible for switching the measuring system to MAINTENANCE MODE (STAND-BY MODE is also activated). The data is tagged with “M” for Maintenance/Stand-by and is not counted as valid data.

To manually activate MAINTENANCE MODE, perform the keystrokes listed below. By activating the MAINTENANCE MODE (and STAND-BY MODE simultaneously), the subsequently measured values are tagged as invalid and a “maintenance” signal is indicated on the screen as a message.

► Press Function Key “F3”, <Enter>
► Toggle to “Stop Measure”, <Enter>

To manually exit MAINTENANCE MODE, press the below keystrokes to release the system from MAINTENANCE MODE, clear the “maintenance” message from the MCS display panel and send the system back into MEASURING MODE (provided there are no error messages):

► Press Function Key “F3”, <Enter>
► Toggle to “Start Measure”, <Enter>

CALIBRATION MODE

The analyzer performs automatic calibrations based on data and calibration conditions pre-programmed during system configuration. These parameters are identified as follows:

- Record measuring and / or reference signal
- Calculate absorbance
- Perform zero correction
- Add Extra Offset
- Perform additive interference sensitivity correction
- Perform multiplicative interference sensitivity correction
- Linearization (Calculation of absorbance into concentration)
- Multiply by calibration factor
- Multiply by extra factor.

When in calibration mode, a calibration signal indicating calibration has been initiated is sent from the MCS 100 E to the CEMView system. If the system zero calibration is within predetermined tolerances, the measured value is accepted. If the calibration data exceeds the predetermined tolerances (zero and span each greater than 5%), the measured value is not accepted and an error message is output to the DAS.

A manual calibration cycle can be initiated by pressing the “F7” Function Key on the MCS display. Scrolling through the available options under the F6 menu, choose “Span + Zero” for a zero and span calibration or “Span – Zero” for a span only calibration.

► Press Function Key “F7”, <Enter>
► Toggle to “Span + Zero”, <Enter> (for span and zero calibrations) OR
► Toggle to “Span - Zero”, <Enter> (for span calibration only – no zero performed)

BLOWBACK MODE

This mode is used to “blowback” or purge the sample probe of fine particulates and other impacted materials. These blowbacks or back-purges are performed automatically by the MCS 100 E and cannot be initiated manually but can be initiated through CEMView.

The blowback or “back-purge” of the sample probe program can be adjusted through the *Main Menu (Measurement) Screen: Configuration: Zero/Calib/Purge programs*.

1.2.5. VENT LINE

All exhaust gases are vented to the atmosphere through a heated and temperature controlled vent umbilical.

Technical specifications for the vent line are given in Table 5:

Table 5 - Technical Specifications for Vent Line

PARAMETER	SPECIFICATION
Maximum Temperature Rating	232°C (450°F)
Thermal Insulation and Jacket	Polyurethane and wool fibre
End Connection	3/8” Stainless Steel Compression
Nominal O.D.	5.33 cm (2.1”)
Minimum Bend Radius	45.72 cm (18”)
Maximum Operating Pressure	300 PSI
Length of Umbilical	± 10ft

1.2.6. FLOW MONITOR

The SICK OPTIC FLOWSIC 100 UHD Ultrasonic (acoustic velocimetry) gas velocity (flow) monitor is installed to meet flow monitoring requirements. The FLOWSIC 100 UHD utilizes two (2) transmitter / receiving units (transducers) to alternatively transmit and receive tone bursts through the gas stream. Placed across from each other on the stack, one upstream and the other downstream, the transducers are ultrasonic, non-conducting gas flow monitors. In the event of pressure loss, an alarm is activated to warn of an undesirable operating condition.

The FLOWSIC Model 100 UHD consists of the following components:

- Two (2) transmitter / receiving units with ultrasonic converters, probe and electronics unit for recording the gas velocity and temperature;
- Two (2) mounting flanges for mounting transmitter / receiver units;
- One (1) Evaluation unit for controlling and processing the data from the transmitter / receiver units. Contains electronics with power supply, all input/output interfaces, an LCD for displaying the measuring variables, LEDs for signaling the device status and 2 control buttons for selecting the measuring variable and device status;
- MEPAFLOW 100 Software to support the menu driven configuration of the FLOWSIC devices and troubleshooting on-site.

The FLOWSIC device is a low-maintenance and reliable instrument that offers self-testing functions and MEPA software for configuration.

The non-contact ultrasonic measurement technique performs simultaneous measurement of the gas temperature and volumetric flow. The digital measurement processing means high precision and interference immunity in operation. Figure 10 shows a typical FLOWSIC installation. Figure 11 shows how data is gathered and communication occurs between the sender receiver units and the evaluation unit.

Figure 10 – Downstream Flow Monitor Unit (A)

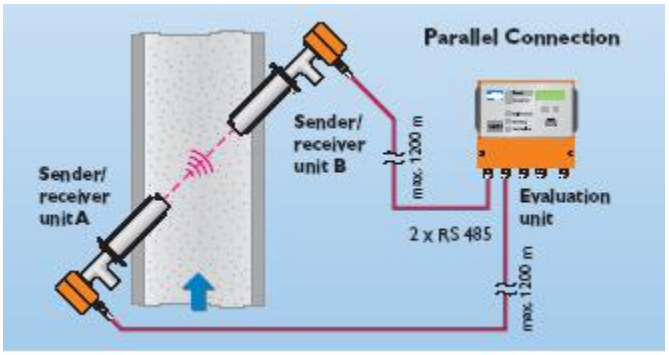


Figure 11 - FLOWSIC Configuration

Please note that the blower, discrete MEPAFLOW laptop computer, optional Recorder and RCU-MS are not required for the Bowmanville application. Table 6 shows the flow monitor technical specifications:

Table 6 – Technical Specifications Flow Monitor

PARAMETER	SPECIFICATION
Measurement Variables	Gas Velocity, volumetric flow in operation / normal state and gas temperature
Range	0 – 40 m/s
Typical Accuracy	+/- 2 m/s
T_{90} Time (freely selectable)	≥ 1 second
Interface	RS 232 (front panel)
Analog Output	1 current output (0/2/4…20mA)
Relay Outputs	4 relay outputs (load capability: 48V, 1A) for ERROR, WARNING, MAINTENANCE, CHECK CYCLE
Binary Inputs	Maintenance Switch- connection of a switch for direct triggering of a complete check cycle; the circuit must be implemented with a floating contact
Display	Two row LCD for displaying measuring variables
Ambient Temperature Range	-20 to 50°C
Degree of Protection	IP 65
Weight	5 kg

1.2.6.1. TRANSDUCERS

Two (2) transducers with ultrasonic converters are supplied for recording gas velocity and temperature. The transducers also measure temperature as a reference check to create a correction factor in determining the flow unit calibration drifts. Table 7 shows the technical specifications for the transducers:

Table 7 – Technical Specifications Transducers	
PARAMETER	**SPECIFICATION**
Temperature of Medium	0 to 250°C
Typical Accuracy Temp	+/- 2°C
Mounting Angle	31° (current)
Internal Duct Pressure	+/- 30 mbar
Degree of Protection	IP 65
Weight	5 kg

1.2.6.2. EVALUATION UNIT

Data control and processing from the probe assemblies is performed by the FLOWSIC Evaluation unit. This module contains the electronics with power supply for the two transducers, all input/output interfaces, an LCD for displaying the measuring variables, LED's for signaling the device status, and two (2) control buttons for selecting the measuring variable and device status. Table 8 shows the technical specifications for the Evaluation Unit:

Table 8 – Technical Specifications Evaluation Unit	
PARAMETER	**SPECIFICATION**
Display	2 row LCD for gas velocity, volumetric flow during operation and in normal state, temperature LED for operation, malfunction, maintenance and check cycle
Analog Output	0/2/4…20 mA, max. load 750 Ω
Digital Output	RS 422
Floating Relay Contacts	48V, 1A for status signals: malfunction, warning, maintenance, check cycle
Interfaces	RS 232
Operating Voltage	90…140 V AC 60 Hz or 190…260V AC 60 Hz
Power Consumption	20 W
Weight	1.5 kg

1.2.6.3. FLOW SOFTWARE

MEPAFLOW 100 software supports menu-driven configuration (analogue and digital inputs / outputs) of the FLOWSIC unit and assists with on-site troubleshooting. This computerized interface software should only be used by qualified, trained service support personnel familiar with the programming of the MEPAFLOW software.

There are three (3) levels of passwords for the FLOWSIC:

A) Without Password – parameters and setting descriptions but no changes can be made
B) Level 1 Password – used to change parameters and settings for standard commissioning
C) Specialist Level Password – All parameters, settings and internal device parameters can be changed. This should be reserved for SICK technicians or experts only

The MEPAFLOW section of the FLOWSIC manual offers further details on display and storage functions and test and diagnosis functions. Table 9 shows the technical specifications for the FLOWSIC software:

Table 9 – Technical Specifications FLOWSIC Parameter

KEY	FUNCTION
Hardware	IBM Compatible PC or Laptop, Pentium 1 or upwards with at least 640 kB RAM, Graphic VGA 640x480 Pixel display and DOS at least version 3.1
Interface Cable	Required
MEPAFLOW 100 Program	Required
FLOWSIC SOCKET	PC-SOCKET 9-PIN
Pin 2 (txd)	Pin 2 (rxd)
Pin 3 (rxd)	Pin 3 (txd)
Pin 5 (gnd)	Pin 5 (gnd)

1.2.7. CEM CONTROL AND DATA ACQUISITION SYSTEM (DAS)

CEM system control is provided mainly by the MCS 100 E computer. CEMView DAS software is used to display the data in other locations and to collect and record the data. Figure 12 is an example of the CEMView data acquisition main screen:

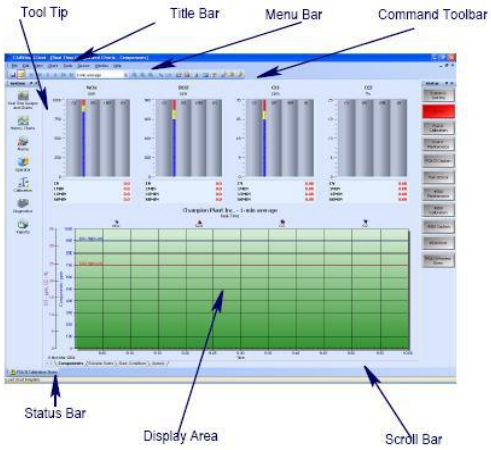


Figure 12 - CEMView Main Screen

1.2.7.1. DATA ACQUISITION AND REPORTING SYSTEM

Signals from the respective CEM system equipment are sent to and from the CEMVIEW server where it is “tagged” and saved as follows (Table 10):

Table 10 - Technical Specifications for Data Tags

DATA TAG	DESCRIPTION	COMMENTS
I	Invalid	Data cannot be used to calculate availability
C	Calibration	System is being calibrated
M	Maintenance	System is in Maintenance Mode
E	Error	Errors normally occur during a Device Malfunction, and occasionally because of a configuration error.
X	Excess Emission	Emission level outside of normal range parameters
D	Process Down	Source is not operational
O	Out-Of-Control	See “Out-of-Control Period” in section 1.7.5 of the manual for the definition.
U	User Data	Data that has been modified by the user, such as backfilled data.
R	Out of Range	Data is out of normal range.
W	Caution	Warning of potential problem.
N	Not Calibrated	Data Not Calibrated.
BLANK	Missing Data	Data not logged into the system.

The CEMVIEW DAS utilizes an operator interface in addition to data storage, report generation, real-time, and historical graphical display of data. The DAS system is

designed to operate with low maintenance and personnel requirements. Remote access is available through modem connection and a local area network (LAN) if available. The following table presents information regarding the components and their specifications for communications.

Table 11 – Technical Specifications Communication

PARAMETER	SPECIFICATION	DATA FREQUENCY
MCS 100 E HW Analyzer	OPC	Sent every 7.5 seconds
FLOWSIC Flow Monitor	OPC	Sent every 7.5 seconds
OMD 41	OPC	Sent every 7.5 seconds

The following table presents hardware specifications for CEMView DAS on the SMC Bowmanville Main Stack System. More detailed information including the CEMView software and “Frequently Asked Questions “FAQ” manuals are appended to this plan.

Table 12 - Technical Specifications CEMView DAS

PARAMETER	SPECIFICATION
Computer Hardware	• Proliant DL 380 Server • Xenon Processor 2MB Cache • CD Room • 6 hot plug drive bays 3PCI-X slots • 2 Remote clients • Dell PC Pentium 4/3.0 Ghz.512 MB • 1.44 CDRW/DVD Xpro • GeForce 256 MB Videocard • SDLT 160/320 GB Storage Media
Computer Software	• Windows XP • Brightstore Software Back Up Software • CEMView Software 2.5

1.2.7.2. DATA VALIDITY

Data is sent as a corrected signal to CEMView by the MCS 100 E computer system. CEMView will log any MCS 100 E errors as errors.

As data is collected by the CEMView OPC server, it is tagged according to whether it is valid or invalid. Table 10 lists the data tag options that are assigned by CEMView. The absence of any status alarms on the CEMView display indicates that the data is considered to be valid.

In accordance with the preventive and corrective action procedures, the system should be inspected regularly to ensure quality data is being produced. Emission and calibration data produced by the CEM system should be regularly inspected and compared against historical data. In particular, the following trends should be scrutinized:

- missing data
- unusually noisy
- unusually “flat” data
- inconsistent trends
- annotations for monitor and source downtime
- annotations for exceedances
- faults or alarms.

1.2.8. CONTROLLED ENVIRONMENT SHELTER

Specifications on the controlled environment shelter provided to SMC Bowmanville for the Main Stack application are shown below in Table 13.

Table 13 - Technical Specifications Shelter

PARAMETER	SPECIFICATIONS
Shelter Description	Steel Frame, non combustible building, 5’8”’ x 6’ including 2” x 4” stud walls, entrance door, insulation, galvanized steel roof, 28 gauge steel siding, under floor galvanized steel.
Heating, Ventilation and Air Conditioning (HVAC) System	Baseboard heater manually controlled. Air conditioning unit manually controlled.

1.2.9. FACILITIES AND EQUIPMENT

1.2.9.1. LOCATION OF ANALYZER / ANALYZER SHELTER

The SMC Bowmanville CEM system is housed inside a controlled environment shelter manufactured by Canadian Portable Structures Ltd. This shelter is located at the top of the CF Silo. The temperature is regulated at approximately 20^{o}C, +/- 1^{o}C.

The sampling probe is located in the breech of the Main Stack. The flow monitor is located at the platform of the main stack. A process schematic is included in Section 1.2.1 of this manual. The heated sample umbilical runs along a cable tray until it enters the wall of the CEM shelter. The zero and span calibration gas cylinders and associated regulators are located inside the analyzer shelter.

1.2.9.2. ANALYZER EQUIPMENT AND INVENTORY

Table 14 - Analyzer and Equipment Inventory

INSTRUMENT	SERIAL NUMBER
SICK UPA Gas Sample Probe	
FURON Heated Sample Umbilical	210-6/644-25FT-2R-155-72-6/1-4M-6/18M
SICK UPA MCS 100 E Analyzer	191
OMD 41-4	01328019
Sick Flowsic 100 UHD Flow Monitor	06098712
CEMView DAS System	CEMView 2.5

1.3. EXCEPTIONS / CLARIFICATIONS / ALTERNATIVE METHODS

1.3.1. SEMIANNUAL EVALUATIONS

According to EPS Report 1/PG/7 section 6.4.2, SMC Bowmanville may waive their semiannual evaluations and conduct them annually if all of the following criteria are met (so long as the CEM system includes the monitored parameter):

- the system availability is greater than 95% annually;
- the previous relative accuracy for the pollutant gas analyzers is either less than 7.5% or 8 ppm mean difference
- the previous relative accuracy for the flow monitor is either less than 7.5% or 0.6 m/s mean difference
- the previous relative accuracy for the moisture monitor is less than 7.5% for (100 – B_{ws})
- the previous relative accuracy of the pollutant emission system is either less than 7.5% or less than 7.3 g/GJ heat input average absolute difference

1.3.2. MASS EMISSIONS CRITERIA

The calculations for recording of mass emissions of NO_X and SO_2 for the appropriate regulatory authority under O.Reg.194/05 may need to be amended upon the following circumstances:

- The plant is granted allowances under O.Reg.194/05.
- The plant has modified their process so that deemed emissions are altered.

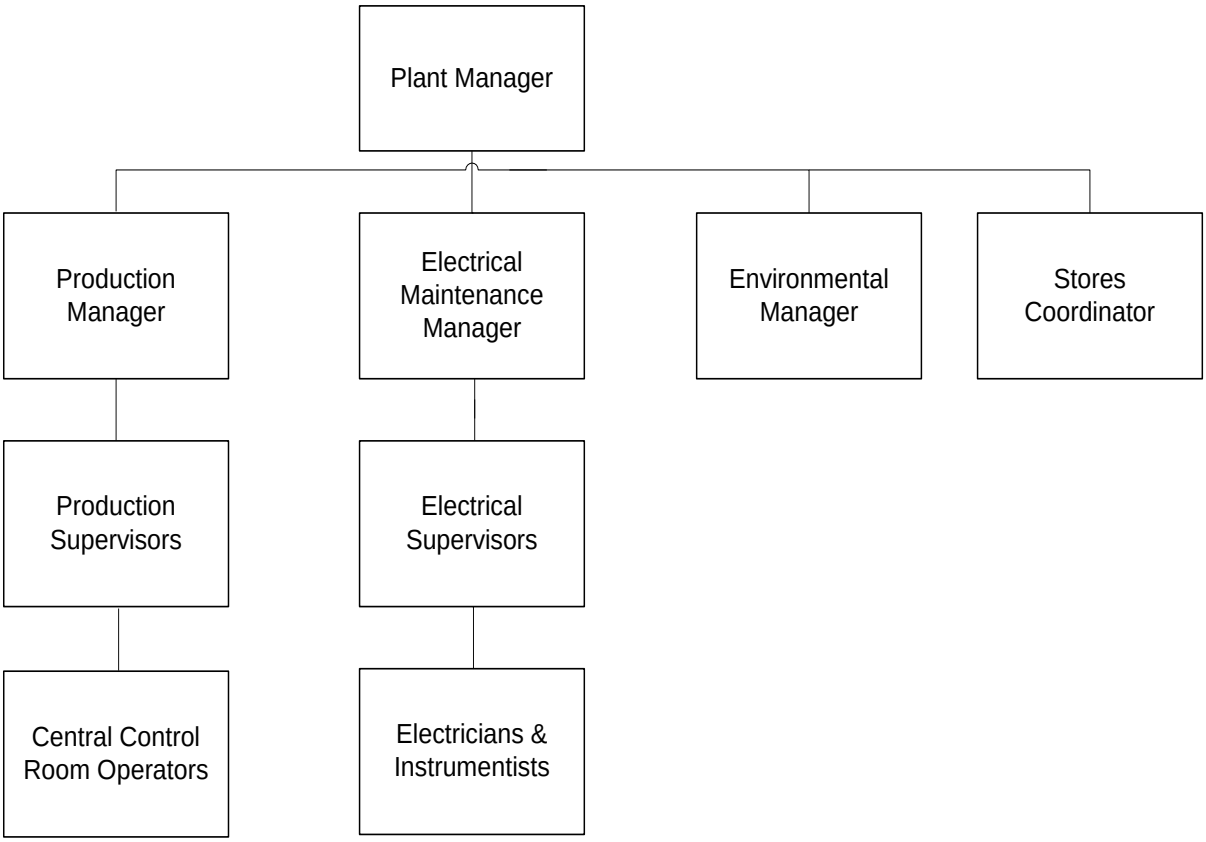
As there are many provisions that deal with allowances for plants. Please read sections 7-42 of O.Reg.194/05 for information regarding allowances.

1.3.3. CERTIFICATION FLOW MONITOR

Certification of flow monitor can be done using only one flow rate instead of three flow rates as required by 1/PG/7 due to the fact that flow rates in the cement industry are very stable.

1.4. ORGANIZATION AND RESPONSIBILITIES

It is the responsibility of the Environmental Manager to ensure all necessary compliances are met with the QA/QC plan at St. Marys. The overall responsibility for operation and maintenance of the CEM system rests with the Electrical Maintenance Manager. The Electrical Maintenance Supervisor is responsible for ensuring the Instrumentation Technicians are compliant with maintenance requirements and maintenance check sheet completion. The Electrical Maintenance Manager is responsible for all documents related to the CEM system operation and data verification. The chain of command is shown in SMC Bowmanville plant organizational chart, a detailed organizational chart is kept by the Human Resources Department. The chain of command for the St. Marys CEM System is shown in Figure 12. Further descriptions of job responsibilities are available in their respective SOP's.



1.4.1. RESPONSIBILITIES

The following are roles and responsibilities for St. Marys personnel:

1.4.1.1. ENVIRONMENTAL MANAGER

- Overall responsibility for compliance of CEM systems at SMC Bowmanville to regulatory specifications
- Ensures that reports are sent to the Ministry of Environment in a complete and timely fashion
- Reviews and revises the QA/QC manual as required
- Responsible for scheduling the RATA and assisting third party auditors during the test

- Responsible for scheduling the annual QA/QC audit and assisting the third party auditor throughout the audit
- Responsible for determining when data is missing, valid, or invalid. Upon this determination, the required data will be backfilled and reasons for the use of backfilled data will be recorded
- Responsible for training on the DAS
- Maintains of electronic reports relating to the Monthly, Quarterly, and Annual Maintenance of the system

1.4.1.2. ELECTRICAL MAINTENANCE MANAGER

- Overall responsibility for the proper maintenance and functioning of the CEM systems
- Responsible for training on the gas analyzer, flow monitor and ancillary equipment as it pertains to the CEM systems
- Schedules and coordinates monthly and quarterly performance evaluations and audits
- Ensures appropriate gasses are available for the CGA and RATA
- Verifies that operating and maintenance procedures in the QA/QC manual are current and available to all appropriate personnel
- Reviews and revises the QA/QC manual as required
- Responsible for maintenance and calibration drift documentation
- Obtains resources as required to ensure safe and reliable operation of CEM system
- Responsible for maintaining an adequate supply of spare parts
- Maintains of electronic reports relating to the monthly, quarterly, and annual maintenance of the system

1.4.1.3. ELECTRICAL MAINTENANCE SUPERVISOR

- Monitors preventive maintenance requirements
- Provides software (CEMView) support and ensures that upgrades are properly installed as required
- Ensures appropriate gases are available for the CGA and RATA
- Responsible for performing corrective and preventive maintenance or appropriate delegation
- Responsible for the completion and filling of logbook entries and weekly check sheets
- Responsible for the ensuring maintenance records are completed
- Monitors and ensures that all required logbooks, check sheets etc. regarding maintenance of the CEM system are completed
- Calls for outside services for corrective action as needed
- Ensures that the analyzer passes appropriate calibrations

1.4.1.4. INFORMATION TECHNOLOGY SPECIALIST (IT SPECIALIST)

- Responsible for backing up CEMView DAS data according to procedures

1.4.1.5. CENTRAL CONTROL ROOM OPERATOR

- Responsible for notifying the **Shift Production Supervisor** of any alarms pertaining to the maintenance or calibration drift of the CEM system
- Responsible for notifying the **Shift Production Supervisor** and the **Environmental Manager** of an Out-of-Control (OOC) Alarm

1.4.1.6. SHIFT PRODUCTION SUPERVISOR

- Responsible for contacting the **Electrical Maintenance Supervisor or Instrument Technician** when notified by the **Central Control Room Operator** of alarms pertaining to maintenance or calibration drift of the CEM system

1.4.1.7. MAINTENANCE PLANNER

- Schedules preventative maintenance

1.4.1.8. STORES COORDINATOR

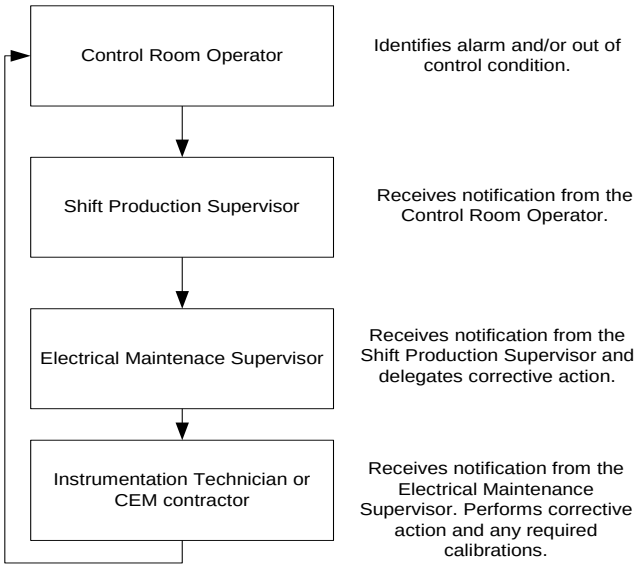
- Maintains recommended quantities including creation of requisitions to keep levels updated
- Maintains control system to ensure allocated parts are replenished

1.4.1.9. INSTRUMENTATION TECHNICIAN

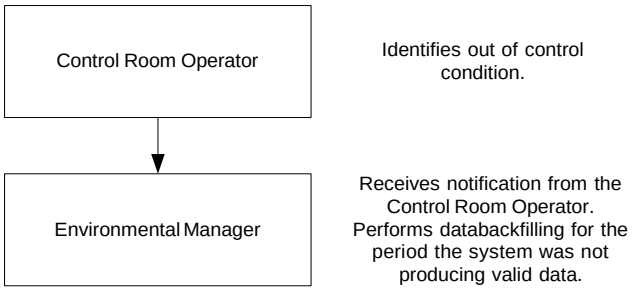
- Provides preventive and corrective maintenance as required
- Communicates malfunctioning and alarms of the CEM system to his supervisor

1.4.2. RESPONSIBILITIES AND FLOW OF COMMUNICATION

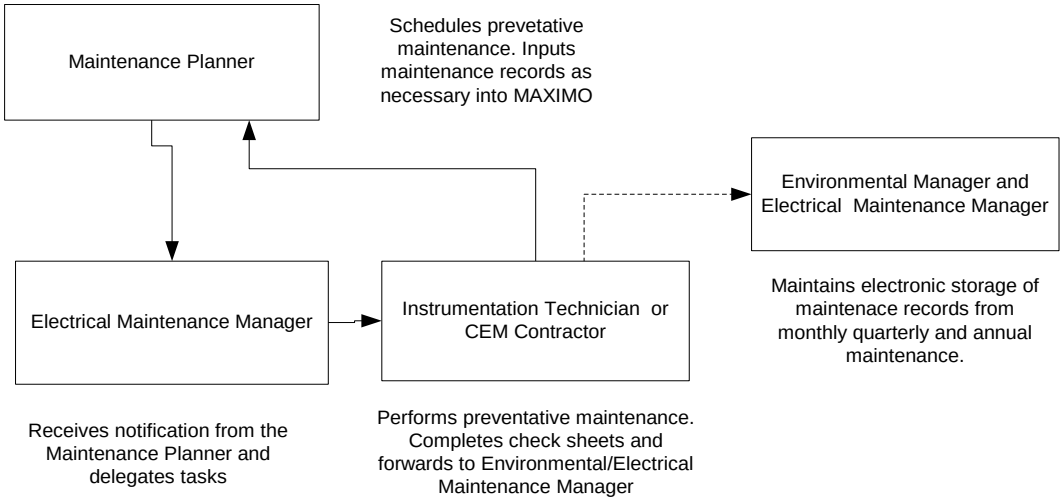
Below are flow charts that demonstrate the flow of communication associated with events and/or tasks.



1.4.2.1. ALARM RECOGNITION AND DATA BACKFILLING



1.4.2.2. PREVENTATIVE MAINTENANCE AND DOCUMENTATION



1.4.3. DESCRIPTION OF JOB TASKS

The following jobs are the most essential tasks included in the SMC Bowmanville QA/QC Plan:

1.4.3.1. DAILY, WEEKLY, MONTHLY, AND QUARTERLY CHECKS

- Ensure that checks are completed
- Log documents and events accordingly

1.4.3.2. ALARM RESPONSE

- Acknowledge alarm and initiate immediate corrective action (maintenance)
- Log and document events/alarms as necessary when information will need to be backfilled
- Communicate occurrence of alarm as appropriate

1.4.3.3. CALIBRATION DRIFT

- Inspect daily calibration drift reports
- Initiate corrective maintenance when appropriate/required
- Backfilling of data when the system is deemed out-of-control

1.4.3.4. SYSTEM INSPECTION

- Performs scheduled inspections as specified in procedures
- Inspects DAS reports for availability
- Inspects DAS for invalid data periods
- Initiates corrective action where required
- Maintain records of tasks in logbook or on check sheets

1.4.3.5. INVENTORY OF SPARE PARTS

- Maintaining recommended quantities including creation of requisitions (if required) to keep levels updated
- Maintain control system to ensure allocated parts are replenished
- Ensure appropriate levels of gasses are maintained for the calibrations, CGA, and RATA

1.4.3.6. PREVENTATIVE ACTION

- Scheduled cleaning, replacement, adjustment of parts as specified in procedures
- Request corrective action where equipment problems are identified
- Coordinate third-party preventive maintenance visits
- Maintain records of preventive action taken

1.4.3.7. CORRECTIVE ACTION

- Unscheduled service taken in emergencies or on equipment failure
- Scheduled service / repair, electronic component repairs, rebuilds to electrical, pneumatic or mechanical components in system
- Maintain records of corrective action taken

1.4.3.8. TRAINING

- Operation and system training (theory and “hands-on”)
- Preventive maintenance and corrective maintenance
- Quality assurance procedures and knowledge

1.4.3.9. QA/QC MANUAL REVIEW

- Review audit findings and observations and initiate action as required
- Revision of quality assurance manual as required including gap analysis of existing system documentation

1.4.3.10. DATA MANAGEMENT AND REPORTING

- Database and DAS support including system hardware
- Maintenance and back-up of systems as noted in procedures

- Generates reports as required for appropriate recipients (Ministry of Environment, Plant, Environmental Manager, etc.)

1.4.3.11. QUARTERLY PERFORMANCE EVALUATIONS

- Schedule audits to meet Ministry of Environment requirements
- Ensure data reporting as required by Ministry of Environment

1.4.3.12. SEMIANNUAL PERFORMANCE EVALUATIONS

- Schedule audits to meet Ministry of Environment requirements
- Ensure data reporting as required by Ministry of Environment

1.4.3.13. MASS EMISSIONS REPORTING

- Calculate mass emissions per year for NO_X and SO_2 from CEM system data
- Report findings to the proper regulatory authority as per O.Reg.194/05

1.4.3.14. ANNUAL SYSTEMS AUDIT

- Schedule audits and program management
- Technical support to facilitate audits
- Ensure data integrity

1.5. CALIBRATION AND QUALITY CONTROL CHECKS

A system calibration is performed on a daily basis to determine the magnitude of calibration drift for the MCS 100 E analyzer and to adjust the analyzer output for the degree of drift. System calibration is initiated automatically through the MCS 100 E analyzer computer. Alternatively, the calibration can be initiated manually (see SOP 3).

The flow monitor is programmed to complete a “reference check” cycle every 24 hours. This reference check cycle tests all the internal function groups of the FLOWSIC. If a systematic zero point offset of > 0.25 m/s is detected within the check cycle, a warning is sent to the evaluation unit then to CEMView. If a major fault is detected, the measurement is stopped and a fault is sent to the evaluation unit and subsequently CEMView.

Calibration gases, including both zero and span gases, are injected into the system through a series of solenoid valves located beneath the analyzer electronics cabinet on the back-plate panel. These gases are introduced to the probe assembly through a calibration line in the sample umbilical. Gases are drawn through the sample line in the umbilical by the analyzer sample pump and measured with the cell optics. The MCS instantaneously corrects for drift on zero and span points and sends the calibration information to the CEMView software.

The CEMView data acquisition system will monitor all calibration cycles. Calibration reports include:

- date and time
- expected values, in ppm or %, for both zero and span gases
- "as found" or actual values, in ppm or %, for both gases
- difference between expected and actual values, in ppm or %, for both gases
- range of component
- percent difference as percent of Full Scale (%FS) for both.

System calibration gases are certified standards with at least 2% accuracy. Minimum gas specifications are provided in Table 15. Gas cylinders are located inside the controlled environment shelter as seen in Figure 13.

Figure 13 – Cylinder Gases Used for Calibration

Appropriate lengths of 1/4" O.D. tubing and stainless steel compression fittings are used to connect the gas regulators to the appropriate solenoid valves on the CEM system. Calibration gas cylinder concentrations are recorded in the CEM logbook and entered into the MCS 100 E computer for generation of calibration data and reports. Concentrations are then transmitted from the MCS 100 E to the CEMView DAS.

Table 15 - Calibration Gas Specifications

CYLINDER NO.	COMPONENT DESCRIPTION	CONCENTRATION SPECIFICATION	QUALITY GRADE
1	Zero Gas (N_2)	99.9999%	UHP
2	Gas Mixture (NO 560-700ppm, SO_2 600-750ppm, bal. N_2)	80-100% FS of high range span value	EPA Certified 1%

3	Gas Mixture (NO 400-500ppm, SO_2 360-450ppm, bal. N_2)	80-100% FS of low range span value	EPA Certified 1%
4	Gas Mixture (NO_2 80-100ppm, CO_2 16- 20%, bal. N_2)	80-100% FS of range span value	EPA Certified 1%
5	Gas Mixture (2.1% O_2, balance N_2)	80-100% FS of low range span value	EPA Certified 1%
6	THC (as Methane)	80-100% FS of range span value	EPA Certified 1%
	Instrument Air	20% FS of span value	

1.5.1. CALIBRATION DRIFT CALCULATION

Each of the following calibration drift calculated values are held in the appropriate monitor until the next calibration drift calculation is performed. The calibration drift must be calculated once daily in 24-hour intervals.

SO_2 and NO_x Analyzer

As shown in the EPS PG/7 2005 section 5.3.2.4: “Calculate the gas calibration drift for the responses to the low, mid, and high concentration test gases,” using the equation below.

$$D_c = \left[\frac{(A - R)}{FS} \right] \times 100$$

where:

D_c concentration calibration drift, %

A average of the three system responses to the low- and high-range calibration gas, % or ppm

R certified concentration of the low-, mid- and high-range test gas, % or ppm

FS full scale setting of the analyzer, % or ppm

Flow Monitor

The FLOWSIC 100 flow monitor uses a tone burst and calculates changes in transmitter/receiver timing as a zero and span calibration. Each calculated correction factor, once applied to the raw data results in corrected output data (until the next automatic calibration is initiated). The calibration interval for the flow monitor is every 24 hours.

The calibration drift or "reference correction factor" is not sent to CEMView as a value, but merely as a status signal indicating that the check cycle has been completed.

Flow measurement drift calibration calculations are made by using the following equation found in section 5.3.2.4 of EPS PG/7 2005:

$$D_f = \left[\frac{(A_f - RM)}{FS} \right] \times 100$$

where:

D_f flow calibration drift, %

A average gas velocity or flow rate, (m/s or m^3/s)

RM average gas velocity or flow rate, as measured by the reference method, (m/s or m^3/s)

FS full scale setting of the flow monitor, (m/s or m^3/s)

Note: Do not average the daily drift results when reporting the calibration drift measured during the system certification.

Acceptability for Analyzer and Flow Monitor Calibrations

The following criteria are cited from section 6.2.1.5 of the EPS PG/7 2005 for daily performance evaluations. Adjustments must be made to the analyzer or monitor when it is in excess of the acceptable criteria shown below:

Pollutant gas analyzer:
- Low level: 2.0% of the FS setting or 2.5 ppm, whichever is greater
- High-level: 2.5% of the FS setting or 2.5 ppm, whichever is greater

Flow Monitor:
- Low level: 3.0% of FS setting or 0.6 m/s, whichever is greater
- High-level: 3.0% of FS setting or 0.6 m/s, whichever is greater

Moisture Monitor:
- Low level: ≤ 0.5%[6]

1.6. DATA ACQUISITION AND ANALYSIS

The CEMView data acquisition and reporting system performs most of the data manipulation and handling. It is designed to accept signals from the MCS 100 E and flow monitor systems. These signals in addition to manually inputted data are used in the required calculations for the SMC Bowmanville reporting system.

[6] See foot note 4.

Demands from the EPS Report PG/7 2005 of the DAS include the following cited from section 3.4:

i) AVERAGING TIME

For reporting purposes the data provided by the instruments is reduced to 1-hour averages for the pollutant gases. The calculation for mass emissions is explained in section 1.11.2.1 of this manual.

ii) REPORTING BASIS

Data shall be prepared as required by the appropriate regulatory authority.

The flow chart below (Figure 14) is a graphic demonstration of the communication between the monitors/analyzers and the DAS system.

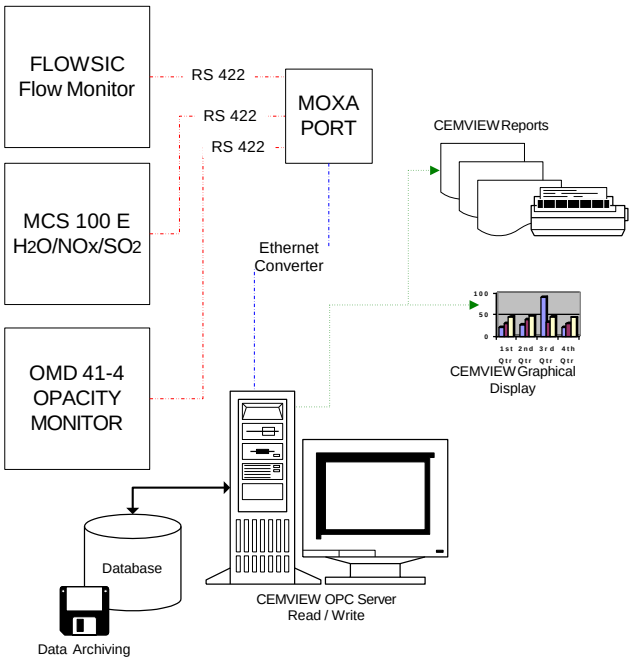


Figure 14 - CEMVIEW Data Communication

The MCS 100 E sends status signals via standard Modbus protocol to the CEMView OPC server. The OPC compliant server uses a device-specific driver as a communication interface.

CEMView performs some calculations and the devices perform others. For example, the calibration drift for the SO_2 and NO_x measurements is calculated by the MCS 100 E and

the “drift value” is then sent to the CEMView OPC server as an input signal. Table 16 illustrates the data available to CEMView, their origin and where related calculations are performed.

Table 16 – Calculation Summary

CALCULATION	INSTRUMENT(S)	ORIGIN	UNIT
Calibration Drift	SICK MCS 100 E	Calculated by MCS	% of Full-scale
Calibration Correction	FLOWSIC 106	Internal Correction By FLOWSIC	
Availability	MCS 100 E, FLOWSIC	Calculated by CEMVIEW	%
Data Backfilling	MCS 100 E, FLOWSIC 106	Manual / Calculated by CEMVIEW	
Out of Control	MCS 100 E, FLOWSIC	Calculated by CEMVIEW	% drift and time

1.6.1. AVAILABILITY

Availability is calculated by CEMView according to the period that the devices are generating quality assured and valid data against the total operating time of the Main Stack installation. Data availability for the CEM system must be greater than 90% in its first year of operation and 95% every year thereafter based on the Main Stack operating time. The equation for availability is:

$$AVA = \frac{T_a}{T} \times 100$$

where:

AVA	availability for the system, gas analyzer or flow monitor, %
T_a	number of hours during which the kiln burned fuel and the system gas analyzer, or flow monitor, was generating quality-assured data during the year
T	total number of hours the kiln burned fuel during the year.

Out-of-Control Periods and Missing Data

Refer to section 1.6.2 for information regarding the system being considered out-of-control upon completion of the calibration drift measurements.

1.6.2. OUT OF CONTROL

The concept of “out of control” applies to the amount of drift encountered in an analyzer calibration. An analyzer is deemed to be “Out-of-Control” when the calibration results indicate that the % drift as calculated from the latest calibration data exceeds pre-defined limits of acceptability. The following are standards which demonstrate a system is out-of-control:

- When a calibration drift exceeds twice the acceptable criteria specifications given in section 1.5.1 of this manual.
- When a Cylinder Gas Audit drift and Stack Gas Flow Test exceeds the acceptable criteria specifications given in section 1.9.1.1 and 1.9.1.2 of this manual.
- When RA and Bias Tests are in excess of the acceptable criteria specifications given in sections 1.9.2.1 and 1.9.2.2 of this manual.

Once an analyzer is determined to be out-of-control, it is to remain in that state until corrective action and a new calibration (either automatic or manually invoked) produces % drift results that are within the acceptable drift limitations for that particular analyzer.

Once an analyzer has gone “out-of-control”, then all associated data produced by it during the period of “out-of-control” must be marked invalid and the appropriate backfill mechanisms be allowed to operate upon this data. Information pertaining to backfilling of data is located in 1.6.3 of this manual.

Alarms (one for each analyzer) are configured that identify when an analyzer has been determined to be out-of-control. These alarms are generated in the CEMView system and can be called up under the CEMView Active Alarms and Events display.

1.6.3. DATA BACKFILLING

Data backfilling is an important part of the QA/QC Plan as all data must be backfilled when the system is deemed out of control. SMC Bowmanville personnel will ensure that all necessary data is backfilled according to the guidelines of 1/PG/7 as required by O.Reg.194/05.

A manual backfilling screen is available on the CEMView server under “Database Settings and Tasks”. CEMView administrator privileges are required to fill in or change backfilled data. Any data that is entered through the backfilling function is automatically “tagged” in the database as backfilled or edited data. See SOP 8 for further information.

1.7. PREVENTATIVE MAINTENANCE

Preventive or routine maintenance consists of cleaning, adjusting, testing, lubricating and rebuilding/reconditioning equipment as required to prevent failures or emergency situations with the equipment.

Preventive maintenance is performed on a routine schedule. This schedule outlines daily, weekly, monthly, quarterly, and annual procedures which include the tasks as listed in the previous paragraph. Detailed preventive maintenance procedures are listed in SOP 5.

The following equipment is subject to periodic preventive maintenance:

- MCS 100 E HW System
- FLOWSIC Model 106 Flow Monitoring System
- CEMView DAS System

Regarding the aforementioned equipment, most of the maintenance consists of cleaning the instrument and ensuring that desiccants and filters are clean.

This preventive maintenance program is modeled from equipment manufacturer recommendations and user experience. The preventive maintenance schedule is changed as required to establish component replacement or repair dates, consistent with anticipated failure rates.

All calibration and preventive maintenance activities are recorded, dated and signed (or initialed) by the person carrying out the activity. Documents such as logbooks and checklists create a written history of the CEM system performance. These records must be kept available for five years except for the weekly inspections that are kept for one year.

These records provide information necessary to:

- ✓ revise preventive maintenance schedules where appropriate,
- ✓ adjust spare parts inventories,
- ✓ track and investigate CEM downtime patterns,
- ✓ draw correlations between CEM system operation and the Main Stack operation/conditions,
- ✓ support prompt trouble-shooting and corrective action, and
- ✓ enable improved preventive maintenance procedures to be developed.

The following preventive maintenance checklists have been developed:

- Weekly Check Sheet
- Monthly Check Sheet
- Quarterly Check Sheet
- Annual Check Sheet

1.7.1. GUIDELINES FOR REVIEW AND RETENTION OF DOCUMENTS

It is intended that the checklists be modified, based upon experience with the CEM systems, specifically:

If a checked item shows frequent problems, the frequency of checking that item should be increased, or if a checked item shows no change over an extended period of time and number of checks, the frequency of checking that item could be reduced.

Checklist forms for preventive maintenance procedures are provided Appendix E. These forms are maintained in Maximo, and in electronic form by the Environmental Manager and Electrical Maintenance Manager and will be available for a period no less than five (5) years (except weekly check sheet that is kept for one year). Sheets to be kept include:

- ✓ Weekly Check Sheet – Input in Maximo
- ✓ Monthly, Quarterly, and Annual Check Sheet – Submitted by CEM Maintainer to Environmental Manager and Electrical Maintenance Manager

It is the responsibility of the Environmental Manager to assure that all specified records and files are being maintained.

A summary table, which ties together all the operational checks and calibration procedures, can be found in Table 17. This table provides a “quick reference” for the technicians for all quality control related activities.

Table 17 – Operator’s Quick Reference

Check/Procedure	In QA/QC Manual	Frequency	Control Limits (Specifications)	Corrective Action Required
System Startup	SOP 1	Main Stack or CEM system returned to service after a planned outage	N/A	N/A
System Shutdown	SOP 1	Main Stack or CEM system going into a planned outage	N/A	N/A
Daily Checks	SOP 2	Performed daily	N/A	See SOP 7
Weekly Checks	SOP 2	Performed weekly	Gas press < 150 psi	Replace calibration gas bottle.

Replace Calibration Gas Cylinder	SOP 4	When required	N/A	N/A
Monthly Checks	SOP 5	Performed monthly	N/A	See SOP 7
Quarterly Checks	SOP 5	Performed 4 times per year	N/A	See SOP 7
Annual Checks	SOP 5	Performed once a year	N/A	See SOP 7
Manual Calibrations	SOP 3	Monthly or when zero/span drift exceeds specification for 2 consecutive days	N/A	Consult the manufacturer's manual.

1.8. CORRECTIVE ACTION PROGRAM

Corrective action (also termed corrective maintenance or non-routine maintenance) is performed when the system or part of the system fails. When a system or part of the system does fail, data is either questionable or the CEM system is considered unavailable for providing reportable data. Detailed corrective maintenance procedures are given in SOP 7.

The implementation of preventive action procedures should minimize the need for frequent corrective action, although realistically, some corrective action will be required in the life of the instruments. The system is repaired as soon as possible when corrective action is warranted.

Due to the monitoring techniques of equipment installed, most problems will be either electronic or optical in nature. Equipment is repaired by qualified personnel according to the individual manufacturer manuals. Repairs beyond the capability of the service personnel at SMC Bowmanville are performed by a suitable repair contractor.

Specific repair procedures are not found in this manual, but in the CEM system supplier's instruction manuals or specific instrument manuals appended to the back of the QA/QC manual.

1.8.1. GUIDELINES FOR REVIEW AND RETENTION OF DOCUMENTS

Where non-routine maintenance is carried out, full details of the event are to be recorded by the Electrical Maintenance Supervisor or the Instrumentation Technicians.

CEM system corrective actions performed are recorded in the CEM system logbook located at the analyzer shelter.

1.9. PERFORMANCE EVALUATIONS / AUDITS OF CEM SYSTEM

The performance evaluation is an independent check on the CEM systems. A performance audit is a quantitative evaluation of the system, involving testing system performance by using certified cylinder gases, reference test methods, or other audit materials.

1.9.1. QUARTERLY PERFORMANCE EVALUATIONS

A performance audit provides an independent assessment of the monitoring system accuracy. Daily calibration drift determinations and routine maintenance do not necessarily guarantee that data will be accurate. Data validity can be assessed using the relevant auditing technique. For procedures on quarterly performance evaluations please refer to SOP 12.

1.9.1.1. CYLINDER GAS AUDIT (CGA)

EPS 1/PG/7 Section 6.3 “Quarterly Performance Evaluations” requires that a performance evaluation be conducted at least once each quarter using a Cylinder Gas Audit and one of the options for a Stack Gas Flow Test or an F-Factor System Test must be performed on the CEM system”:

This test, which measures the linearity error of the gas monitor, shall be performed on all analyzer ranges used during the previous quarter.

SMC Bowmanville personnel must: “Perform a three level cylinder gas test in each quarter of the calendar year, with tests being no closer than thirty (30) days for two (2) adjacent quarters, using the following test gases and procedures.” (Section 6.3.1.1 EPS 1/PG/7)

Protocol gases must be at: low (0 to 20% FS), mid (40 to 60% FS), and high-level (80 to 100% FS) for each pollutant gas analyzer.

The following equation is to be used for **all levels** (low, mid, high) of gas tests:

$$L_j = \frac{100}{3 \times FS} \sum_{i=1}^{3} | d_{j_i} |$$

where:

L_j Linearity error of the low, mid or high level calibration, %

FS Full scale value of the tested CEM range, ppm or %

d_{ji} Difference between the low, mid or high reference gas and the corresponding CEM system measurement for the i^{th} test run, ppm or %

$_j$ Low, mid or high level reference gas

$_i$ 1 of 3 injections of each low, mid or high reference gas

The linearity error must not exceed the greater of:

Pollutant gas analyzer:

Low level:	4.0% of the FS setting
Mid-level:	4.0% of the FS setting
High-level:	5.0% of the FS setting

Out-of-Control Periods and Missing Data

Refer to section 1.6.2 for information regarding the system being considered out-of-control upon completion of the CGA.

1.9.1.2. STACK GAS FLOW TEST

Due to the circumstances of the cement plant industry, under section 6.3 of EPS PG/7, the most reasonable option for a quarterly performance evaluation alongside the mandatory CGA, is the stack gas flow test option d) under section 6.3.2. The method of performing the calculations for this test is shown in section 6.3.2.7 and below.

This test must be carried out using Method B from “Reference Methods for Source Testing: Measurement of Releases of Particulate from Stationary Sources” (Environment Canada, December 1993, as amended). Wall effects and complex velocity patterns may be determined with U.S. EPA Methods 2H, CTM-041, and 2F/2G or with equivalent methods approved by an appropriate regulatory authority. The audit comprises three consecutive RM measurements: CO2, O2, and moisture values from a certified CEM system may be used for calculating molecular weights during this testing. E_f, the average of the absolute difference between the RM value and the corresponding CEM system flow measurement, is calculated using the equation below.

$$E_f = \frac{1}{3 \times RM} \sum_{i=1}^{n} | d_i |$$

where:

d_i Difference between an RM value and the corresponding CEM system measurement for the i^{th} test run (m/s or m^3/s)

RM Average gas velocity or flow rate, as measured by the reference method (m/s or m3/s)

Acceptable results are as follows:

$E_f \leq$ 6% of FS, or average $|d_i| \leq 1.2$ m/s

Note: It is the velocity that is measured for the stack gas flow test since it is much easier to obtain than the figures for volumetric flow.

1.9.2. SEMIANNUAL PERFORMANCE EVALUATIONS

As per section 6.4 of the EPS PG/7 2005 "Two (2) tests procedures are involved in the semiannual performance evaluation: a relative accuracy test and a bias test. These are carried out for each pollutant gas measured, as well as the stack gas flow. A performance evaluation is carried out twice a year, no less than four (4) months apart. It is highly recommended that this evaluation coincide with a scheduled quarterly performance evaluation, and be carried out in a day closely following the cylinder gas test."

1.9.2.1. RELATIVE ACCURACY TEST AUDIT (RATA)

A repeat of the relative accuracy test procedures as defined in EPS 1/PG/7 Section 5.3.5 Performance Specifications. The RATA need only be conducted once every 12 months if the following conditions are met[7]:

- ✓ MCS 100 E component availability is greater than 95%
- ✓ Previous RA was equal to or less than 7.5%
- ✓ System and analyzer bias test results fall within tolerances

The audit is the same as the Relative Accuracy Test required for the certification of the system after installation. The relative accuracy is the percent difference in the CEM

[7] See EPS 1/PG/7 Section 6.4.2 "Exemptions from Semi-Annual Evaluations"

system's measurement of the pollutant versus the value as determined using a Reference Method (RM) running in parallel with the CEM. The term "relative accuracy" and not "accuracy" is used since the accuracy is determined relative to a second, independent measurement and not relative to a known or standard value. The relative accuracy determination evaluates the representation of the sampling location and the integrity of the sampling and analysis system.

(i) Relative Accuracy is calculated in the following equation:

$$RA = \frac{|\bar{d}| + |cc|}{\overline{RM}} \times 100 \qquad \textbf{Equation (i)}$$

where:

RA	Relative Accuracy (%)
$\lvert\bar{d}\rvert$	Mean difference between the CEM and RM test measurements
$\lvert cc \rvert$	Confidence coefficient
$\overline{RM}$	Average of the reference method results

When the pollutant gas concentrations are less than 250 ppm, the FS setting of the analyzer must be substituted for the value of RM when calculating the relative accuracy using Equation (i).

(ii) Calculation of Differences

Calculate the absolute value of the difference between the CEM system and RM results using Equation (ii).

$$|d| = \left| \frac{1}{n} \sum_{i=1}^{n} d_i \right| \qquad \textbf{Equation (ii)}$$

where:

d_i Difference between a RM value and a corresponding CEM system value (d_i = CEM_i-RM_i) for the i^{th} test run

n Number of data pairs

Note: Retain the numeric signs for each data pair. The absolute value of the sum of differences is used, not the sum of absolute values of the differences.

(iii) Calculation of confidence coefficient and standard deviation

The values of the confidence coefficient and standard deviation are determined from Equations (iii) and (iv) respectively.

$$|cc| = \frac{t_{0.025} \times Stdev}{\sqrt{n}}$$ **Equation (iii)**

where:

$t_{0.025}$ t value from Table A for a one-tailed t-test corresponding to the probability that a measured value will be biased low at a 95% level of confidence

Stdev Sample standard deviation of the differences of the data pairs from the relative accuracy test, calculated using Equation 7

n Number of data pairs

$$Stdev = \sqrt{\frac{\sum_{i=1}^{n}(d_i)^2 - \frac{1}{n}\left(\sum_{i=1}^{n}(d_i)\right)^2}{n-1}}$$ **Equation (iv)**

Table A: *t* Values

n -1	8	9	10	11	12	13	14
$t_{.025}$	2.306	2.262	2.228	2.201	2.179	2.160	2.145

The *t* value for a one-tailed t-test at 95% confidence level

Acceptance criteria for Relative Accuracy (RA) must be met to the following levels:

The relative accuracy for an SO_2 and NO_X monitor must not exceed 10%, or 8 ppm average absolute difference (|d|), whichever is greater.

The relative accuracy for a stack gas flow monitor must not exceed 10%, or 0.6 m/s average absolute difference (|d|), whichever is greater.

The relative accuracy for the moisture monitor must not exceed 10% for (100-B_{ws}).

The relative accuracy for SO_2 and NO_x mass emissions must not exceed 10%, or 7.3 g/GJ heat input average absolute difference, whichever is greater.

Meeting the relative accuracy for SO_2 and NO_x concentrations and stack gas flow does not guarantee meeting the relative accuracy for SO_2 and NO_x mass emissions.

Out-of-Control Periods and Missing Data

Refer to section 1.6.2 for information regarding the system being considered out-of-control upon completion of the RATA.

1.9.2.2. BIAS TEST

As stated in section 5.3.5 of the EPS PG/7 2005:

"A bias or systematic error is considered to be present if, in the measurements of a pollutant gas or stack gas flow:

$$|d| \geq |cc| \qquad \textbf{Equation (v)}$$

As presented in Subsection 5.1.6, acceptable bias is either:

$(|d| - |cc|) \leq 5\% RM$, or

$|d| \leq 5 ppm$ for pollutant concentration, or

$|d| \leq 0.6 m/s$ for stack gas flow monitor

It is highly recommended that the sources of bias in the system be investigated and remedied.

If bias is present, as determined by Equation (v), and it is within the above levels, then the subsequent measurement of the CEM system must be corrected by a Bias Adjustment Factor (BAF), using Equations (vi) and (vii):

$$CEM_{adjusted} = CEM_{monitor} \times BAF \qquad \textbf{Equation (vi)}$$

where:

$CEM_{monitor}$	Data provided by the monitor
$CEM_{adjusted}$	Data adjusted for bias
BAF	Bias adjustment factor, defined by Equation (vii)

As per section 5.3.5 of EPS 1/PG/7 “The use of BAF at any measurement level must be stated in the QA/QC manual.” This Provision shall be followed by including any found BAF in appendix F of the QA/QC Manual. This shall be performed by SMC Bowmanville personnel.

$$BAF = \frac{RM}{CEM_{RATA\,avg}}$$ **Equation (vii)**

where:

BAF	Bias adjustment factor
$CEM_{RATA\,avg}$	Average CEM results during RATA
RM	Average of the reference method results

Acceptance Criteria for the Bias Test must be met:

The bias for a SO_2 and NO_X monitor must not exceed 5% of the FS value or 5 ppm avg. absolute difference when no BAF is used, whichever is greater.

The bias for a stack gas flow monitor must not exceed 5% of the FS value or 0.6 m/s avg. absolute difference when no BAF is used, whichever is greater.

The bias for a moisture monitor must not exceed 5% of the FS value for (100 - B_{ws}).

Should there be any bias as defined in Subsection 5.3.5 of EPS 1/PG/7 either positive or negative, in any measurements made by the CEM system, the data that is subsequently generated must be corrected for the bias before any subsequent use is made of the data.

Out-of-Control Periods and Missing Data

Refer to section 1.6.2 for information regarding the system being considered out-of-control upon completion of the Bias Test.

1.9.3. ANNUAL PERFORMANCE EVALUATIONS

In accordance with EPS 1/PG/7 Section 6.5.2 SMC Bowmanville will have its QA/QC manual, CEM system operation, reports, and other associated records reviewed by an independent inspector every 12 months ±1 month. This inspection will determine if the procedures in the QA/QC manual are being followed. The inspector shall make note of

any changes to the system or procedures since the last yearly evaluation and make sure that these changes are noted in the QA/QC manual.

The inspector will report findings to SMC Bowmanville and the appropriate agency within 30 days of the completion of the evaluation. Recommendations for improvement of the CEM System or its operation may be included in this report. The procedures for conducting Annual Audit are located in SOP 15.

1.10. DOCUMENT CONTROL SYSTEM

1.10.1. QUALITY ASSURANCE PLAN AND PROCEDURES

The CEM system documents include reference materials, system data, and disk copies of software and archived data.

Two (2) hard copies and one (1) CD-ROM copy of the system Quality Assurance Plan Manual and all supporting documentation are provided as part of the CEM system. SMC Bowmanville is responsible for creation of manuals over the two copies provided originally. Text has been entered using Microsoft Word 2000 for Windows word processing program for the IBM PC and compatibles. System diagrams have been provided electronically and in hard-copy (paper) form.

The QA/QC manuals are comprehensive manuals which include the QA/QC plan (Section 1 and 2) and all supporting documentation required to operate and maintain the CEM system (appendices). Individual component operation and maintenance manuals are provided after the QA/QC section of this manual as additional information.

The Sisquali system of document control shall apply to the QA/QC Manual. It includes approval mechanisms, distribution routings, a numbering scheme, and a method for document control maintenance.

1.10.1.1. PREPARATION AND DISTRIBUTION OF SECTIONS

In order to improve the quality assurance program at SMC Bowmanville, the creation of new sections or procedures may occasionally be necessary. The Environmental Manager has primary responsibility for the creation and distribution of new sections to be included in the QA section of the manual. This person is responsible for updating the existing manual. All sections of the Manual are uniquely numbered and current.

1.10.1.2. REVISION OF THE MANUAL

The Environmental Manager has primary responsibility for review and revisions to the Plan as required. The following events are examples of events that may mandate revisions:

- In accordance with recommendations subsequent to the annual systems audit
- Whenever excessive inaccuracies occur during quarterly or semiannual evaluations, the source owner or operator must revise the QC procedures as per EPS 1/PG/7 Section 6.6 or modify/replace the CEM system.
- Following operation experience, methods of streamlining processes may be identified
- New instrumentation added or substantial reconfiguration in existing instruments or processes

Note: Revision of the Manual requires a written notice to the Director of the Environmental Monitoring and Reporting Branch of the Ministry of the Environment (the Director).

Changes in the QAQC manual will be recorded on SOP 21 Change Document Log QAQC Manual in Sisquali. Changes will be notified to the Director of the MOE through the annual third party audit of the QAQC manual.

1.10.1.3. APPROVAL MECHANISMS FOR THE MANUAL

Drafts of new sections or revisions to the Plan are to be reviewed and approved by the appropriate level of technical responsibility.

1.10.1.4. NUMBERING MECHANISM FOR THE MANUAL

The Quality Assurance Quality Control Plan is numbered according to revision level. Revisions are tracked through Sisquali.

The Standard Operating Procedures (SOPs) of the QA/QC Manual are numbered according to the following scheme, for which the following information will appear in the header of each page:

- SOP Number
- Page “x of y” Number
- Revision Number

All SOP’s are implemented into the Sisquali Intranet System at SMC Bowmanville for easy access and transparency.

A table of contents for the SOP’s is located in the front of the Procedures section of this manual.

The following appendices are appended to this manual before the discrete manufacturer operation manuals. The QA/QC Appendices documents shall be included in an electronic document in Sisquali separate from the SOP’s and the QA portion of the Manual.

APPENDICES

Appendix A: Most Recent Certificate of Approval # including Appendices
Appendix B: EPS Report 1/PG/7 revised December 2005
EPA Ontario Regulation 194/05
Appendix C: CEM System Specifications
Appendix D: Reference Methods
Appendix E: Blank Forms, Reports and Check Sheets
Appendix F: Bias Adjustment Factor Record Keeping

1.10.2. SYSTEM LOGBOOK

The system logbook is a bound book with all pages sequentially numbered. Only one (1) copy of the current logbook is to be kept inside the CEM shelter. This document is to be completed by personnel that inspect and/or maintain the CEM system. Each entry should include the following data as a minimum:

- Date of activities performed;
- Time of activities performed;
- Reasonable description of activities performed;
- Name or identification of personnel performing activities;
- List of spare parts that were replaced;
- Any other information that may impact performance of the CEM system.

1.10.3. DATA RECORDS AND RETENTION

Records must be retained by SMC Bowmanville for a minimum of FIVE (5) years (except weekly check sheets) and be available to the Ministry staff upon request in compliance with conditions outlined in Section 50 of the O.Reg.194/05. These records will ensure subsequent compliance with O.Reg.194/05. This information is also beneficial to SMC Bowmanville for knowledge preservation purposes should personnel changes occur with persons responsible for the operation and maintenance of the CEM system.

Maintenance Check sheets. Weekly checks are filled out in Maximo. Monthly, Quarterly, and Annual Check Sheets are filled out by a CEM system maintainer and stored electronically by the Environmental Manager and the Electrical Maintenance Manager. Blank copies of check sheets are located in Appendix E of the QA/QC manual.

System Data - All emissions data generated by the SMC Bowmanville CEMView DAS is backed up by an IT Specialist. Calibration and availability data stored on the computer are backed up on a daily basis to the server and are stored in a hard copy weekly.

System Software - The CEMView system archives all records within its database. Backup copies of the system data are downloaded daily and stored on the Zetta-Cloud backup server as per procedure PP00006 IT Data Systems Backup.

1.11. REPORTS AND RECORDS

1.11.1. REGULATORY REPORT AVAILABILITY

SMC Bowmanville will maintain, as a minimum:

1) Records on the maintenance, repair and inspection of Equipment;
2) Records and summaries produced from the source testing and continuous emissions monitoring;
3) A recording of all situations, including date, time, duration, description of upset condition and reason, where the Main Stack and/or the kiln serving Main Stack ceased operation or were in upset condition outside the range of normal operation[8]; and
4) Reports conducted by external parties that relate to quarterly, semi-annual, and annual evaluations.

These records must be made available to the Ministry of Environment upon request.

These records shall be stored on site for a minimum of FIVE (5) YEARS.

1.11.2. REPORTING

According to the Environmental Protection Act Ontario Regulation 194/05 (O. Reg. 194/05) section 48, SMC Bowmanville facility shall have an EPS 1/PG/7 compliant QA/QC Plan in effect and a readily available QA/QC Manual as of January 1, 2006. This section also requires that SMC Bowmanville CEM system adhere to the design specifications listed in Table 1 and the performance standards set out in Table 3 of EPS 1/PG/7. Sections 1.9, 1.11, and SOP's 11-16 display the methods and explicate the procedures whereby the personnel operating the CEM System shall obtain the figures necessary to report to the Director of the Environmental Monitoring and Reporting Branch of the Ministry of the Environment (the Director).

To obtain the required figures for reporting to the Ministry of the Environment, the CEM system shall produce the data needed to carry out the calculations shown in EPS 1/PG/7 which apply to SMC Bowmanville.

[8] The process conditions shall be made available as a reference against the CEM data to ensure that the analyzer is recording accurate emissions and will assist in explaining the reasons for backfilling of data when the analyzer goes above 100% FS range.

The report must be in a form provided or approved by the Director as stated in section 3 of O.Reg.194/05.

This report shall include:

1) The date and results of the annual performance evaluations and CEM system availability as performed in accordance with provisions of sections 6.5[9] of EPS Report 1/PG/7.

2) The necessary reporting of mass emissions set out under the provisions of Sections 48 and 49 of O.Reg.194/05:

    - The name and address of the owner of the facility.
    - The name, address and geographical location of the facility.
    - The name of, or identifier for, each source set out in Table 10 [O.Reg.194/05] from which nitrogen oxides or sulphur dioxide are emitted.
    - Any change in information provided under Section 3 [O.Reg.194/05] that has occurred since the last report.
    - The amount of nitrogen oxides or sulphur dioxide emitted each month from each source set out in Table 10 [O.Reg.194/05].
    - The total amount of nitrogen oxides or sulphur dioxide emitted during the smog season (May 1 till September 30) from each source set out in Table 10 [O.Reg.194/05].
    - The total amount of nitrogen oxides or sulphur dioxide emitted during the non-smog season (October 1 till April 30) from each source set out in Table 10 [O.Reg.194/05].
    - The total amount of nitrogen oxides or sulphur dioxide emitted during the year from each source set out in Table 10 [O.Reg.194/05].

    SMC Bowmanville will give written notice of any changes made to the CEM system or to the QA/QC Manual. This notice is to be sent to the Director as soon as possible. O.Reg.194/05 s.48 (9)

    If the CEM system is down for seven (7) consecutive days SMC Bowmanville will give written notice to the Director no later than the eighth day following the start of the malfunction. O.Reg.194/05 s.48 (8)

Note: SMC Bowmanville must prepare and maintain these reports on site for a minimum of five (5) years.

Reports shall be sent to:

Director

[9] The section of EPS Report 1/PG/7 is altered to reflect the changes in sections between the old document and the latest version revised December 2005.

Environmental Monitoring and Reporting Branch
Ministry of the Environment
West Wing
125 Resources Road
Etobicoke, ON M9P 3V6

1.11.2.1. MASS EMISSIONS CALCULATIONS

Under Appendix B.3 Method B: "Determination Using Real-Time Stack Gas Flow Monitors" of EPS Report 1/PG/7, SMC Bowmanville personnel will calculate their target rate for mass emissions of pollutants. Any gas flow rate monitoring system that meets the specifications and passes certification is acceptable and may be used." The following equation is used to calculate hourly pollutant mass emissions:

$$ER_x = Q_w C_{d,x} K_x \frac{(100 - B_{ws})}{100}$$

where:

ER_x	Emission rate of pollutant x, kg/hr
Q_w	Wet stack gas volumetric flow rate, WSm^3/hr
$C_{d,x}$	Dry concentration of pollutant x, ppm, v/v
K_x	Conversion factor of pollutant x for ppm into kg/Sm^3, $kg/Sm^3/ppm$
B_{ws}	Stack gas moisture content, %, v/v.

O.Reg.194/05 requires SMC Bowmanville to provide amounts of NO_X and SO_2 produced per year in tonnes to the appropriate authority. The SMC Bowmanville facility shall be in compliance with the figures shown in Tables 1, 2, 4, 6, 7, 9, and10 as well as their requisite sections and subsections of O.Reg.194/05.

Refer to Sections 4, 6, 48, and 49 of O.Reg.194/05 and section 1.13 of this Manual for specifics pertaining to the reporting process as it applies to the SMC Bowmanville facility.

1.11.2.2. INTENSITY RATE CALCULATIONS

Intensity rates are used by the Ministry of the Environment to calculate the allowances of each pollutant which SMC Bowmanville is eligible to receive under O.Reg.194/05. The intensity rates are determined by the equation below.

$$I_R = \frac{PolKg/h}{ClKg/h}$$

where :

I_R	Intensity Rate
PolKg/h	Pollutant kilogram emissions per hour
ClKg/h	Clinker kilogram emissions per hour

1.11.3. SMC BOWMANVILLE INTERNAL RECORDS

This section describes all the records that are generated and maintained for the CEM systems. Further information can be found in SOP 15 and SOP 16 of this QA/QC Manual. Long term storage of completed check sheets, calibration records, and log books is in the Environmental Manager's office. The following documentation is maintained by SMC Bowmanville in designated locations:

1.11.3.1. QA/QC PLAN MANUAL

Copies of the CEM system QA/QC manual are kept available on the Sisquali system at SMC Bowmanville. The QA/QC manual contains a description of the CEM system along with all the necessary procedures required to have the system produce accurate and reliable emissions data.

1.11.3.2. CEM SYSTEM LOGBOOK

Information contained in the log book should include the date, time, and name of the person entering the Main Stack CEM shelter to perform maintenance. All CEM system problems including alarms, maintenance performed, notification numbers created, observations and adjustments made to the CEM system, must be logged in the log book. The log book will be replaced when full and transferred to the Electrical Maintenance Manager's office for storage.

1.11.3.3. CHECK SHEETS AND OTHER RECORDS

Weekly Check Sheet (See SOP 2)

Blank weekly gas cylinder check sheets are kept in the QA/QC Manual Appendices. Completed check sheets are filled out and stored in Maximo on the SMC Bowmanville server.

Monthly Check Sheets (see SOP 5)
Monthly check sheets are kept in the QA/QC Manual Appendices. Completed check sheets are archived in electronic form in the Environmental Manager and Electrical Maintenance Manager's office. Information recorded on the CEM system Monthly Check Sheet includes all the filter checks along with a reminder to perform a manual calibration if one has not already been done for the month.

Quarterly Check Sheets (see SOP 5)
Quarterly check sheets are kept in the QA/QC Manual Appendices. Completed check sheets are archived in electronic form in the Environmental Manager and Electrical Maintenance Manager's office.

Annual Check Sheet (see SOP 5)
Annual check sheets are kept in the QA/QC Manual Appendices. Completed check sheets are archived in electronic form in the Environmental Manager and Electrical Maintenance Manager's office.

Maintenance Log
ALL MAINTENANCE PERTAINING TO THE CEM SYSTEM MUST BE DOCUMENTED IN THE SYSTEM LOGBOOK.

Manufacturer's Manuals
Copies of the original manufacturer's equipment manuals are located in the Instrumentation Technicians' office.

Bias Adjustment Factor Records
All records shall be kept in the QA/QC Manual in Appendix F.

Training Records
Records of all training performed by St. Marys personnel on the CEMS QA/QC policies or procedures will be kept by the Human Resources Department.

1.12. MODIFICATION AND UPGRADES

It is important for there to be a plan of action regarding the modification or upgrade of the CEM system at SMC Bowmanville. As necessary changes to the CEM system become apparent through operational difficulties, SMC Bowmanville has implemented policies addressing these changes. Also included in this section are the requirements for modifications to the system under the appropriate regulatory authority.

1.12.1. SMC BOWMANVILLE INTERNAL POLICIES

Policies for the implementation of modifications and upgrades to the system are included in SOP 18.

1.12.2. REGULATORY REQUIREMENTS FOR CHANGE

Under O.Reg.194/05 s.48 (9), SMC Bowmanville must notify the Director in writing of any changes made to either the CEM system or the QA/QC Manual.

1.13. TRAINING AND QUALIFICATIONS

SMC Bowmanville will achieve its availability targets for valid data recorded by the CEM system by ensuring that only qualified people are permitted to perform: CEM maintenance, calibrations, data recording, data validations, performance evaluations, and document control. Training on the system will be provided by the Electrical Maintenance Manager. The guidelines for training are available in SOP 17.

1.13.1. QUALIFICATIONS

Qualifications for personnel performing specific job tasks (in relation to the CEM system) are to be strictly enforced to ensure that the CEM system is providing valid data. Below are the qualifications that each job must have as a minimum.

Each job position, as noted in Section 1.4, is to be filled with someone who has obtained the appropriate level of education and experience as stipulated by SMC Bowmanville Corporate requirements.

1.14. REFERENCES

References have been made throughout this document; they are referenced internally or footnoted at the bottom of the applicable page.

SECTION 2 - QUALITY CONTROL AND PROCEDURES

Included as part of this Quality Assurance Manual are documented procedures to follow in order to ensure quality data is being generated by the CEM systems.

STANDARD OPERATING PROCEDURES

SOP: 1 System Start-up and Shut-down Procedures
SOP: 2 Daily System Inspections
SOP: 3 Calibration Procedures
SOP: 4 Gas Cylinder Check Procedures
SOP: 5 Preventive Maintenance Procedures
SOP: 6 Spare Parts Inventory
SOP: 7 Corrective Maintenance Procedures
SOP: 8 Backfilling Data Procedures
SOP: 9 Data Back-Up Procedures
SOP: 10 System Security
SOP: 11 Reporting Procedures
SOP: 12 Quarterly Performance Evaluations
SOP: 13 Semiannual Performance Evaluations
SOP: 14 Bias Procedures
SOP: 15 Annual Systems Audit
SOP: 16 Mass Emissions/Intensity Rates Monitoring
SOP: 17 Training Procedures
SOP: 18 Managing Change
SOP: 19 Records
SOP: 20 RATA Bias Adjustment Factor Records
SOP: 21 Document Change Log QAQC Manual

Appendix I

Employee Training Manual

	Location: Bowmanville	ST. MARYS CEMENT COMPANY		Page 1 of 3
	Department: Production	Title: Operator Training Plan for Alternate Fuels		Revision: 2
	System: Alternate Fuels	WHO: Production Personel	WHEN: As required	Type: Plan
	APPROVED AND PUBLISHED ELECTRONICALLY ORIGINAL AVAILABLE ON THE INTRANET		WHERE: Production	

1.0 PURPOSE

To outline the training that is to be provided to production personnel that operates the alternative fuel system including both use of alternative low carbon fuels (woody materials) under ECA 7024-9XUK4C and the alternative fuel demonstration project under ECA 1255-7QVJ2N.

2.0 SCOPE

Covers all equipment, regulatory and permit conditions of this system.

3.0 RESPONSIBILITY

Environmental Manager: Ensures that the plan is up to date and the most resent version has been submitted to the District Regional Office of MOECC.
Production Manager: Ensures that all production personal that operate the alternate fuel system have been appropriately trained.

4.0 DEFINITIONS

Definitions applicable to this program are identified in the relevant project ECA approvals as noted below (Section 5 G.).

5.0 TRAINING PLAN

The Operator Training Program as outlined by this Plan will be composed of three components to ensure that all operators are familiar with the new equipment that will be installed, specifications for fuel to be used, pertinent applicable legislation, and any special requirements that will have to be met as per the environmental approvals for this project. These components will be:

1. General overview
2. Detailed equipment review
3. On-the-job training

General Overview

The purpose of this training is to provide the operators with all the background information about the Alternate Fuels Project. Items to be covered in these sessions will include:

A. Fuel source

a. What is the fuel to be used
b. Where is the fuel coming from
c. How will the fuel be delivered
d. What types of fuels can be accepted
e. Environmental concerns related to the fuel
f. Health and safety concerns related to the fuel

B. Alternate fuel equipment
   a. General layout
   b. Alternate Fuel building
   c. Off-loading bays
   d. Transport system
   e. Fuel delivery at the calciner
C. Fuel delivery
   a. Communication with Central Control Room
   b. Driver's responsibilities
   c. Production crew responsibilities
   d. Inspection and acceptance/refusal
   e. Records and samples
D. Fuel use
E. System interlocks
   a. Interlocks as mandated by permits
   b. How these interlocks will be realized in Foxboro system
F. Legislation - What legislation applies to this project?
   a. EPA – Environmental Protection Act
   b. O. Reg 347 – General - Waste Management
   c. O. Reg 419 – Air Pollution – Local Air Quality
   d. Publication NPC 207 – Impulse Vibration in Residential Buildings
   e. Publication NPC 233 – Information to be Submitted for Approvals of Stationary Sources of Sound
   f. Publication NPC 300 – Environmental Noise Guideline, Stationary and Transportation Services – Approval and Planning
G. Permits and conditions
   a. Air approval ECA 0469-9YUNSK
      i. Material testing
      ii. Noise studies
      iii. Emissions modeling
      iv. Process monitoring
      v. CEMs
      vi. Record keeping
      vii. Complaints
   b. Waste approval ECA 7024-9XUK4C
      i. Inspections
      ii. Operation and maintenance
      iii. Sign
      iv. Training

v. Emergency response
vi. Daily log
vii. Annual report

c. Air approval ECA 4614-826K9W (demonstration)
i. Operation and maintenance
ii. Raw feed and fuels
iii. Monitoring
iv. Source testing
v. Reporting
vi. Complaints

d. Waste approval ECA 1255-7QVJ2N (demonstration)
i. Inspections
ii. Operation and maintenance
iii. Sign
iv. Training
v. Emergency response
vi. Daily log
vii. Final Report on the Demonstration

H. Standard Operating Procedures for Alternate Fuels
I. Emergency Response Plan
J. Safety considerations
K. Other items

This training will be provided in classroom sessions by plant and corporate personnel who are involved with the project. Operators will be made aware of the many new environmental conditions with relation to this project such as reporting, inspection, review and record keeping. The division of duties will be clearly explained so that before any fuel arrives they are well aware of their individual responsibilities. There will be time made available to answer any questions or concerns that are raised.

Detailed Equipment Review

Once the equipment has been installed but before it is made fully operational, all operators will receive an in-depth tour of the facility. This tour will include detailed explanation of what each component is used for, normal operating parameters, how the components interact with others, and any safety precautions. This equipment review will also include explanation of how the equipment is operated (started, stopped, and optimized) by the central control system and associated interlocks with existing equipment. As this system will become one of two fuel systems for the calciner the operators will have to become well aware of how the two systems work together. System troubleshooting will be outlined at this time.

This component of the training will be mainly in the field but also in the central control room and may require some additional classroom work to clarify any issues that are raised.

On-Job-Training

By far the most important component, the operators will be trained in the actual operation of the alternate fuels system. This will include the start-up and shutdown of all equipment, addition of alternate fuel to the system, receiving of alternate fuels, required record keeping, inspection, and optimization. This time will allow the operators to become very familiar with the new system as well as allowing them to de-bug the operation at the same time. This training will be entirely hands on and mentor based.

Training Records

Records will be kept of all training provided to ensure that all personnel has received the required training. As new members join the production crews, the training will be repeated for them.

6.0 EXPECTED RESULTS

Personnel operating the alternate fuels system will know all that is required of them.

7.0 ACTIONS IN CASE OF ABNORMALITY

Notify Shift Supervisor or Production Manager.

8.0 REFERENCE DOCUMENTS

A. EPA – Environmental Protection Act
B. O. Reg 347 – General - Waste Management
C. O. Reg 419 – Air Pollution – Local Air Quality
D. Publication NPC 207 – Impulse Vibration in Residential Buildings
E. Publication NPC 233 – Information to be Submitted for Approvals of Stationary Sources of Sound
F. Publication NPC 300 – Environmental Noise Guideline, Stationary and Transportation Services – Approval and Planning
G. Air approval ECA 0469-9YUNSK
H. Air approval ECA 4614-826K9W (demonstration)
I. Waste approval ECA 7024-9XUK4C
J. Waste approval ECA 1255-7QVJ2N

Votorantim Cimentos

ST MARYS

Alternate Fuels

(LCF and demostration)

Site Training

September 2018

Alternate Fuels

Training Topics

- Fuel Source
- Equipment
- Fuel Delivery
- Fuel Use
- Interlocks
- Legislation
- Permits
- Permit Conditions
- SOPs
- Emergency Response Plan
- Safety Considerations
- Other Items

LCF Fuel Specifications

ECA (Waste) 7024-9XUK4C Low Carbon Alternative Fuels:

Woody biomass consisting mainly of wood chips from industrial and post-consumer sources which contains:

- < 10% non-woody material such as plastic, shingles, laminate, surface coatings and other material
- < 5% treated wood
- 80% must be < 2 cm (20 mm) minus in particle size

ECA (Waste) 1255-7QVJ2N Demonstration Alternative Fuels:

Residuals derived from industrial and/or post-consumer sources, including plastic polymers, paper fibre and woody materials, received as single streams or blends.

- 80% must be < 5 cm minus in particle size

LCF Fuel Specifications

Project / Fuel Requirements

Operational Specifications	Parameter	Rationale
Moisture	≤ 25% by weight	▪ Fuel quality ▪ Prevention of run-off ▪ Consistent heating value
Total Halogen Content	≤ 1% by weight	▪ Fuel quality, in accordance with ECA (Air) 0469-9YUNSK ▪ Similar to regulatory guideline in other jurisdictions for similar wood waste materials (as well as other materials including plastic, paper, and textiles) ▪ Testing undertaken in accordance with CSA C22.2 No. 0.3 or MIL-DTL-24643
Calorific Value	≥ 10 MJ/kg	▪ Similar to guidance provided by US EPA under CFR 241.3 (d)(1) for non-waste fuels ▪ Ease of operation

Project / Fuel Requirements

Environmental Specifications	Parameter	Rationale
Metals and Metal Hydrides	Testing for the following metals in accordance with current adjunct fuel requirements in the ECA (Air) 0469-9YUNSK. ▪ Antimony ▪ Arsenic ▪ Barium ▪ Beryllium ▪ Cadmium ▪ Chromium ▪ Cobalt ▪ Iron ▪ Lead ▪ Manganese ▪ Mercury ▪ Nickel ▪ Selenium ▪ Silver ▪ Tin ▪ Vanadium	▪ Quarterly testing of the alternative fuel for metals currently listed on Schedule of D of the ECA (Air) 0469-9YUNSK, Condition 9.(1)(a). ▪ Results of POI concentration modeling based on determination of the proportion of the contribution of the alternative fuel to the mass of the material to the cement plant, should indicate that the POI would not be exceeded. ▪ Applies the current approach for testing of Fuel Adjunct Materials in the Bowmanville Plant ECA (Air) 0469-9YUNSK Condition 4. (1) (a)

LCF Fuel Specifications

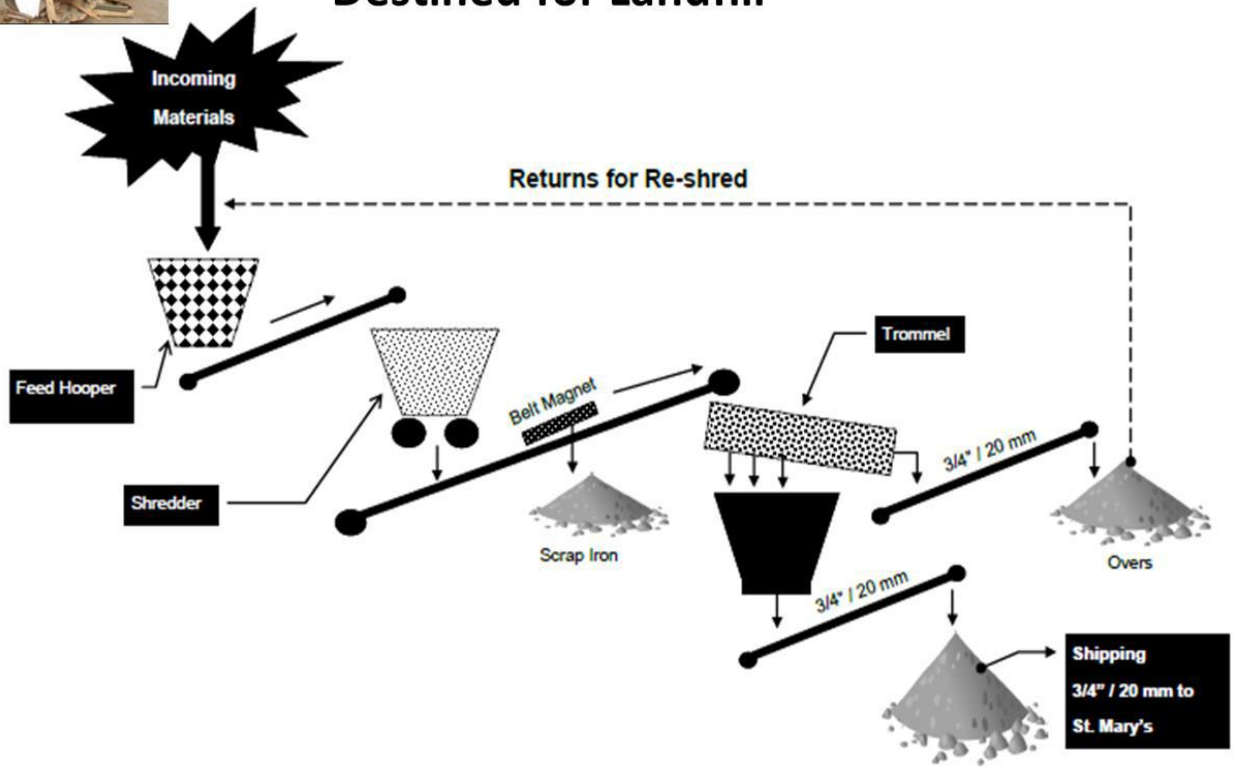
Unacceptable Materials:

- excessively wet material
- oversized material
- non-combustible materials (inert materials including rock, concrete, dirt and metals)
- significant quantities of treated wood (less than 5% of LCF is to consist of treated wood)
- hazardous materials (asbestos, hazardous waste as defined by O. Reg. 347); and,
- highly odorous materials.

Alternate Fuels – Woody Materials

Fuel Source

- Non Recyclable Materials
- Wood and Biomass
- Construction and Demolition
- Destined for Landfill

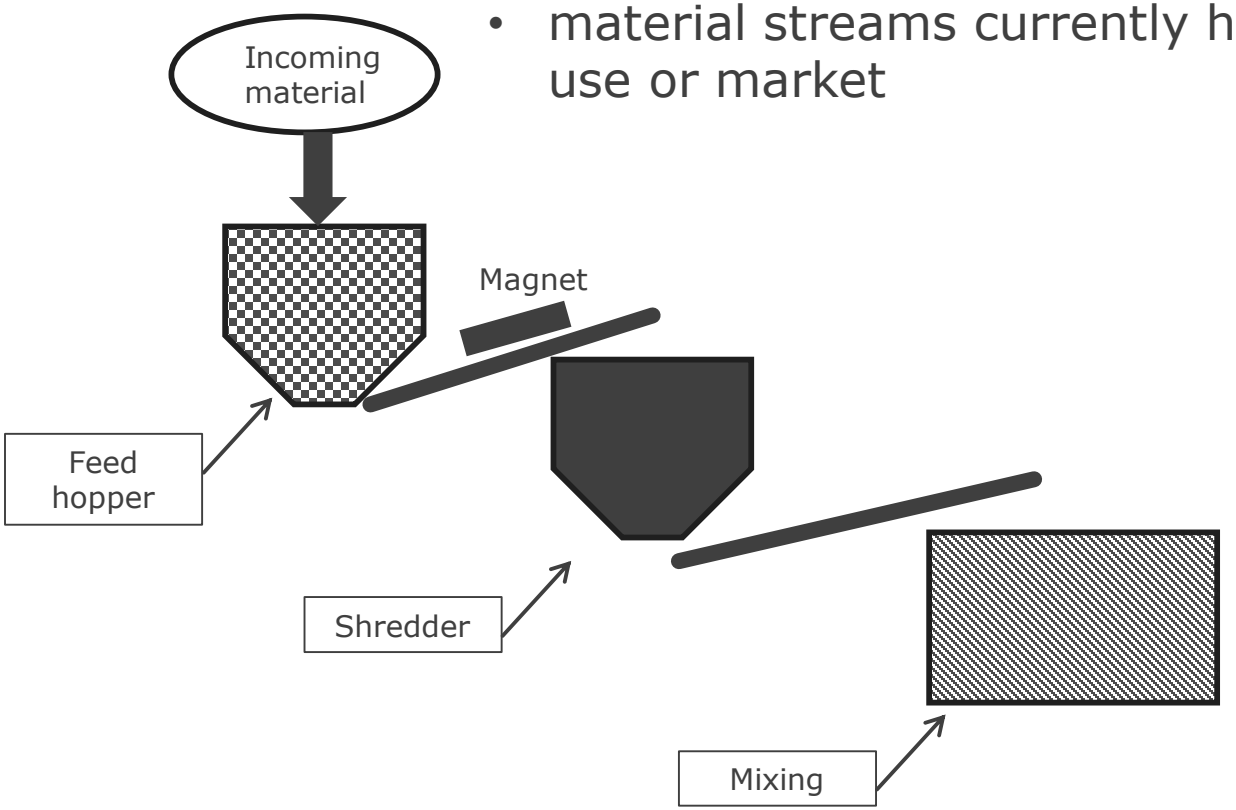


Loaded for Transport

Demonstration Alternate Fuels – Post Composting and Post Consumer Residuals

Fuel Source

- post composting residual
- post-consumer residuals
- material streams currently have no other use or market



Loaded for transport

Low Carbon Alternative Fuels

Fuel Source

Highlights

- **First approved project for Ontario, for full time use of Low Carbon Fuels (LCF) granted by MOE.**
- **Showcase project for industry, in general**
- **The LCF fuels are classified as GHG neutral.**
- **Initial Supply of up to 100 t/d of Construction and Demolition wood waste currently sent to landfill.**
- **45% Energy of Coal, when prepared**

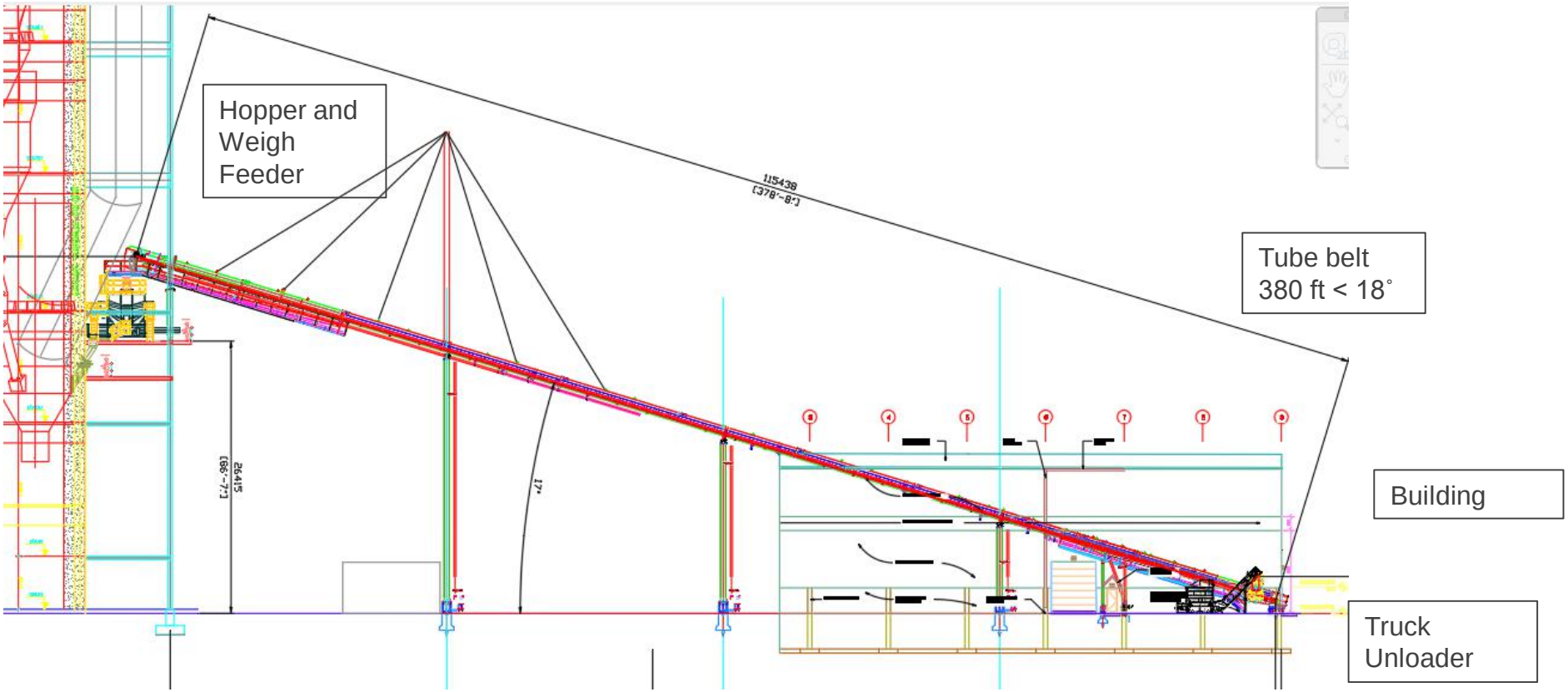
Demonstration Alternative Fuels

Fuel Source

- Demonstration fuel mix generated off-site
- Includes post composting residual (mixture of woody materials and plastic) from composting facilities in Ontario
- Includes post-consumer residuals from material recycling plant in Ontario
- Demonstration fuel material streams currently have no other use or market
- Demonstration approvals (waste, air) limit use to up to 350 tonnes per day, 30% fuel replacement

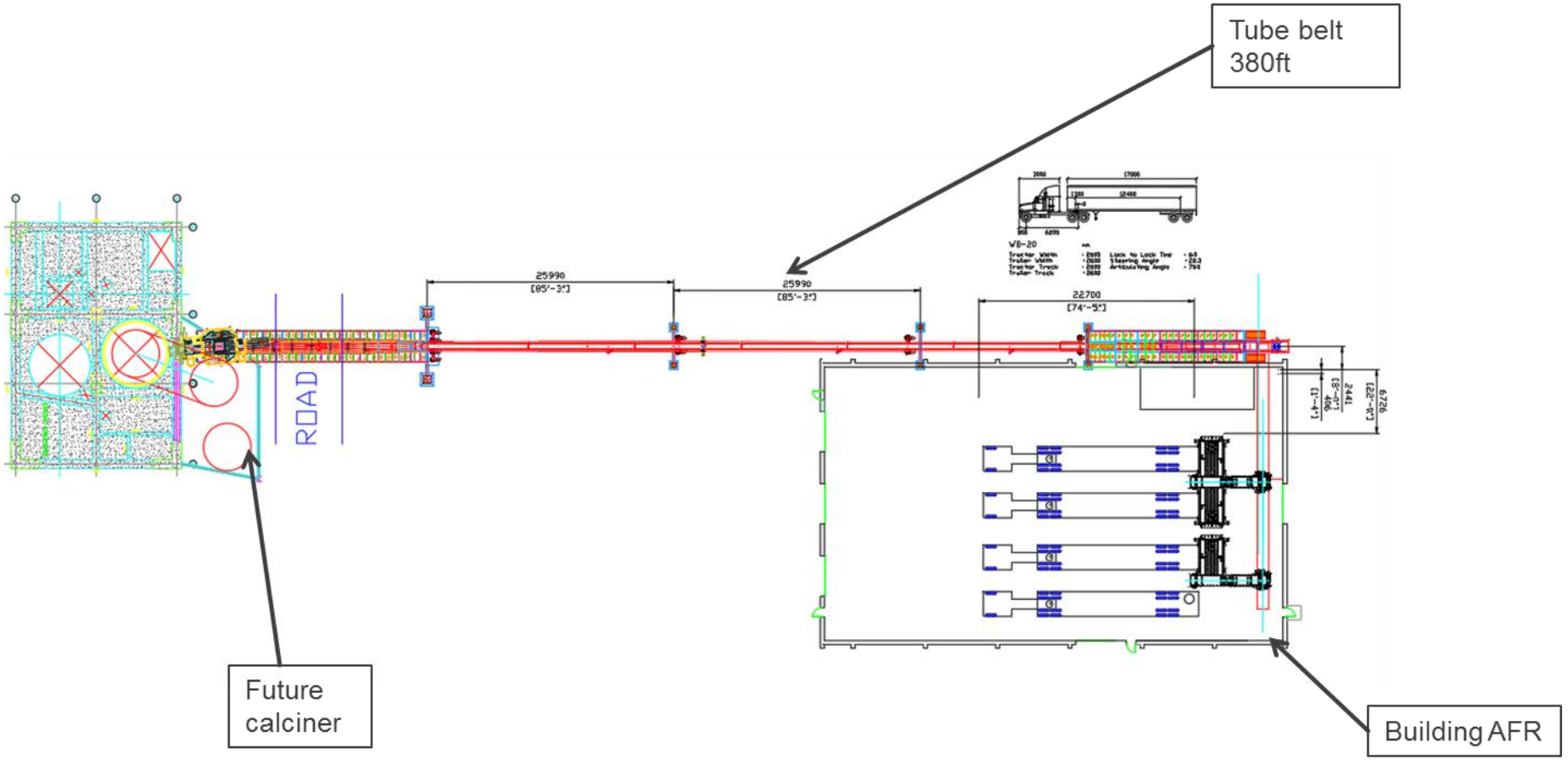
Alternate Fuels

Basic Equipment Layout



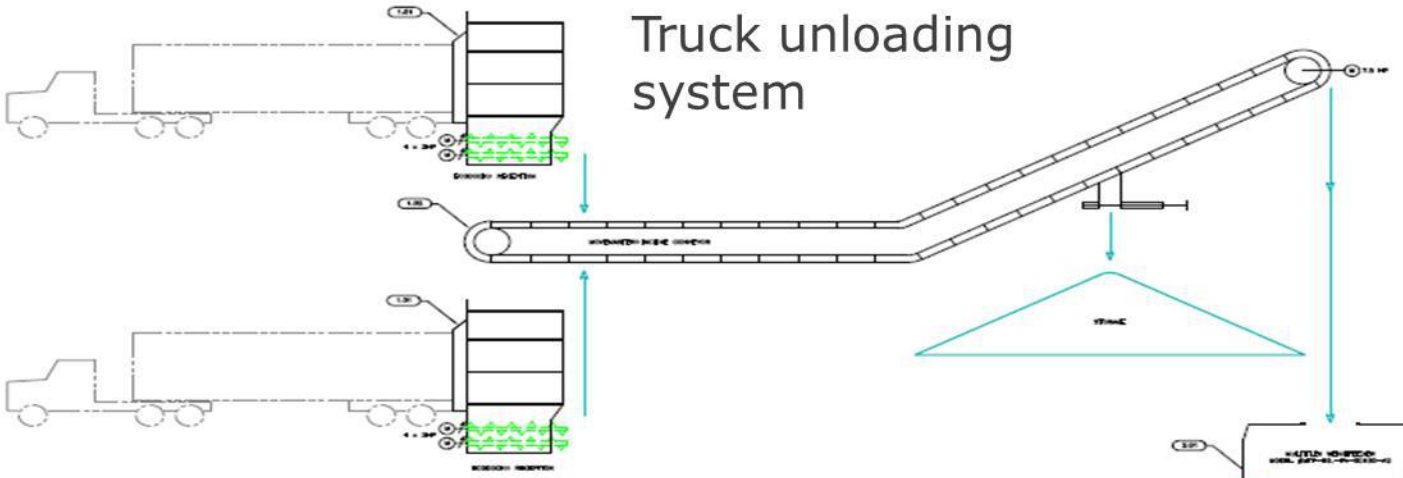
Alternate Fuels

Basic Equipment Layout

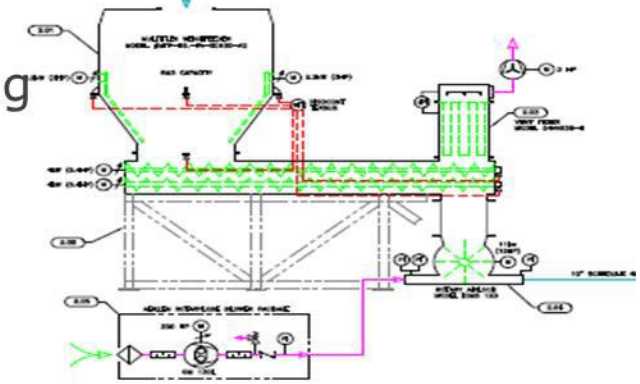


Alternate Fuels

Basic Equipment Layout



Gravimetric weighing system



Alternate Fuels

Fuel Delivery

- **Walking floor trucks with approximately 25 tonnes will arrive at the plant.**
- **Truck will back trailer into bay. May have to un-hook to move empty trailer. Then put full trailer in its place.**
- **Driver will leave sample and load weigh ticket in assigned spots**
- **Driver will leave with empty trailer.**
- **There will be two loading bays. Building is large enough for four trailers.**
- **There are six cameras at site – one in each bay, three inside the building, one at weigh feeder**

Alternate Fuels

Fuel Use

- System is totally enclosed
- Walking floor trailer unloads to ECOdock, metered to conveyer belt to main belt, fed into weighfeeder, then deliver to calciner.
- System is tied together so that rate of feed to calciner controls the entire process
- Hydraulic system to run trailers – cab is not required
- Currently permitted use rate for low carbon alternative fuel (woody materials) is 100 tonnes per day maximum of 4 tonnes per hour
- This will require four trucks per day at full feed rate
- Permitting use rate during demonstration is higher (up to 350 tpd, up to 12 tonnes per hour), but over much shorter period

Alternate Fuels

Interlocks

- **There are a number of mandated interlocks on our operation approval with regards to alternate fuels**
  - Amount of wood used, a maximum of 4 tonnes per hour
  - Amount of demonstration fuel used, a maximum of 350 tonnes per day, 12 tonnes per hour
  - Temperature
    - Kiln must be greater than 1000°C
    - Calciner must be greater than 850°C
  - Residual oxygen
    - >1% at backend of kiln
    - >3% at calciner downcomer
  - Pressure
    - Kiln, calciner and raw mill must be operated under negative pressure at all times
  - Start-up and Shut-down
    - No alternative fuel is to be used
- **If any of these rules are violated, alternative fuel to be shut-off**

Alternate Fuels

Permits

- **Four permits – Air for conventional and LCF, Waste for Low Carbon Fuels, Air for demonstration, Waste for Demonstration**
- **Air Approval covers the entire plant as well as use of wood waste as fuel**
- **Waste approval allows us to accept waste material at site and store it**
- **These permits come with many conditions and requirements for the use of alternate fuels**

Alternate Fuels - LCF

Permit Conditions

- **Air Approval 0469-9YUNSK**
  - Material testing
  - Noise studies
  - Emissions modeling
  - Process monitoring
    - Temperature, oxygen, feed rate
  - CEM's
    - SO_2, NO_2, THC
  - Record keeping – all the above items
  - Complaints

Alternate Fuels - LCF

Permit Conditions

- **Waste Approval 7024-9XUK4C**
  - Inspections
    - Set up as a PM
  - Operation and maintenance
  - Sign
    - Posted at the end of the road
  - Training
  - Emergency Response
  - Daily Log
    - Use
    - Receipts
    - inspections
  - Annual Report

Alternate Fuels - demonstration

Permit Conditions

- **Air Approval 4614-826K9W (demonstration)**
  - Operation and maintenance
    - 30 days for testing
    - Operation and monitoring equipment working correctly
  - Raw feed and fuels
    - Monitoring of raw feed and fuels done by consultants
  - Monitoring
    - CEM system (SO2, NOx, opacity)
    - Consultant (upwind and down wind)
  - Source testing
    - consultant
  - Reporting
    - 6 moths after testing is done
  - Complaints

- **Waste Approval 1255-7QVJ2N (demonstration)**
  - Inspections
    - Set up as a PM
  - Operation and maintenance
  - Sign
    - Posted at the end of the road
  - Training
  - Emergency Response
  - Daily Log
    - Use
    - Receipts
    - inspections
  - Final Report on the Demonstration

Alternate Fuels

SOP's

- **Need to make new SOP's for system or modify existing SOP's to include new items in relation to alternate fuels**
- **Fortunately many of the required SOP's are already in place but some will have to be prepared as we become more familiar with running the system**

Alternate Fuels

Emergency Response Plan

- **Four main documents**
  - PD-000929 Emergency Response
  - PD-000371 Bowmanville Emergency Planning and Preparedness
  - PD-00000788 Spill Response
  - DD-000066 Bowmanville Emergency Phone List
- **All of these have been in place for years so nothing new**
- **Alternate fuel building has a water sprinkler system in case of fire**
- **No worry about spills as wood and the demonstration fuels are easy to clean up with current plant equipment – no environmental hazard**

- **Safety concerns with wood and demonstration fuels**
  - Minimal as system is totally enclosed
  - Health
    - There may be fine wood dust particles so respirators should be worn for prolonged exposure
    - No treated wood or hazardous materials
  - Fire
    - Enclosed system
    - Sprinkler system
    - Will be fire extinguishers on site
  - Floor – slips, trips and falls
    - Concrete floor in building – may get slippery due to moisture from trucks
    - May get oil on floor from hydraulic system – keep spill materials in building
    - Clean debris quickly

Alternate Fuels

Questions

Appendix J

Daily Log Book

Bowmanville Production/Utilization/Energy Report

Update | Print | Send

SHIFT COORDINATOR:

DATE: 12 HR REPORT (Month/Day/Year) HR:MN:SC

		ON OVERTIME			ON OVERTIME
OPERATOR:			LAB:		
ASSISTANT:			ELECTRICIAN:		
UTILITY 1:			MILLWRIGHT:		
UTILITY 2:			MILLWRIGHT:		
UTILITY 3:			MILLWRIGHT:		
UTILITY 4:			ABSENTEEISM:		

		EQUIPMENT:	AVG. PRODUCTIVITY	PRODUCTIVITY	# of Stops	UTILIZATION	ENERGY	Quality NC
			tph	%	#	%	kwh/t	# of samples
PRODUCTION		SECONDARY						
		ATOX						
	Kiln Feed	Kiln String Feed						
		Calciner String Feed						
	CLK	Clinker Total						
		Roll Press						
		COAL MILL						
		FM1						
		FM2						
		FM3						

Atox vs Kiln variance
T

Total Clk Production:
T

	EQUIPMENT:	OPACITY	DIFFERENTIAL PRESSURE	Stack NOx (kg / T clk)	Stack Sox (kg / T clk)
ENVIRONMENT	KFBH				
	COOLER BH				
	FM # 1				
	FM # 2				
	FM # 3				

Alternative Fuel	Runtime hrs	Proc. Ready Time hrs	Kiln Ready time * hrs	Availability* %	Feed rate t/h

*Availability = Runtime / Kiln Ready Time (time for >5000tpd)

Notes:

1/ Safety / Environment:

Was there excessive fugitive dust? Y/N

Describe Corrective Actions.

2/ Stops / C.A.R.:

3/ Shift Problems/Solutions:

Secondary

ATOX

Kiln

Alt Fuel

Lime Injection

Coal

Gyp & Roll Press

FM1

FM2

FM3

Dock

Utility Checks:

Route # 1:	
Route # 2:	
Route # 3:	
Route # 4:	
Finish Mill:	
Gyp 1A	
Gyp 4A	
Gyp 5A	
K5 pressure port	

W/O's:

Location:	Equip #:	WO #	Description

Notifications:

Location:	NOT #	Description

General:

Page no:

St. Marys Cement – Bowmanville Plant
Alternative Fuels Demonstration Daily Log
ECA 1255-7QVJ2N

Date	Source of Fuel Received	Amount of Fuel Received	Daily Inspection Notes	CARs Issued	Name

Appendix K

Fuel Feed System Specifications and Manual(s)

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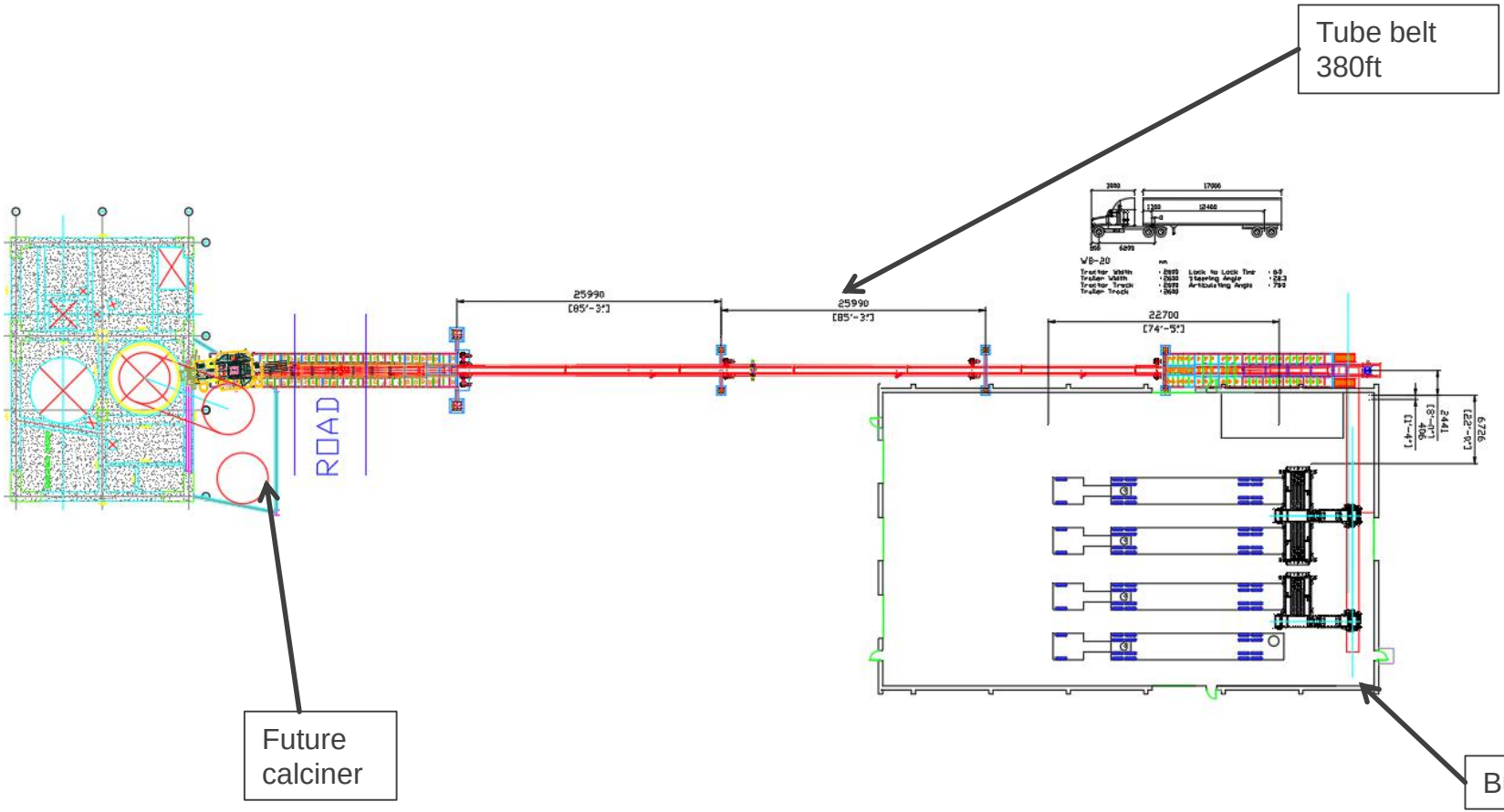
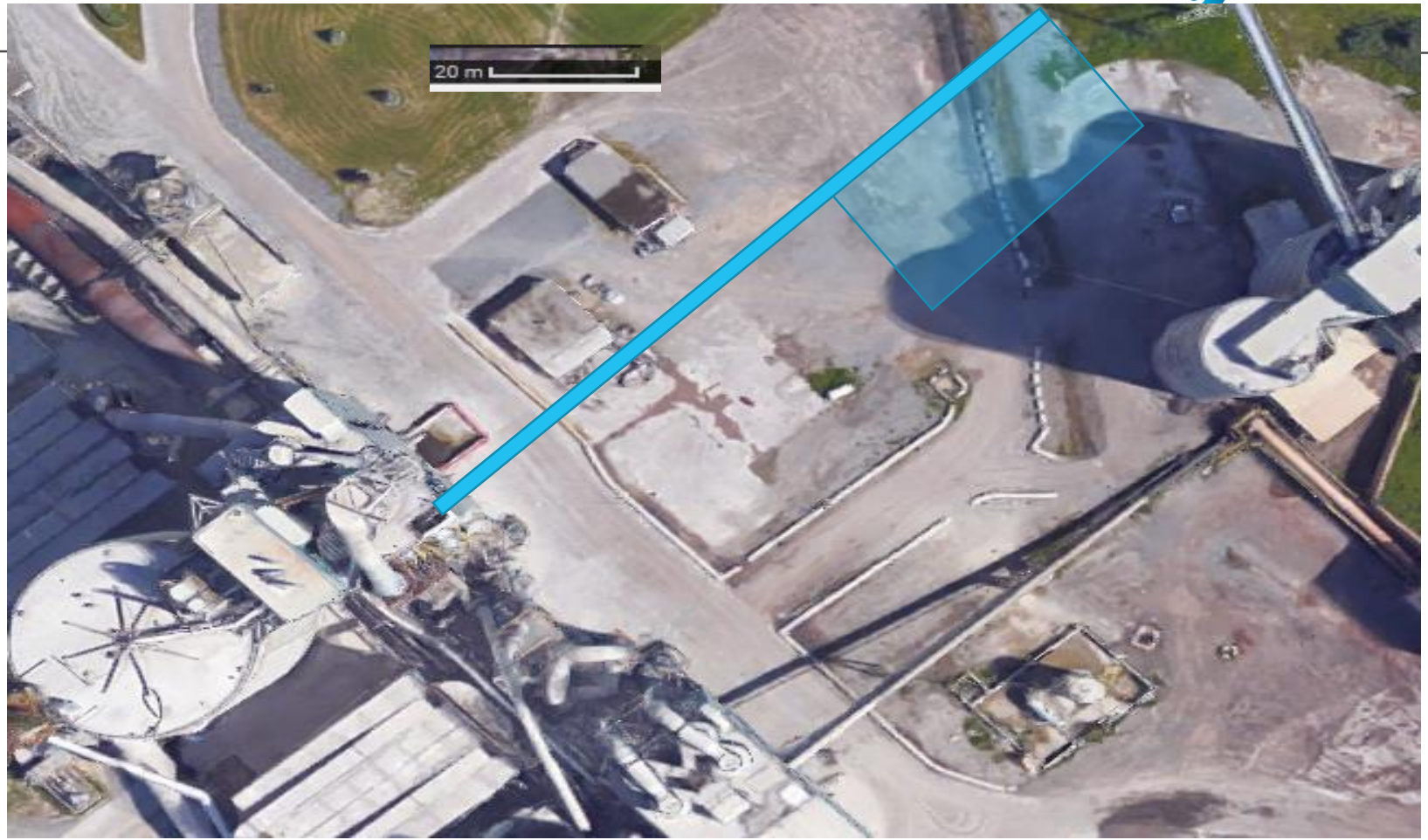
Cimentos

BOWMANVILLE AFR

OP-01 Plan View

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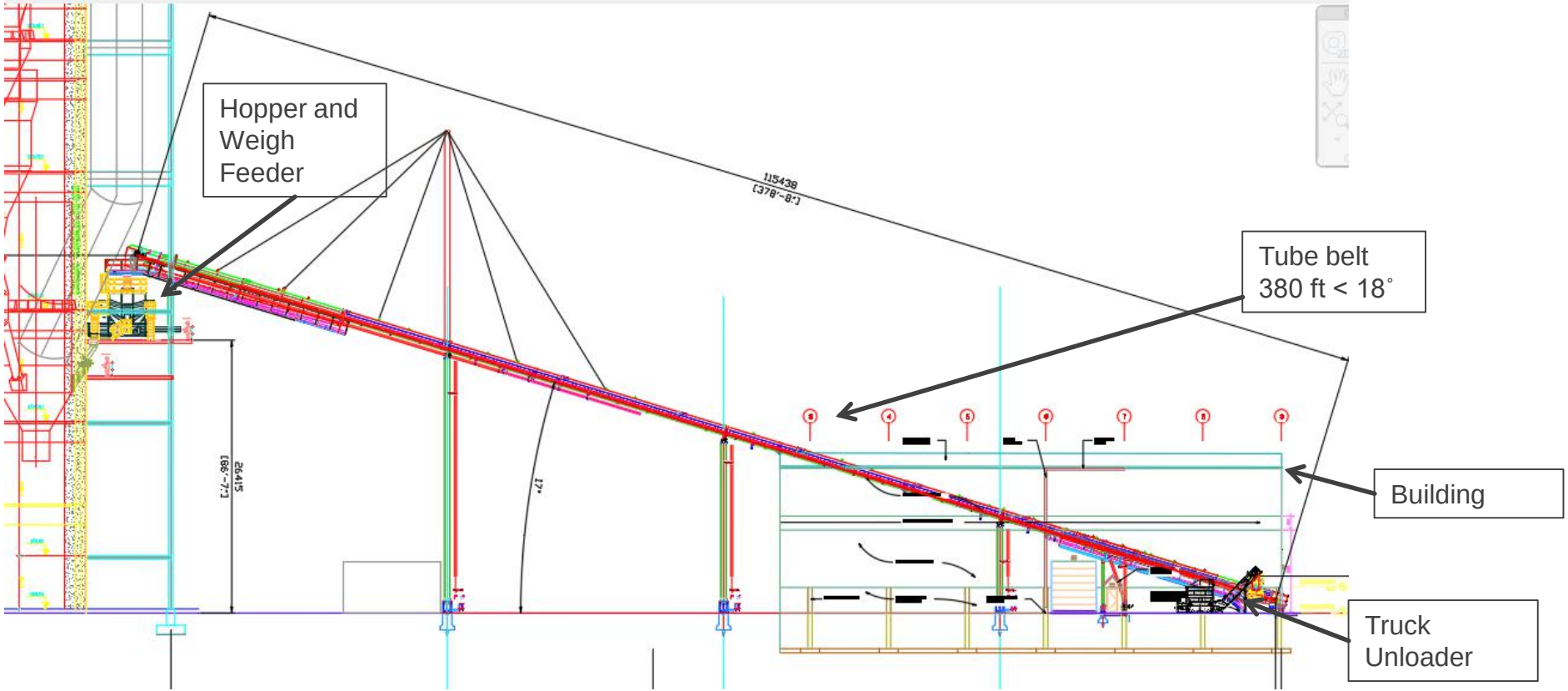
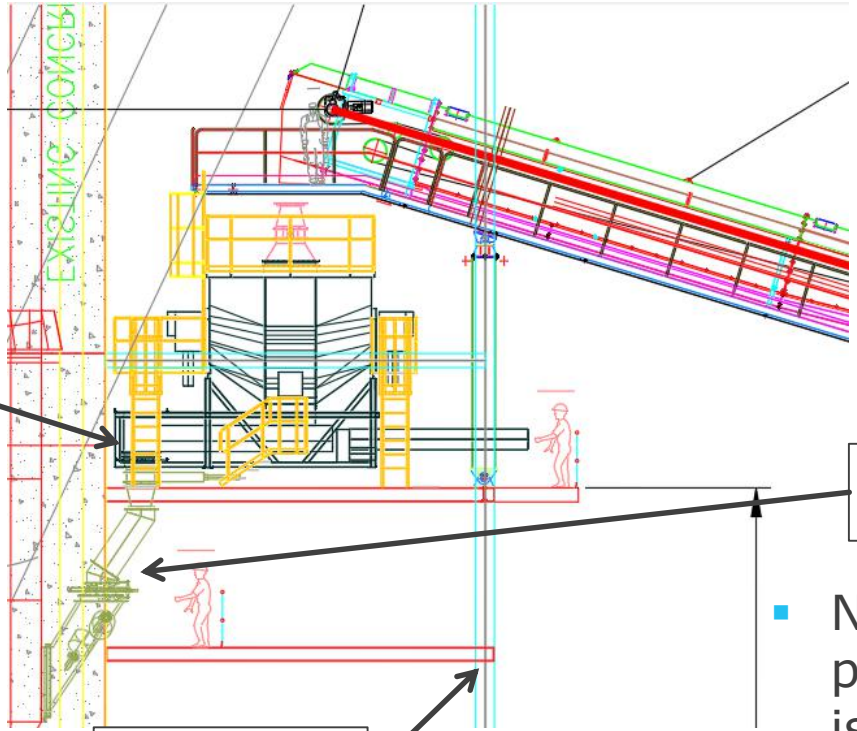
OP-01 Side View



OP-01Fuel Injection System



Screw Feeder Pressure Seal, Fire Block

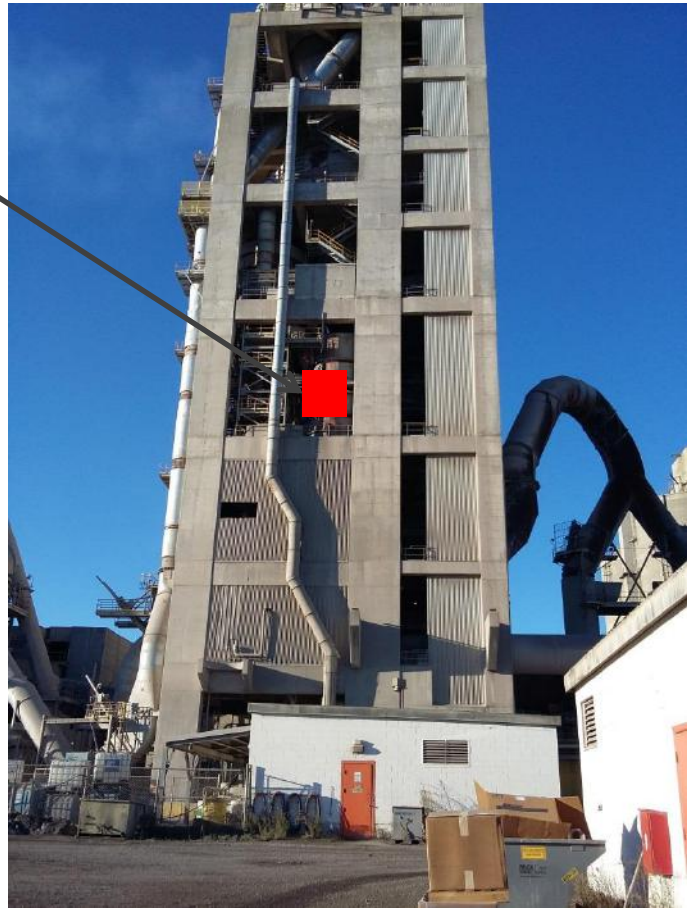
Shut off gate, Fire Block

Struture for future calciner

- Need to ensure positive pressure isolation to prevent conveyor belt fire

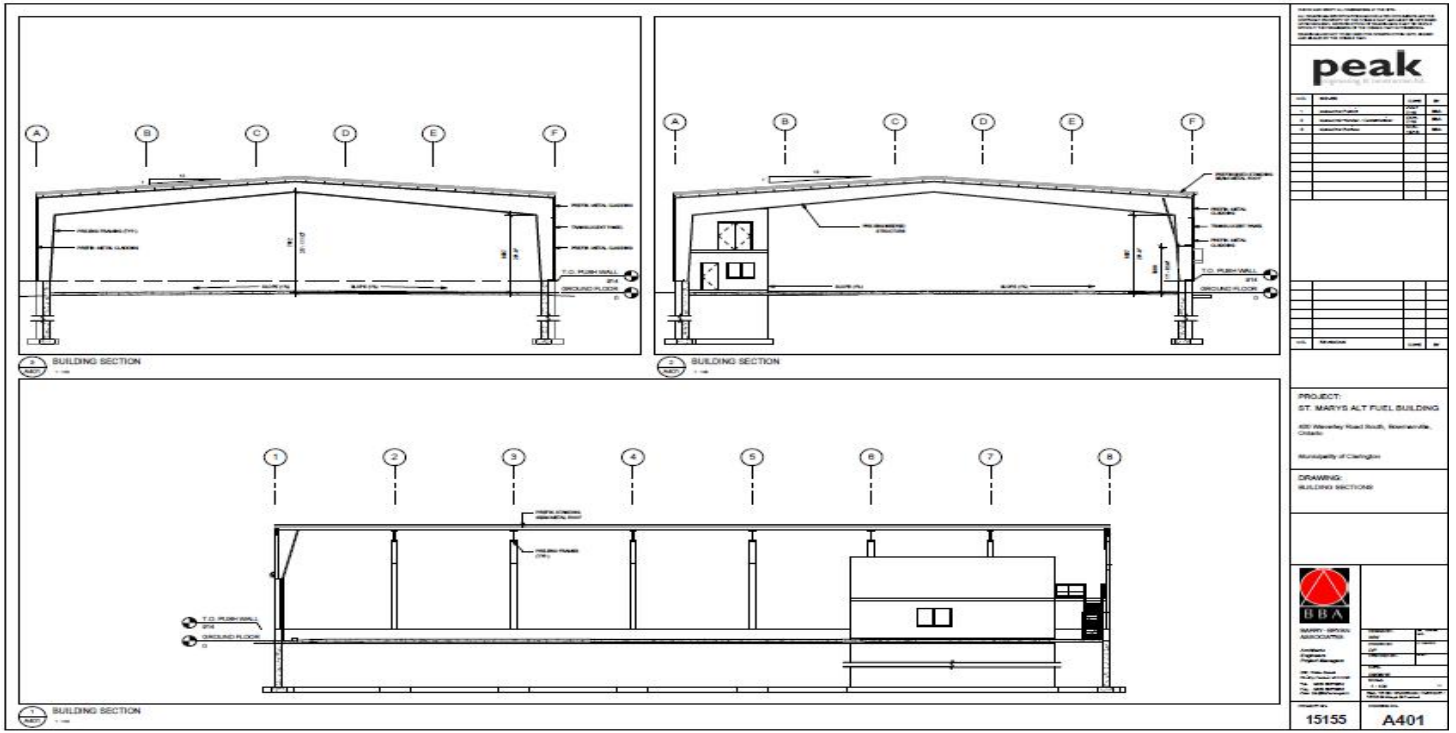
Position for Entry to PH Tower

Considering the future Calciner Option



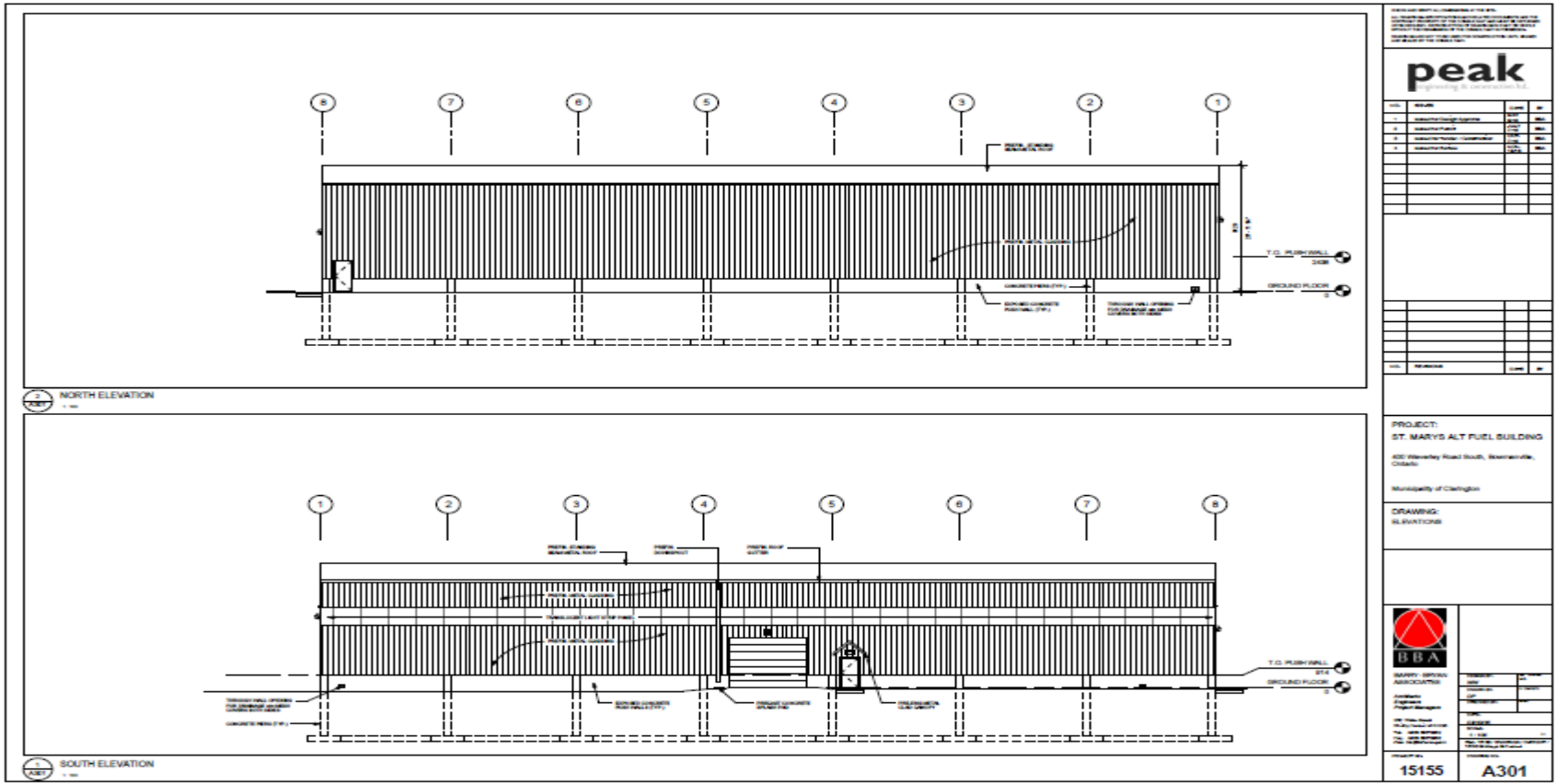
Project Infrastructure and Layout

Building Architectural View



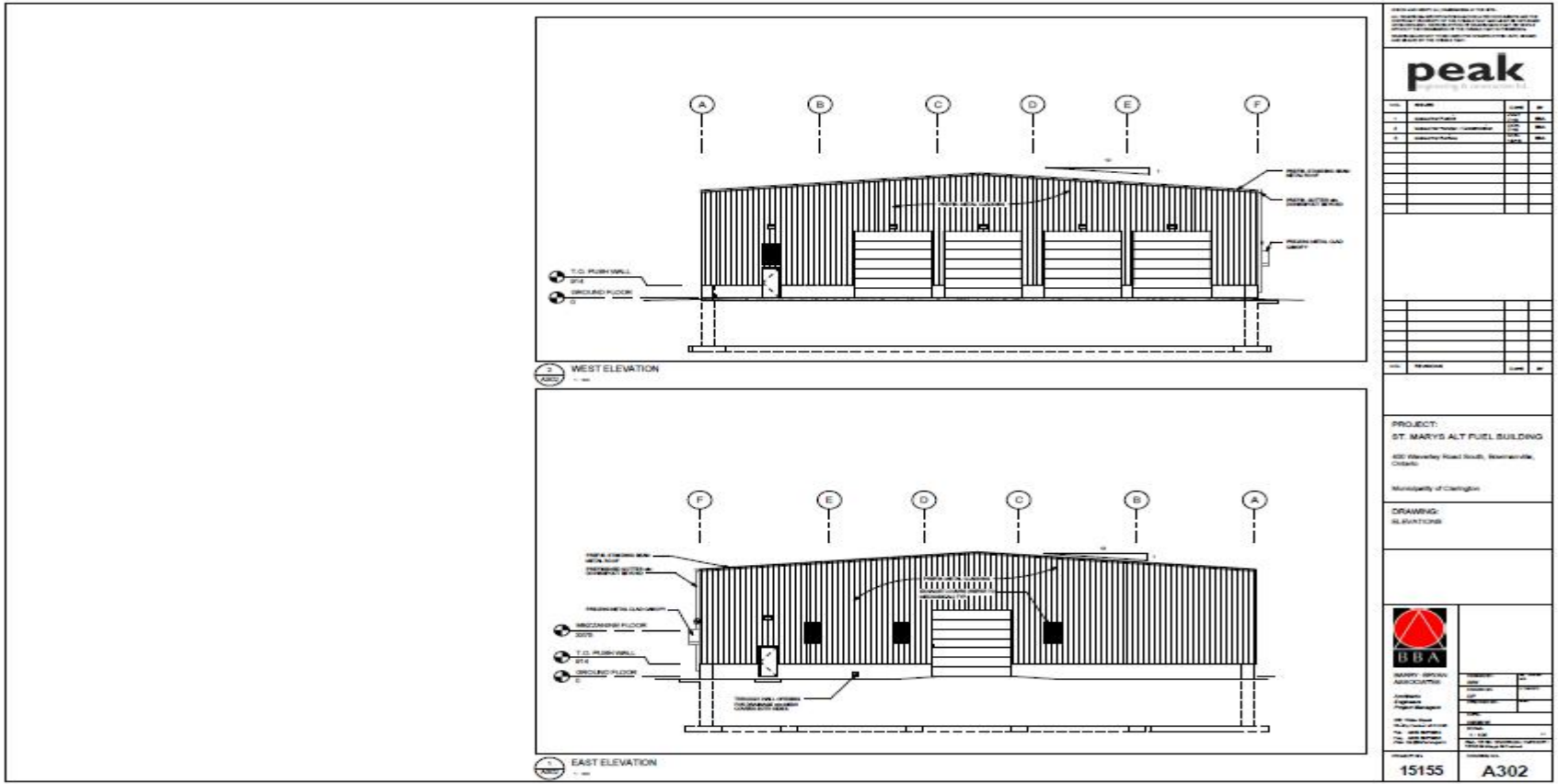
Project Infrastructure and Layout

Building Architectural View



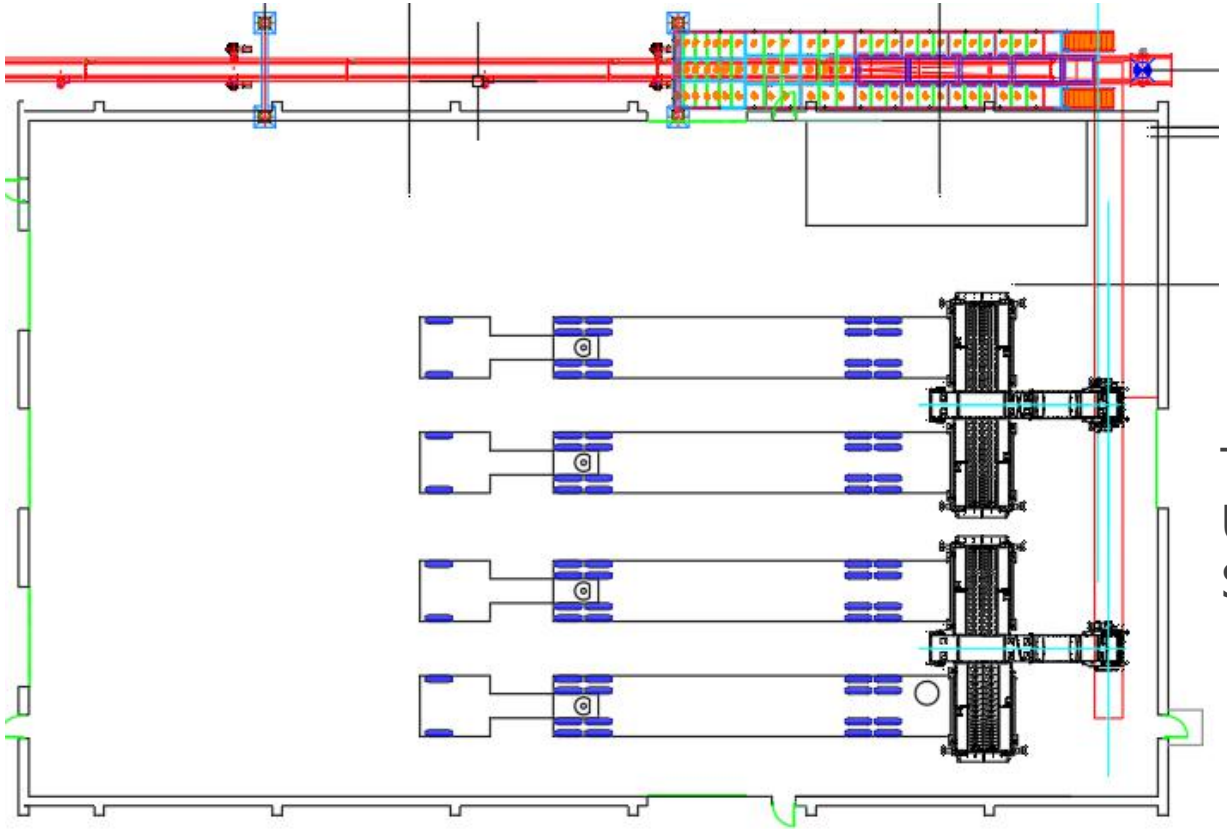
Project Infrastructure and Layout

Building Architectural View



Project Infrastructure and Layout

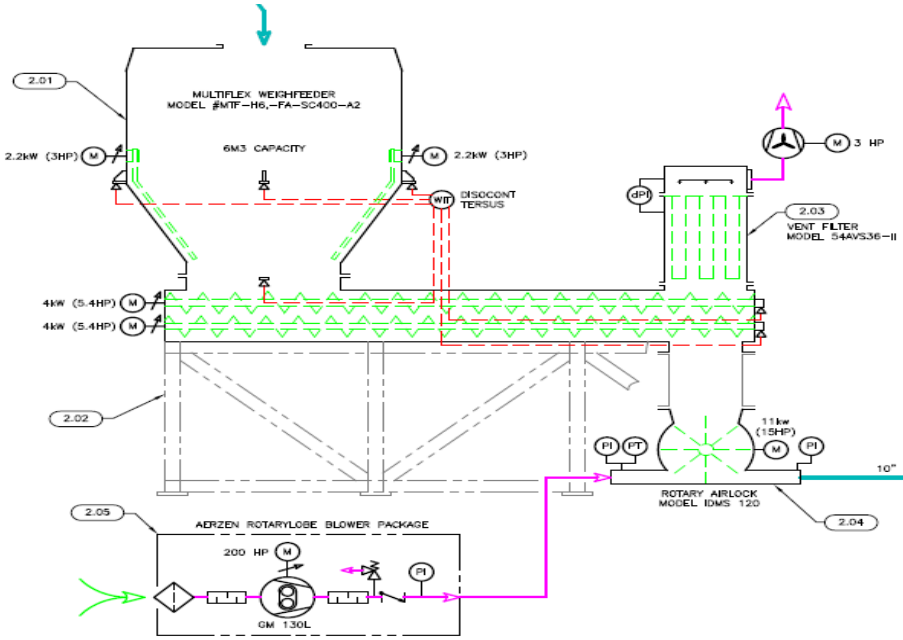
Equipment Layout



Truck Unloading Stations

Schenk weight Systems for metering

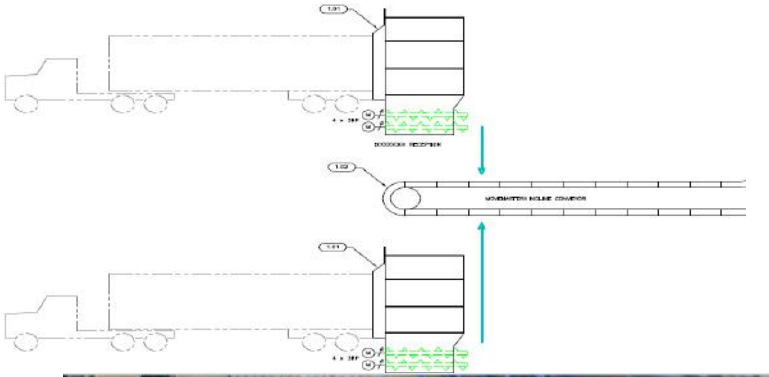
Dosing System



- Compact
- Established Vendor with VCNA and Alt Fuels
- Supported from USA
- 25 Tonnes Per Hour +
- Gravimetric, but not weigh belt
- Fully Enclosed and Dust Free
- Compact, lower installation profile, easy access
- Direct feed into Calciner with isolation gates

Schenk Trailer Unloading Systems

Receiving System



- US Supplier, we have some of these already at SAC
- Integrated with Feeder, or stand alone
- 15 Tonnes Per Hour each
- Very Compact Design and Layout (save floor space)
- Large installed base world wide

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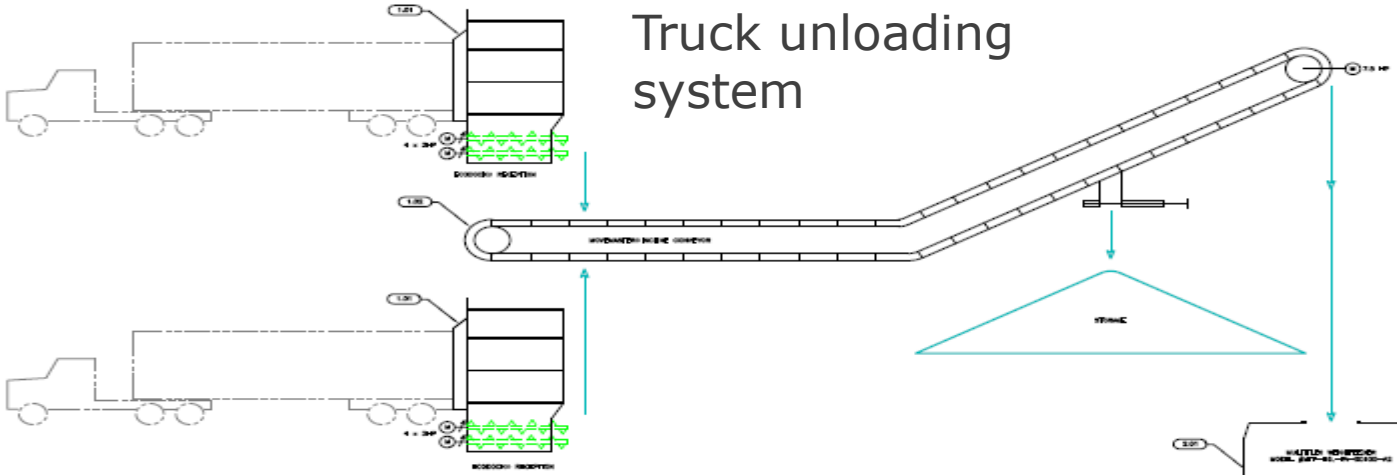
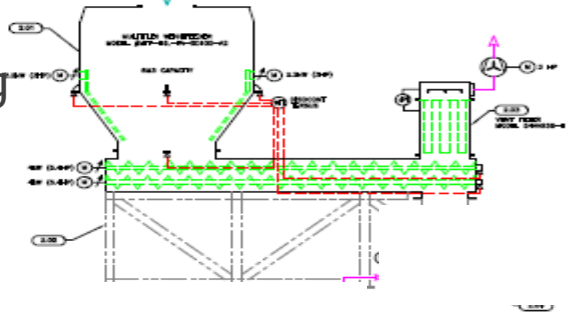
Truck unloading system



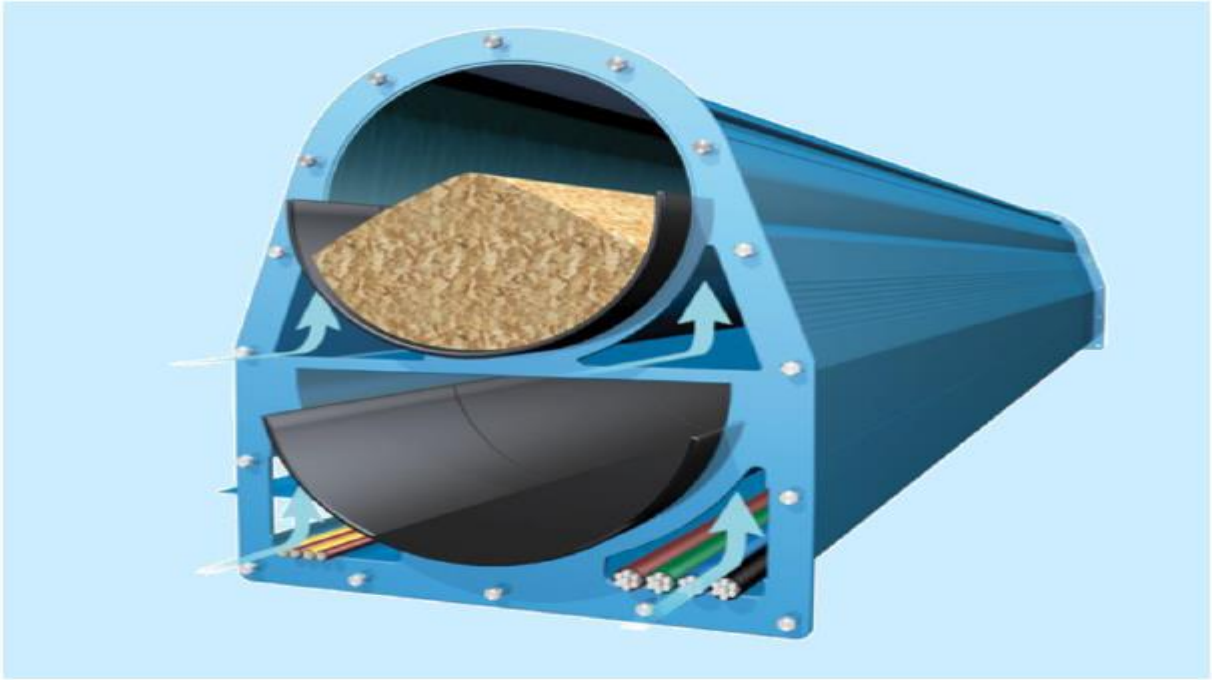
Gravimetric weighing system



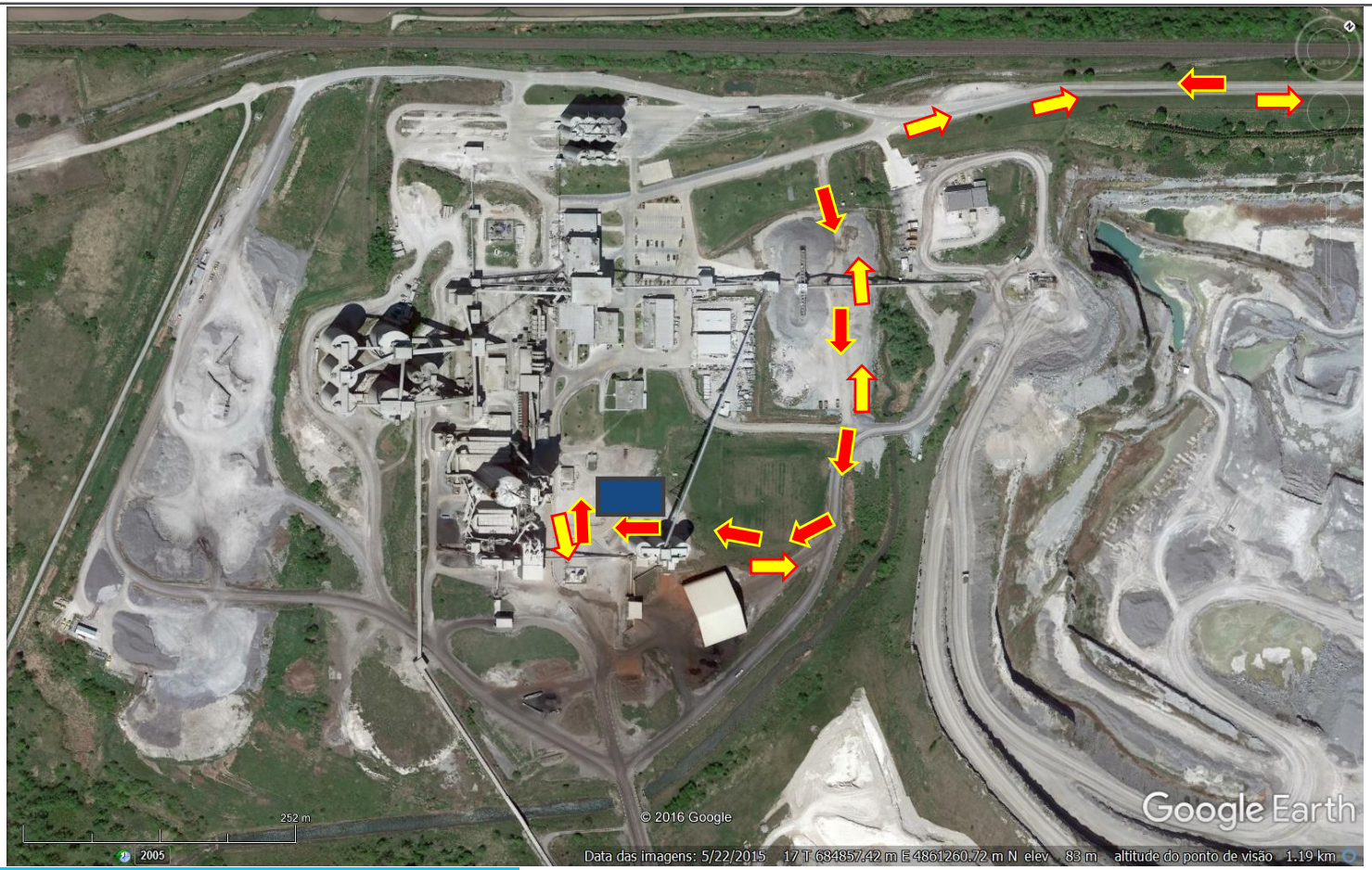
- Typical enclosed tube belt

Votorantim Cimentos

Shredded Waste Conveyor



BRUKS Tubulator CT830 ACR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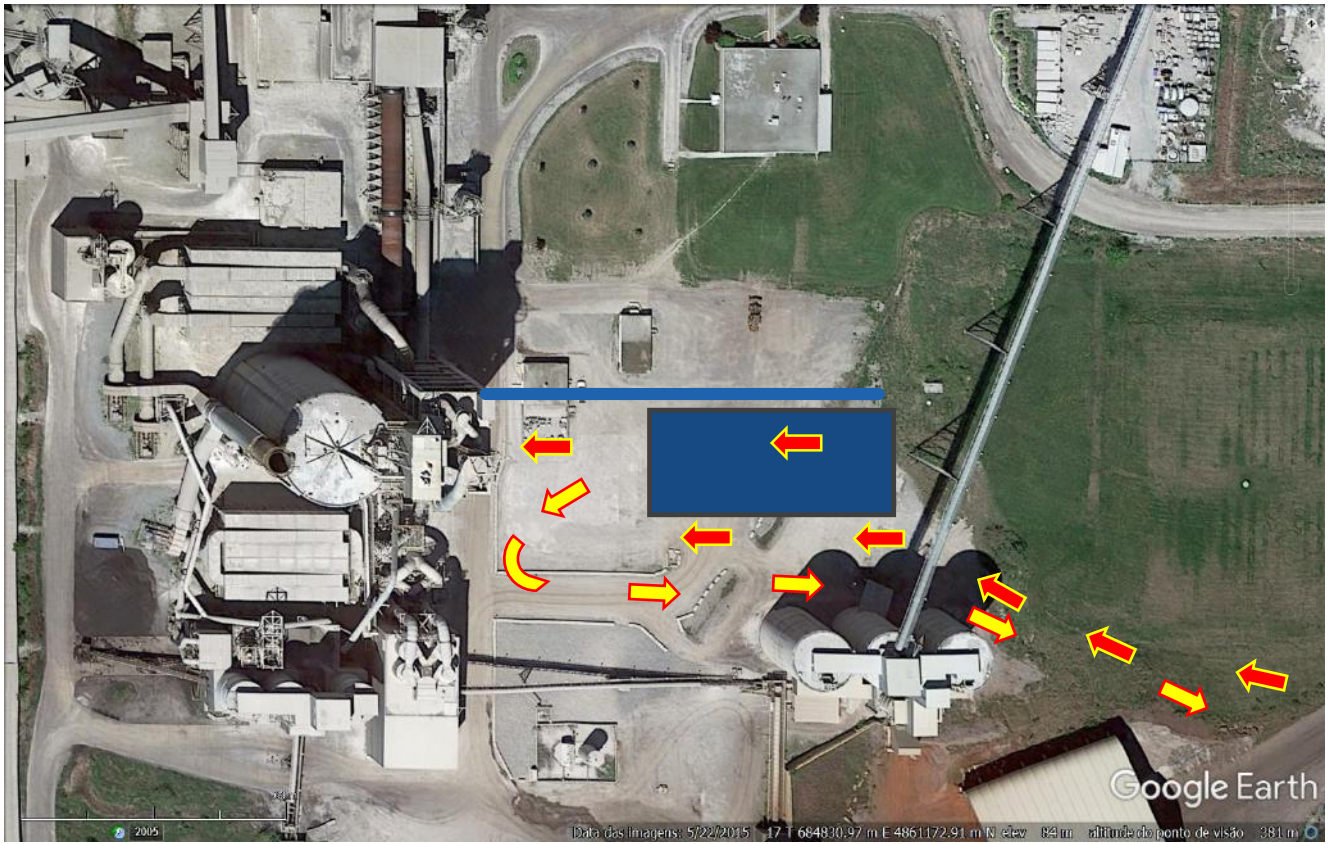
© 2016 Google
Google Earth
2005
Data das imagens: 5/22/2015 17 T 684857.42 m E 4861260.72 m N elev 83 m altitude do ponto de visão 1.19 km



IN

OUT

Appendix L

Emergency Planning and Preparedness Procedure

LEGEND

This document utilizes **hyperlinks** to assist with rapid searches while viewing on a computer. The hyperlink list below also acts as a table of contents with page numbers to assist searches while using a hard copy version

PURPOSE

The purpose of this procedure is to ensure that all St. Marys Cement Bowmanville facility personnel, visitors, contractors and sub-contractors **know what to do in an emergency situation** such as injury, fire, severe weather, power failures, major spills etc.

Remember – in the event of an Emergency DIAL 292

SCOPE

The scope of this document includes all cases of emergency that will require emergency response and / or the evacuation of an area of the property or complete plant evacuation.

RESPONSIBILITY

Safety Coordinator: Responsible to maintain this document
Production Shift Coordinator: Responsible for and designated as, the Emergency Response Coordinator
Supervisory Staff: Responsible to follow and to train Hourly Employees on this procedure
Hourly Staff: To follow this procedure and report deficiencies to their immediate Supervisor

PROCEDURE

MEDICAL EMERGENCY PROCEDURE – dial 292

1. A Medical Emergency occurs any time that professional emergency medical transport or professional emergency services are required.

2. Ambulance services must be used to transport an employee to the Hospital during off-shift hours. At no time should a Taxi Company be used to transport an employee to the Hospital during non-regular hours.

3. Upon discovery of medical emergency call CCR Operator at **EXT: - 292** and calmly relate the nature of the emergency.
    a. The CCR Operator will make the 911 call for appropriate emergency response
    b. The CCR Operator will dispatch internal first aid response to the emergency site.
    c. The CCR Operator will dispatch an employee to the end of the Plant Road (at Waverley Road) to guide the emergency vehicle to the site of the medical emergency

4. Stay calm and assist with the injured if and where possible until internal first aid or external emergency response arrives.

5. The Supervisor in charge (generally the Shift Coordinator), will ensure the following:
    a. Ensure that all injured employees receive treatment as soon as possible.
    b. Verify that someone has been sent to the plant road and Waverley Rd junction to guide the municipal emergency responders to the correct location.
    c. If it is a critical injury as per the OHS Act the site must be secured for ministry investigation. The definition of a critical injury is located in the Definitions section of this document
    d. Where applicable ensure that all employees and other personnel are accounted for.
    e. Ensure that all non-essential employees return to normal workstations.
    f. Assist municipal emergency responders wherever possible.
    g. Contact the Health and Safety Coordinator, the Plant Manager, and the Department Manager responsible for the employee involved in the medical emergency
    h. Co-ordinate the resumption of normal operations in all areas unaffected by the emergency and in the affected areas as soon as the situation allows.
    i. Complete an SAIR Accident Incident Report and distribute it as stated on the form

FIRE EMERGENCY – DISCOVERING A FIRE – dial 292

1. Report all incidents of fire immediately to the CCR Operator by calling **Ext. 292**.

2. Pull the local fire alarm in the nearest location to the fire area.

3. Ask these 2 questions
   a. **Is the fire small enough to be extinguished with a hand held extinguisher?**
   b. **Can I safely extinguish the fire?**

4. If the answer is **No to either** of these questions the employee must:
   a. Once out of the immediate danger area the employee must immediately notify the CCR operator giving detailed information about the location, the type and size of the fire as accurately as possible.
   b. The CCR Operator will call 911 and request emergency assistance from the fire department and other emergency professionals as required.
   c. The CCR Operator will dispatch an employee to the end of the Plant Road at Waverley Road to escort the emergency professionals to the required location

5. If the answer is **Yes to both** of these questions the employee must:
   a. Notify the CCR operator and attempt to extinguish the fire using a hand held extinguisher. If it is safe to do so and the employee has been properly trained.
   b. If the use of extinguisher(s) fails to contain the fire follow Step #4 above.

FIRE EMERGENCY – RESPONDING TO A FIRE ALARM
Main Plant Area

1. When a fire alarm is sounded in a normally occupied building all personnel in the building must, if safe to do so close all windows and shut off all equipment in the room they are in and proceed out of the building through the nearest fire exit in an orderly manner closing all doors behind them.
    a. **Building Fire Warden(s)**(see Appendix A) for the assigned area will perform a sweep of the floor they work on checking for stragglers as they leave the building and report to the **Emergency Response Coordinator** upon arriving at the assembly area if the floor is clear of personnel.
    b. **Where safe to do so bring obtain and bring the contractor sign in log book for the department to the assembly area for the head count.**
2. Once outside of the building proceed to the safe assembly area in front of the employee lunch / change room building (or other safe area as is practical in the circumstance directed by the Production Shift Coordinators)
3. **Department Shift Coordinators will do actual head count of employees for their respective departments** and **submit** the department counts to the **Production Supervisor**.
4. No one is permitted to re-enter the building until clearance is given from the fire department through the **Department Shift Coordinators**.

FIRE EMERGENCY – RESPONDING TO A FIRE ALARM
Quarry Area

1. When the fire alarm is sounded in the quarry maintenance building all personnel are required to, if safe to do so close all windows in the room they are in and proceed out of the building through the nearest fire exit in an orderly manner closing all doors behind them.
2. Once out of the immediate danger area the **Quarry Shift Coordinator** must immediately notify the CCR
    a. **Building Fire Warden(s)** (see Appendix A) for the assigned area will perform a sweep of the floor they work on checking for stragglers as they leave the building and report to the **Emergency Response Coordinator** upon arriving at the assembly area if the floor is clear of personnel.
    b. **Where safe to do so obtain and bring the contractor sign in log book for the department to the assembly area for the head count.**
3. Once outside the building proceed to the safe assembly area outside the parking area gate, (or other safe area as is practical in the circumstance directed by the **Quarry / Production Shift Coordinators**), where the **Department Shift Coordinator** will do a head count and provide the information the **St. Marys Emergency Coordinator** who will provide the information to the responding local municipal emergency response authority.
4. operator, by radio or phone, giving information on the location, type and size of fire as accurately as possible.
5. The CCR operator will call 911 and request emergency assistance from the fire department and other emergency professionals as required.
6. No one is permitted to re-enter the building until clearance is given from the fire department through the **Department Shift Coordinators**.

FIRE EMERGENCY – RESPONDING TO A FIRE ALARM
Central Control Room

As the Operator/Assistant Operator is leaving the control room, **(if safe to do so)**, they will record and bring with them:

1. Location of the fire(s) indicated on the fire control panel.
2. Check the Shift Coordinator's office and bring the cell phone to the safe assembly area, if available.
3. Report to the Shift Coordinator at the safe area for the head count.
4. Give the cell phone to the Shift Coordinator to make the appropriate 911 calls using the cell phone.
5. Immediately after checking in for the head count proceed to electrical office to monitor Plant Processes from that location until advised otherwise by the Production Shift Coordinator by following the **"Foxboro Operator Emergency Station Remote Access Procedure"**. A copy of which can be found on "G\SHE\Safety & Health\Linked Docs\Foxboro Operator Emergency Station Remote Access Procedure".

ENVIRONMENTAL EMERGENCY

In the event of an **INTERNAL SPILL** within the Plant:

1. Notify a Supervisor/CCR immediately.
2. Where necessary evacuate personnel to a safe area.
3. Consult MSDS for safety precautions necessary for containment and clean up.
4. Contain and clean up spill by following the procedures outlined in PD00166 "Accident Incident & Non-conformance Reporting" sections 5.1.5 Response, 5.1.6 Cleanup and 5.1.7 Notification.
5. Where possible continue operations in unaffected areas.
6. Notify Environmental Manager.
7. In the absence of the Environmental Manager and Safety Coordinator, immediately notify the Ministry of the Environment Spill Action Centre **(1-800-268-6060**) and the Fire Dispatch **(905-433-1234)**
8. In case that the spill is larger than St Marys' personnel can handle contact immediately **DETOX emergency spill response service (905-623-1367)** to handle the spill.
9. Where applicable ensure that all employees and other personnel are accounted for.

In the event of an **EXTERNAL SPILL** outside of the Plant:

1. In the event that an external spill occurs that may affect St Marys personnel, St. Marys Bowmanville will be notified by the local police or fire department by phone or in person; please ensure the following:
2. Production Shift Coordinator is informed immediately.
3. Notify management immediately; **Plant Manager, Human Resources Manager**; **Environmental Manager.**
4. Account for and inform all employees, contractors, visitors, Cargo Dockers, Aggregates as appropriate in the circumstance.
5. Cooperate with local emergency agencies.

EVACUATION EMERGENCY

In the event of a Localized Evacuation **on site**:

1. Where necessary evacuate onsite to a safe location as directed

2. Shift Coordinator will communicate safe assembly location to all employees, contractors, visitors, Cargo Dockers, Aggregates, as appropriate in the circumstance.

3. Where possible continue operations in unaffected areas.

4. Shift Coordinator will keep management informed of information as situation develops

5. Employees may resume normal operations when given notification to do so

In the event of an External Evacuation **off site:**

1. Where necessary, evacuate off site to a safe location as directed (**where safe to do so plant equipment should be safely shutdown before evacuating using PD 00244 Kiln Emergency Procedure**).

2. Upon arrival at the directed safe location the Shift Coordinator is to account for all employees, contractors, visitors, Cargo Dockers, Aggregates as appropriate in the circumstance.

3. Where necessary the Shift Coordinator will send all employees, contractors, visitors, Cargo Dockers, Aggregates as appropriate in the circumstance home and advise them that they will be contacted as information becomes available.

4. The Shift Coordinator will keep management informed of information as situation develops.

5. Where necessary Management will inform potential incoming shift changes of the situation and advise that they will be contacted as information becomes available.

6. Management will coordinate the resumption of operations when given notification to do so by local emergency agencies.

NUCLEAR EMERGENCY

Auto Dial Notification System

In the case of a nuclear emergency St. Marys Cement will be notified by the Nuclear Emergency Auto Dial Notification System. It will call on phone-line (905)-623-7073 which is located in the central control room. It will notify St. Marys Cement that evacuation of the property is necessary. It will indicate the number of days that St. Marys Cement will have to safely shut down its process and evacuate the property. The CCRO immediately upon receiving a notification will relay the notification to the Production Shift Coordinator.

Public Disaster Siren Alerting Sirens

The region has placed a Public Disaster Siren Warning System in various locations of the community to alert the public within a 3 km radius of the Nuclear Plant of a disaster. It sounds like **"a very high shrill steady beep"**. If you hear this siren you are to report it immediately to the Production Shift Coordinator. The intent of this siren is not to give notice to evacuate; it is intended to tell those that hear it to go inside and tune to local broadcast media for further instructions.

The Shift Coordinator will perform the following duties in a Nuclear Emergency:

1. Contact the Plant Manager and the Human Resources Manager to inform them of the situation.
2. Notify all personnel on site, employees, contractors, visitors, Cargo Dockers and Aggregates.
3. Follow the direction of the governmental authority directing the emergency.
4. Ensure head counts are done and all parties are accounted for.
5. Coordinate the safe shutdown of the operation as may be necessary before evacuating using PD 00244 Kiln Emergency Procedure) **if** evacuation notice is given by the governmental authority directing the emergency.
6. Coordinate notification to possible incoming shifts as necessary.
7. Remind employees to monitor local media stations for resumption of operations notices.

POWER FAILURE EMERGENCY

In the event of a **major and extended** power failure ensure the following:

Employees / Contractors / Visitors

1. Contact your supervisor/CCR and give your location so that they know you are safe and accounted for in their head count.
2. Report to safe area **if requested** by the Shift Coordinator or their designate.
3. If you are in an area where there is insufficient lighting to safely exit call for assistance to bring a flash light to guide you to safety; if you have no radio stay where you are until someone is dispatched with a flashlight to safely guide you.
4. Cooperate with instructions communicated by Shift Coordinator.
5. When power resumes return to normal operations in a safe and efficient manner.

Production Shift Coordinator

1. Ensure that all employees, contractors and visitors are accounted for;
2. Dispatch lighting assistance where necessary to assist workers to safely exit areas unlit enough to safely see their way out.
3. Designate a safe location for workers to assemble **if required**.
4. Determine the extent and duration of outage where possible.
5. Notify Management; Plant Manager, Production Manager.
6. Where employees or workers are trapped in elevators attempt to arrange for rescue through the Elevator Service Provider.
7. Contact off shift employees for shift cancellation or call-in as necessary in the circumstance.
8. Coordinate the resumption of normal operations when power is restored.

SEVERE WEATHER EMERGENCY

Hurricanes

1. In the event of a Hurricane related emergency; prepare the operation in advance for:
    a. Winds (remove / secure potential materials / goods that may be blown about).
    b. Heavy rains / flooding by securing all known areas susceptible to flooding where possible, have on hand necessary pumping equipment to drain in the event of excess water collection.
2. Ensure that all elevated work in high winds is suspended until safe to do so.
3. Ensure that all employees are reminded to seek shelter where appropriate.
4. Where injuries occur obtain appropriate treatment as soon as possible.
5. Monitor Weather Reports.
6. Resume normal operations when safe to do so.

Tornados

1. Notify employees to take appropriate shelter where there is an actual sighting or report of imminent Tornado activity in the immediate area:
    a. **If indoors**: the basement of the building is best, **if there is no basement**, go under a desk on a centre wall away from windows and possible flying debris.
    b. **If outdoors:** find cover in a building if possible or a ditch or culvert.
2. Where injuries occur obtain appropriate treatment as soon as possible;
3. Monitor Weather Reports.
4. Resume normal operations when safe to do so.

Snow / Ice Storms

1. Prepare the operation as much as possible in advance for:
    a. Winds (remove and/or secure potential materials that may be blown about).
    b. Heavy snows - secure all doors and entry points from snow entry and ensure that essential operations and emergency accesses are cleared as soon as practically possible.
    c. Icy conditions - arrange for clearing, salting and sanding of roads and passageways as soon as practically possible.
2. Ensure that all employees are reminded to work safely and to take appropriate protection for the weather conditions (clothing and shelter as appropriate).
3. Where injuries occur obtain appropriate treatment as soon as possible.
4. Monitor Weather Reports.
5. Maintain operations as normal where possible.

BOMB THREAT EMERGENCY – dial 292

Employees - upon receiving any type of threat such as a bomb etc.:

1. Write down as much detail as given (if possible).
2. Report it immediately to your supervisor/CCR.
3. Await instructions.
4. Cooperate with 911 authorities and management as required.
5. Assist in the efficient resumption of operations when authorized by the authorities and management.

Supervisors/CCR - upon receiving information of a threat:

1. Immediately contact 911 Services.
2. Follow direction of 911 services.
3. Quickly evacuate the affected area(s) in an orderly manner to a safe location.
4. As an added precaution avoid the main parking lot and main lunchroom areas.
5. Use an area that has a clear field of vision.
6. Treat any abnormal condition in that area as suspect and move to alternate location.
7. Ensure a head count is performed and all personnel are informed and given direction as per 911 services.
8. Notify senior management
9. Resume normal operations as directed by the 911 authorities and management.

FIRE DRILLS

Annual Effectiveness Test

The purpose of the fire drill is to test the effectiveness of the evacuation procedure in the event of a fire. A drill will be conducted at least annually during the warm weather months. Things that should be evaluated:

1. Time taken to completely evacuate buildings.
2. Time taken to place call to fire department or other emergency services as required.
3. How well people carried out responsibilities.
4. Is more training required etc.

A record of the evaluation shall be documented and kept on file for two years. Where abnormalities are identified recommendations shall be made and put into place to eliminate the abnormalities.

Real emergencies can be used as well as drills to evaluate emergency response procedures.

REPORTING REQUIREMENTS

All accidents and incidents must be reported to the direct Supervisor who will notify the Health and Safety Coordinator of the occurrence via e-mail or voice-mail before the end of the shift and will furnish an accident report within 24 hours of the occurrence. All after-hours accidents and incidents must be reported to the Shift Coordinator.

In all cases of serious injury or major operation interruption the following personnel must be contacted immediately:

1. Safety Coordinator
2. Human Resources Manager
3. Plant Manager
4. Department Manager of the area or of the individual

DEFINITIONS

Critical Injury: An injury of a serious nature that:

- places life in jeopardy
- produced unconsciousness
- results in a substantial loss of blood
- involves a fracture of a leg or arm but not a finger or toe
- involves the amputation of a leg, arm, hand or foot but not a finger or toe
- consists of burns to a major portion of the body
- causes the loss of sight in an eye

Environmental Emergency: A major spill that causes or is likely to cause any of the following adverse effects:

- Impairment of the quality of the natural environment for any use that can be made of it
- Injury or damage to property or to plant or animal life
- Harm or material discomfort to any person
- An adverse effect on the health of any person
- Impairment of the safety of any person
- Rendering any property, plant or animal life unfit for human use
- Loss of enjoyment of normal use of property
- Interference with the normal conduct of business
- If an emission enters or is likely to enter any waters
- If the volume of the spill exceeds 100 litres

Medical Emergency: Any time the assistance of professional emergency medical transport or professional emergency treatment services are required.

Building Fire Warden: Individuals designated to perform a visual inspection of the building areas that they work on for people as they leave the floor. List of Fire Wardens is supplied in Appendix 1.

APPENDICES

Appendix 1: Fire Wardens

List of Fire Wardens in Normally Occupied Buildings		
Building	**Normal Warden**	**Alternate Warden**
EM Office and Shop	**Electrical Supervisor**	**Shift Electrician**
MM Office	**Maintenance Planner**	**Maintenance Supervisor or Shift Millwright**
MM Shop Floor and Washrooms	**Stores Coordinator**	**Maintenance Supervisor or Shift Millwright**
Stores	**Stores Coordinator**	**Stores Person**
Lab	**Lab Supervisor**	**Lab Manager or Lab Technician**
Production Dept	**Production Manager**	**Kiln Coordinator or Utility Person**
Alternative fuels	**Quality Manager**	**Environmental Manager**
Finance	**Finance Manager**	**Safety Coordinator**
Quarry	**Quarry Supervisor**	**Quarry Manager or Mechanic**

Appendix M

Stack testing and ambient testing program (LACF)

PR-TEST PLAN

ST MARYS CEMENT INC. (CANADA)

BOWMANVILLE, ONTARIO

PRE-TEST PLAN
COMPLIANCE SOURCE TESTING

RWDI #1702401

August 21, 2017

SUBMITTED TO

Ministry of the Environment and Climate Change
Technology Standards Section
6th Floor
40 St. Clair Ave. W.
Toronto, ON M4V1M2
source.testing@ontario.ca

CC TO

St. Marys Cement Inc.
Chris Richards
Environmental Manager
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SUBMITTED BY

Kirk Easto
Senior Project Manager / Principal
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PRE-TEST PLAN

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APPENDICES

PRE-TEST PLAN

1 INTRODUCTION

1.1 Summary of Test Program

RWDI AIR Inc. (RWDI) has been retained by St. Marys Cement Inc. (Canada), (St Marys) to conduct emission sampling on the kiln exhaust at their facility in Bowmanville, Ontario. The testing is required under the Environmental Compliance Approval (ECA) #0469-9YUNSK. The ECA is provided in Appendix A.

The ECA permit allows for three firing conditions:

1. Baseline Conditions;
2. Approved substitution rate of Conventional Fuels with Low Carbon Alternative Fuels; and/or
3. Approved substitution rate of Conventional Fuels with Woodwaste as defined under O.Reg.347.

This pre-test plan and the current plan for fuel burning only involve baseline and woodwaste. The Low carbon alternative fuels will not be used at this time.

This stack testing study will consist of the following parameters, as listed in the Schedule G of the ECA. The testing will consist of three tests for each parameter:

- Total particulate matter (TPM)
- Metals (as listed in ECA)
- Semi-Volatile Organic Compounds (SVOC's) (listed as Polycyclic Organic Matter in ECA)
- Dioxins, Furans and Dioxin-like PCB's (as listed in ECA)
- Hydrogen chloride (HCl)
- Ammonia (NH_3)
- Volatile Organic Matter (VOC's as listed in the ECA)
- Oxygen (O_2)
- Carbon dioxide (CO_2)

1.2 Schedule

The testing is currently scheduled to take place during a two-week period sometime in October or November 2017. Fifteen days' notice will be provided to the Ministry of the Environment and Climate Change (MOECC) via e-mail.

Testing will be conducted Tuesday, Wednesday and Thursday. The following is the general day to day schedule:

<u>Baseline Condition</u>

Test Day 1 - Test 1 for TPM / Metals Train
- Test 1 for (Dioxins/Furans and SVOC's)
- Tests 1 for VOC's, HCl and Ammonia
- O_2, CO_2 continuous during above testing

Test Day 2 - Test 2 for TPM / Metals Train
- Test 2 for (Dioxins/Furans and SVOC's)
- Tests 2 for VOC's, HCl and Ammonia
- O_2, CO_2 continuous during above testing

Test Day 3 - Test 3 for TPM / Metals Train
- Test 3 for (Dioxins/Furans and SVOC's)
- Tests 3 for VOC's, HCl and Ammonia
- O_2, CO_2 continuous during above testing

Firing Woodwaste Condition

Test Day 1 - Test 1 for TPM / Metals Train
- Test 1 for (Dioxins/Furans and SVOC's)
- Tests 1 for VOC's, HCl and Ammonia
- O_2, CO_2 continuous during above testing

Test Day 2 - Test 2 for TPM / Metals Train
- Test 2 for (Dioxins/Furans and SVOC's)
- Tests 2 for VOC's, HCl and Ammonia
- O_2, CO_2 continuous during above testing

Test Day 3 - Test 3 for TPM / Metals Train
- Test 3 for (Dioxins/Furans and SVOC's)
- Tests 3 for VOC's, HCl and Ammonia
- O_2, CO_2 continuous during above testing

1.3 Test Program Organization

Details with respect to the key individuals involved with the stack sampling survey are provided below.

Company Name:	St. Marys Cement
Company Address:	400 Waverly Road
Plant Location:	400 Waverly Road
	Bowmanville, Ontario
Plant Coordinator:	Chris Richards
Telephone Number:	905 623 3341 Ext 248
E-mail:	chris.richards@vcimentos.com
MOE District Office:	York-Durham
Area Manager:	Celeste Dugas
Telephone Number:	905-836-7446

PRE-TEST PLAN

Sampling Company:	RWDI AIR Inc.
Project Manager:	Kirk Easto
Telephone Number:	519-823-1311 x2482
Cellular Number:	705-772-5944
Fax Number:	519-823-1316
Email:	kirk.easto@rwdi.com
Laboratory:	Maxxam Analytics
Project Manager:	Clayton Johnson
Telephone Number:	905-817-5769

2 SOURCE DESCRIPTION

2.1 Plant Location

The Bowmanville facility is located along Lake Ontario, south of Highway 401 at Waverly Road.

2.2 Facility Description

The fundamental process of cement manufacturing consists of combining materials bearing calcium oxide, silica, alumina and iron oxide at high temperatures to produce cement clinker. The clinker is subsequently ground with finishing materials such as gypsum, limestone, clay and slag to produce cement.

The cement plant operates 12 months per year typically on 24 hours per day, 7 days per week schedule, with a maximum production capacity of 6,300 tonnes of clinker per day.

A more detailed process description and process flow diagram for the Bowmanville Plant are included in Appendix B.

3 TEST PROGRAM

3.1 Sample Location

The sampling location on the kiln stack is located 84.5 metres above grade equipped with a proper sampling platform and four 90° offset sample ports. This sampling location is considered 'ideal' as per the Ontario Source Test Code Method 1 since the nearest flow disturbances were greater than eight (8) duct diameters downstream and two (2) duct diameters upstream. A diagram of the stack is provided in Appendix A. The stack height is 105 m, the diameter at the testing location is 5.48 m and the outside diameter is 5.68 m, including the layer of insulation.

3.2 Testing Methodology

The following table summarizes the test methodologies that will be followed during this program.

Table 2: Summary of Test Methodology

Parameter	Proposed Reference Test Method
Flow Rate, Temperature, Moisture	OSTC[1] Methods ON-1 to ON-4
Total Particulate Matter	OSTC[1] Method ON-5
Metals (including Hg)	US EPA[2] Method 29
SVOC's	Environment Canada RM/2
Dioxins and Furans	Environment Canada RM/2
Oxygen and Carbon dioxide	US EPA[2] Method 3A
Volatile Organic Matter	US EPA SW 846 0030 VOST
Hydrogen chloride and Ammonia	US EPA[2] Method 26 (non-isokinetic)

Notes: [1] OSTC = Ontario Source Testing Code, version 3
[2] USEPA = United States Environmental Protection Agency

3.3 Description of Testing Methodology

The following section provides brief descriptions of the proposed sampling methods and discusses any proposed modifications to the reference test methods.

Stack Velocity, Temperature, and Volumetric Flow Rate Determination

The exhaust velocities and flow rates will be determined following the Ontario Source Testing Code version 3 (OSTC) Method ON-2, "Determination of Stack Gas Velocity and Volumetric Flow Rate". Velocity measurements will be taken with a pre-calibrated Stausscheibe type (S-Type) pitot tube and incline manometer. Volumetric flow rates will be determined following the equal area method as outlined in OSTC Method ON-2. Temperature measurements will be made simultaneously with the velocity measurements and will be conducted using a chromel-alumel type "k" thermocouple in conjunction with a digital temperature indicator.

The dry molecular weight of the stack gas will be determined following calculations outlined in OSTC Method ON-3, "Determination of Molecular Weight of Dry Stack Gas". Stack moisture content will be determined through direct condensation and according to OSTC Method ON-4, "Determination of Moisture Content of Stack Gas".

Sampling for Total Particulate Matter and Metals

Sampling for TPM and metals on the kiln will be performed in accordance with OSTC Method 5, "Sampling of Total Particulate Matter from Stationary Sources" and U.S. EPA Method 29 "Determination of Metals Emissions from Stationary Sources", respectively. Sampling will be conducted using an Environmental Supply C-5000 Source Sampling System. Both TPM and metals will be sampled concurrently using the same sampling train. Triplicate sampling runs will be conducted.

The sample will be drawn through a glass lined sample probe and quartz fibre filter, which will be maintained at a temperature of 120 ± 14°C (248 ± 25°F). The sample will then be introduced into the impinger train. The impinger train will include two 5% HNO_3/10% H_2O_2 absorbing solution impingers, one empty impinger, two impingers containing $KMnO_4$ solution and one impinger containing silica gel.

Upon completion of the test, the sampling train will be recovered, as in the procedures detailed in the reference method, and the samples will be packaged for transport to Maxxam Analytical Services in Burlington, Ontario for analysis.

> Testing will be conducted over 32 points, 7.5 minutes per point and 2.5 minutes reading per point. The total test time will be 240 minutes with approximate sample volumes of 180 cubic feet.

Sampling for Semi-Volatile Organic Compounds and Dioxin and Furan Isomers

Sampling for SVOC's and dioxin and furan isomers will be done in accordance with Environment Canada RM/2. Both compound categories and will be determined concurrently using the same sampling train. Triplicate sampling runs will be conducted.

The sample will be drawn through a glass lined sample probe and proofed glass fibre filter. Both of these will be maintained at a temperature of 120 ± 14°C (248 ± 25°F). The sample will then pass through a water cooled condenser and an XAD-2 absorbent module. The temperature of the XAD-2 module will be kept below 20°C. The stack gas sample will then be introduced into the impinger train. The impinger train will be configured as specified in the reference method. As indicated in the method, the water impingers will not be recovered for analysis.

Upon completion of the test, the samples will be kept cool and delivered to Maxxam Analytical Services in Burlington, Ontario. The filter, XAD-2 module and all rinses will be analysed for the target compounds using high resolution mass spectrometry.

> Testing will be conducted over 32 points, 7.5 minutes per point and 2.5 minutes reading per point. The total test time will be 240 minutes with approximate sample volumes of 180 cubic feet.

Sampling for Hydrogen Chloride and Ammonia

Sampling for hydrogen chloride and ammonia will be completed following U.S. EPA Method 26 "Determination of Hydrogen Halide and Halogen Emissions from Stationary Sources - Non-Isokinetic Method". The sampling will be conducted using a midget impinger sampling train. The sample will be drawn through a Teflon lined probe, glass fibre filter and three-way stopcock which will be maintained at a temperature of 120 ± 14°C (248 ± 25°F). The sample will then enter the impinger train which consisted of three impingers. The impingers in order included, two (2) acidic impingers, and a final silica impinger to dry the sample.

Upon completion of the testing, samples will be kept cool and submitted to Maxxam Analytical Services in Burlington, Ontario for analysis for hydrogen chloride and ammonia.

> Testing will be conducted as a single located near the centre of the stack and collected over one (1) hour.

Continuous Emissions Monitoring for O_2, and CO_2

Testing for O_2, and CO_2 will be accomplished using continuous emission monitors (CEMs). The exhaust gas sample will be withdrawn from a single point at the centre of the stack using a stainless steel probe. The sample will then proceed to a heated filter, where particulate matter is removed, and then transferred via a heated Teflon line to a sample conditioner. The Teflon line will be heated to 120°C (250°F) to prevent any condensation. The sample conditioner will remove any moisture in the exhaust. The sample will then be routed through a manifold system and introduced to the individual CEM's for measurement.

Prior to testing, sample system bias checks and instrument linearity checks (calibration error) will be conducted. In addition, the analysers will be calibrated (zeroed and span checked) at the completion of each run. Data acquisition will be provided using a National Instruments data logger system programmed to collect and record data at 1-second intervals. Average 1-minute concentrations will be calculated from the 1-second measurements.

3.4 Process Data

Operating conditions during the sampling will be monitored by St. Marys personnel. All equipment will be operated under normal (desired) conditions.

At the time of the sampling program, St. Marys will be operating as close to maximum production as possible. The normal production rate for the facility is 5,700 tonnes/day of clinker. Due to the nature of the process, St. Marys will try and keep the process as stable as possible over the testing program as operating at a constant rate is the ideal process scenario for St. Marys. Continuously making changes to the process can affect the quality of St. Marys end products. St. Marys will monitor the Kiln Feed Uniformity Index throughout the program and will monitor parameters such as kiln RPM, kiln temperature and process variability. This information will be included in the final report. Other process conditions that will be monitored during the sampling program and will be included in an Appendix in the final report are:

- Oxygen;
- Opacity;
- Nitrogen Oxides;
- Sulphur Dioxide;
- Hourly combined raw feed;
- Hourly Alternative Fuels and Conventional Fuels firing rates in the kiln and calciner;
- Hourly clinker production;
- The concentration of the oxygen and Carbon Monoxide in the backend of the kiln and calciner down comer duct;
- Temperature of the gases leaving the kiln, with a calculation of residence time at 1000oC.
- Temperature of the gases leaving the calciner, with a calculation of residence time at 850oC.
- Total Hydrocarbon (as methane) leaving the kiln stack

Radio contact will be kept between the process operators and the sampling team. A member of the RWDI sampling team will contact the operator before each test, to ensure that the process is at normal (desired) operating conditions.

4 INTERNAL QUALITY ASSURANCE/QUALITY CONTROL ACTIVITIES

4.1 Overview

Applicable quality assurance measures will be implemented during the sampling program to ensure the integrity of the results. These measures will include detailed documentation of field data, equipment calibrations for all measured parameters, completion of Chain of Custody forms when submitting laboratory samples, and submission of field blank samples to the laboratories.

Quality control procedures specific to the CEM monitoring included linearity checks, to determine the instrument performance, and reproducibility checks prior to its use in the field. Regular performance checks on the analyser will also be carried out during the testing program by performing hourly zero checks and span calibration checks using primary gas standards. Sample system bias checks will also be conducted. These checks will be used to verify the ongoing precision of the monitor and sampling system over time. Pollutant-free (zero) air will be introduced to perform the zero checks, followed by a known calibration (span) gas into the monitor. The response of the monitor to pollutant-free air and the corresponding sensitivity to the span gas will be recorded regularly during the tests.

All samplers are bench tested and calibrated in RWDI's Guelph office prior to field deployment and, in many cases, calibrated again in the field before use. For each sample collected with a Method 5 sampling train, both pre- and post- leak checks will be conducted by plugging the inlet and drawing a vacuum of 380 mm of water for at least one minute. Dry gas meter reading leakage rates greater than 4% of the average sampling rate or 0.00057 m^3/min (0.02 cfm), whichever is less, are unacceptable. Similar leak check procedures for the Pitot tube and pressure lines will be conducted. A number of blanks are included in the methods and will be submitted for analyses as well

Chain of custody forms will be completed and submitted along with the samples to the laboratory. All sampling media will be provided or prepared by the laboratory responsible for its subsequent analysis. All quality control and quality assurance measures will be recorded and will be included in the final report.

4.2 Sample Identification and Custody

The following person is responsible for sample handling and recording during this study:

Person Responsible:	Kirk Easto, RWDI AIR Inc.
Sample Identification:	Kirk Easto, RWDI AIR Inc.
Sample Log Sheet:	Kirk Easto, RWDI AIR Inc.

5 REPORTING REQUIREMENTS

5.1 Report Format

The stack testing report will include, as a minimum, the following:

- an executive summary;
- date, time and duration of each test;
- records of operating conditions;
- average of emission concentrations, rates, and calculations.
- Summary table showing measured stack concentrations in units of mass per Reference cubic meter and compared to the applicable in-stack emission limits set out in Schedule B;
- Summary of all records of the facilities CEM System;
- Summary table comparing the measured results to the ESDM report and Performance limits;
- A comparison of the measured emission results collected during the baseline and woodwaste firing conditions. The comparison will provide a description and possible explanation of any statistically significant changes in the measured values.

6 SAFETY

The sampling platform is a confined space, since there is only one exit, and there is a potential for an oxygen deficient environment. For this reason, we are proposing the new sample location.

The following table outlines the additional safety requirements for this testing as identified by RWDI and St. Marys.

Head Protection	Required
Foot Protection	Required
Eye Protection	Required
Hearing Protection	Required
Safety Belt or Harness	Not Required
Respiratory Equipment	Not Required
Other Protective Clothing or Equipment	Not required
Safety Training Session	Required
Date of Session, if Required	First day of testing program
Sampling Location	Stack Platform
Temperature of Sampling Location	Ambient
Work Area	Ambient
Other Safety Requirements	n/a

7 PERSONNEL RESPONSIBILITIES AND TEST SCHEDULE

7.1 Test Site Organization

The following individuals are responsible for the key tasks during the survey.

Task	Individual
Project Management:	Mr. Kirk Easto, RWDI AIR Inc.
Test Preparation/Site Restoration:	Chris Richards, St. Marys Cement Inc.
Modifications to Facility/Services:	Chris Richards, St. Marys Cement Inc.
Sample Site Accessibility:	Chris Richards, St. Marys Cement Inc.
Data Recovery:	Mr. Kirk Easto, RWDI AIR Inc.
Sample Schedule:	Mr. Kirk Easto, RWDI AIR Inc.

7.2 Test Preparations

Personnel at the St. Marys plant will ensure that the plant is operating at acceptable capacity during the source testing. St. Marys personnel will also ensure that RWDI field crew have access to shelter, sampling ports and electrical power.

PRE-TEST PLAN

RWDI aims to accommodate. If you require this document in a different format in order to aid accessibility, please contact the sender of this document, email solutions@rwdi.com or call +1.519.823.1311

APPENDIX A

Ontario

Ministry of the Environment and Climate Change
Ministère de l'Environnement et de l'Action en matière de changement climatique

AMENDED ENVIRONMENTAL COMPLIANCE APPROVAL

NUMBER 0469-9YUNSK
Issue Date: November 25, 2015

St. Marys Cement Inc. (Canada)
55 Industrial Street, 4th Floor
Toronto, Ontario
M4G 3W9

Site Location: Bowmanville Plant
400 Waverley Road
Clarington Municipality, Regional Municipality of Durham

You have applied under section 20.2 of Part II.1 of the Environmental Protection Act, R.S.O. 1990, c. E. 19 (Environmental Protection Act) for approval of:

Description Section

A cement manufacturing facility, consisting of the following processes and support units:

- quarry operations - limestone extraction, processing and shipping;
- raw material and fuel processing, storage and handling;
- clinker production- kiln and calciner operations;
- cement production including ball mills, cement storage and shipping;

including the *Equipment* and any other ancillary and support processes and activities, operating at a *Facility Production Limit* of up to a **clinker production rate of 2.4 million tonnes per year,** discharging to the air as described in the *Original ESDM Report.*

For the purpose of this environmental compliance approval, the following definitions apply:

1. "*Acceptable Point of Impingement Concentration"* means a concentration accepted by the *Ministry* as not likely to cause an adverse effect for a *Compound of Concern* that,

   (a) has no *Ministry Point of Impingement Limit* and no *Jurisdictional Screening Level*, or

   (b) has a concentration at a *Point of Impingement* that exceeds the *Jurisdictional Screening Level*.

   With respect to the *Original ESDM Report*, the *Acceptable Point of Impingement Concentration* for a *Compound of Concern* mentioned above is the concentration set out in the *Original ESDM Report.*

2. "*Acoustic Assessment Report"* means the report, prepared in accordance with *Publication NPC-233* and Appendix A of the *Basic Comprehensive User Guide*, by Corey Kinart, P.Eng. / HGC Engineering, dated May 13, 2014 submitted in support of the application, that documents all sources of noise emissions and *Noise Control Measures* present at the *Facility*, as updated in accordance with Condition 5 of this *Approval.*

3. "*Acoustic Assessment Summary Table"* means a table prepared in accordance with the *Basic Comprehensive User Guide* summarising the results of the *Acoustic Assessment Report*, as updated in accordance with Condition 5 of this *Approval.*

4. "*Alternative Fuels"* means Woodwaste as defined in *O.Reg. 347* and *Low Carbon Alternative Fuels.*

5. "*Approval"* means this entire Environmental Compliance Approval and any *Schedules* to it.

6. "*Baseline Conditions"* means operating conditions which include the use of *Conventional Fuel, Fuel Adjunct Materials* and *Industrial By-Product Materials* in the *Cement Kiln.*

7. "*Basic Comprehensive User Guide"* means the *Ministry* document titled "Basic Comprehensive Certificates of Approval (Air) User Guide" dated March 2011, as amended.

8. "*Best Management Practices Plan"* means the document titled "St. Marys Cement Inc., Cement Plant Operations - Bowmanville Site, Best Management Practices Plan for the Control of Fugitive Dust Emissions" Revision 2, dated February, 2014, as amended.

9. "*CAEAL"* means the Canadian Association for Environmental Analytical Laboratories.

10. "*Cement Kiln"* means the cement kiln and the calciner, firing *Conventional Fuels, Alternative Fuels* and *Fuel Adjunct Materials*, described in the *Company's* application, this *Approval* and in the supporting documentation referred to herein, to the extent approved by this *Approval.*

11. "*CEM System"* means the continuous monitoring and recording system used to measure the emissions and operational parameters of the *Cement Kiln.*

12. "*Company"* means St. Marys Cement Inc. (Canada) that is responsible for the construction or operation of the *Facility* and includes any successors and assigns in accordance with section 19 of the *EPA.*

13. "*Compound of Concern"* means a contaminant described in paragraph 4 subsection 26 (1) of *O. Reg. 419/05;* namely, a contaminant that is discharged from the *Facility* in an amount that is not negligible.

14. "*Conventional Fuels"* means solid fuels including petroleum coke and coal for regular firing and also includes diesel, propane and natural gas for preheating during start-up.

15. "*Description Section"* means the section on page one of this *Approval* describing the *Company's* operations and the *Equipment* located at the *Facility* and specifying the *Facility Production Limit* for the *Facility*.

16. "*Director"* means a person appointed for the purpose of section 20.3 of the *EPA* by the *Minister* pursuant to section 5 of the *EPA.*

17. "*District Manager"* means the District Manager of the appropriate local district office of the *Ministry,* where the *Facility* is geographically located.

18. "*Emission Summary Table"* means a table described in paragraph 14 of subsection 26 (1) of *O. Reg. 419/05;* namely a table in the *ESDM Report* that compares the *Point of Impingement* concentration for each *Compound of Concern* to the corresponding *Ministry Point of Impingement Limit, Acceptable Point of Impingement Concentration,* or *Jurisdictional Screening Level.*

19. "*Environmental Assessment Act"* means the Environmental Assessment Act, R.S.O. 1990, c.E.18, as amended.

20. "*EPA"* means the Environmental Protection Act, R.S.O. 1990, c.E.19, as amended.

21. "*Equipment"* means equipment or processes described in the *ESDM Report,* this *Approval* and in the *Schedules* referred to herein and any other equipment or processes.

22. "*Equipment with Specific Operational Limits"* means the *Cement Kiln* and any *Equipment* directly involved in the thermal oxidation of waste or waste derived fuels, fume incinerators or any other *Equipment* that is specifically referenced in any published *Ministry* document that outlines specific operational guidance that must be considered by the *Director* in issuing an *Approval.*

23. "*ESDM Report"* means the most current Emission Summary and Dispersion Modelling Report that describes the *Facility.* The *ESDM Report* is based on the *Original ESDM Report* and is updated after the issuance of this *Approval* in accordance with section 26 of *O. Reg. 419/05* and the *Procedure Document.*

24. "*Facility"* means the entire operation located on the *Property* where the *Equipment* is located.

25. "*Facility Production Limit"* means the production limit placed by the *Director* on the main product(s) or raw materials used by the *Facility.*

26. "*Fuel Adjunct Materials"* means solid fuel, wholly used at the *Facility,* as supplementary fuels to coal and petroleum coke for firing the *Cement Kiln* , such as but not limited to carbon dust, metallurgical coke and carbon black, but which does not include *Alternative Fuels.*

27. "*Industrial By-Product Materials"* means industrial by-product materials such as but not limited to iron slag from smelting industry, fly ash from coal fired generating plants, ash from waste water treatment plants and foundry sand used in casting processes, wholly used at the *Facility* as substitute raw material sources of calcium oxide, silica, iron oxide and alumina required for the ongoing cement manufacturing process and which do not serve as fuel for the *Cement Kiln.*

28. "*Jurisdictional Screening Level"* means a screening level for a *Compound of Concern* that is listed in the *Ministry* publication titled "Jurisdictional Screening Level (JSL) List, A Screening Tool for Ontario Regulation 419: Air Pollution - Local Air Quality", dated February 2008, as amended.

29. "*Log"* means a document that contains a record of each change that is required to be made to the *ESDM Report* and *Acoustic Assessment Report,* including the date on which the change occurred. For example, a record would have to be made of a more accurate emission rate for a source of contaminant, more accurate meteorological data, a more accurate value of a parameter that is related to a source of contaminant, a change to a *Point of Impingement* and all changes to information associated with a *Modification* to the *Facility* that satisfies Condition 2.

30. "*Low Carbon Alternative Fuels"* means woody biomass consisting mainly of wood chips with some fragments of plastic, shingles, laminate, surface coatings obtained from industrial and post-consumer sources such as construction and demolition waste, which does not contain asbestos and hazardous waste as defined under *O.Reg 347,* and contains:

    (a) less than 10% non-woody material such as plastic, shingles, laminate, surface coatings and other material;
    (b) less than 5% treated wood;
    (c) less than or equal to 1% total halogen content; and
    (d) less than 25% moisture by weight;

31. "*Manager"* means the Manager, Technology Standards Section, Standards Development Branch, or any other person who represents and carries out the duties of the Manager, Technology Standards Section, Standards Development Branch, as those duties relate to the conditions of this *Approval.*

32. "*Maximum Emissions Scenario"* means maximum emissions scenario as outlined in the *Original ESDM Report.*

33. "*Minister"* means the Minister of the Environment and Climate Change or such other member of the Executive Council as may be assigned the administration of the *EPA* under the Executive Council Act.

34. "*Ministry* " means the ministry of the *Minister*.

35. "*Ministry Point of Impingement Limit"* means the applicable Standard set out in Schedule 2 or 3 of *O. Reg. 419/05* or a limit set out in the *Ministry* publication titled "Summary of Standards and Guidelines to support Ontario Regulation 419/05: Air Pollution - Local Air Quality (including Schedule 6 of *O. Reg. 419/05* on Upper Risk Thresholds", dated April 2012, as amended.

36. "*Modification"* means any construction, alteration, extension or replacement of any plant, structure, equipment, apparatus, mechanism or thing, or alteration of a process or rate of production at the *Facility* that may discharge or alter the rate or manner of discharge of a *Compound of Concern* to the air or discharge or alter noise or vibration emissions from the *Facility*.

37. "*Noise Control Measures"* means measures to reduce the noise emissions from the *Facility* and/or *Equipment* including, but not limited to, silencers, acoustic louvres, enclosures, absorptive treatment, plenums and barriers.

38. "*O. Reg. 347"* means Ontario Regulation 347, General - Waste Management, as amended.

39. "*O. Reg. 419/05"* means Ontario Regulation 419/05, Air Pollution – Local Air Quality, as amended.

40. "*Original ESDM Report"* means the Emission Summary and Dispersion Modelling Report which was prepared in accordance with section 26 of *O. Reg. 419/05* and the *Procedure Document* by BCX Environmental Consulting and dated May 10, 2014 submitted in support of the application, and includes any changes to the report made up to the date of issuance of this *Approval*.

41. "*Point of Impingement"* has the same meaning as in section 2 of *O. Reg. 419/05*.

42. "*Point of Reception"* means Point of Reception as defined by *Publication NPC-300*.

43. "*Pre-Test Plan"* means a plan for the *Source Testing* including the information required in Section 5 of the *Source Testing Code*.

44. "*Procedure Document"* means *Ministry* guidance document titled "Procedure for Preparing an Emission Summary and Dispersion Modelling Report" dated March 2009, as amended.

45. "*Processes with Significant Environmental Aspects"* means the *Equipment* which, during regular operation, would discharge one or more contaminants into the air in an amount which is not considered as negligible in accordance with section 26 (1) 4 of *O. Reg. 419/05* and the *Procedure Document*.

46. "*Property"* means the entire property excluding all operations in the dock area.

47. "*Publication NPC-207"* means the *Ministry* draft technical publication "Impulse Vibration in Residential Buildings", November 1983, supplementing the Model Municipal Noise Control By-Law, Final Report, published by the *Ministry*, August 1978, as amended.

48. "*Publication NPC-233"* means the *Ministry* Publication NPC-233, "Information to be Submitted for Approval of Stationary Sources of Sound", October, 1995, as amended.

49. "*Publication NPC-300"* means the *Ministry* Publication NPC-300, “Environmental Noise Guideline, Stationary and Transportation Sources – Approval and Planning, Publication NPC-300”, August 2013, as amended.

50. "*Schedules"* means the following schedules attached to this *Approval* and forming part of this *Approval* namely:

    Schedule A - Supporting Documentation
    Schedule B - Performance Requirements - In-Stack Emission Limits
    Schedule C - Process Dust Control Equipment Operational Requirements
    Schedule D - Material Analysis Contaminants
    Schedule E - *Alternative Fuels* Operational Requirements
    Schedule F - Procedure for *Source Testing*
    Schedule G - Test Sources and Test Contaminants - *Source Testing*
    Schedule H - *CEM System* Requirements - Opacity

51. "*Source Testing"* means sampling and testing to measure emissions resulting from operating the test sources under conditions which yield the worst case emissions within the approved operating range of the test sources which satisfies paragraph 1 of subsection 11(1) of O. Reg. 419/05.

52. "*Source Testing Code"* means the Ontario Source Testing Code, dated June 2010, prepared by the *Ministry*, as amended.

53. "*Toxicologist"* means a qualified professional currently active in the field of risk assessment and toxicology that has a combination of formal university education, training and experience necessary to assess contaminants.

54. "*Written Summary Form"* means the electronic questionnaire form, available on the *Ministry* website, and supporting documentation, that documents the activities undertaken at the *Facility* in the previous calendar year.

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

TERMS AND CONDITIONS

1. GENERAL

1.1 Except as otherwise provided by this *Approval*, the *Facility* shall be designed, developed, built, operated and maintained in accordance with the terms and conditions of this *Approval* and in accordance with the following *Schedules* attached hereto:

Schedule A - Supporting Documentation
Schedule B - Performance Requirements - In-Stack Emission Limits
Schedule C - Process Dust Control Equipment Operational Requirements
Schedule D - Material Analysis Contaminants
Schedule E - *Alternative Fuels* Operational Requirements
Schedule F - Procedure for *Source Testing*
Schedule G - Test Sources and Test Contaminants - *Source Testing*
Schedule H - *CEM System* Requirements - Opacity

2. LIMITED OPERATIONAL FLEXIBILITY

2.1 Pursuant to section 20.6 (1) of the *EPA* and subject to Conditions 2.2 and 2.3 of this *Approval*, future construction, alterations, extensions or replacements are approved in this *Approval* if the future construction, alterations, extensions or replacements are *Modifications* to the *Facility* that:

(a) are within the scope of the operations of the *Facility* as described in the *Description Section* of this *Approval;*

(b) do not result in an increase of the *Facility Production Limit* above the level specified in the *Description Section* of this *Approval;* and

(c) result in compliance with the performance limits as specified in Condition 4.

2.2 Condition 2.1 does not apply to,

(a) the addition of any new *Equipment with Specific Operational Limits* or to the *Modification* of any existing *Equipment with Specific Operational Limits* at the *Facility;*

(b) *Modifications* to the *Facility* that would be subject to the *Environmental Assessment Act;* and

(c) *Modifications* to the *Facility* that would alter the type of *Alternative Fuels* or increase the quantity of *Alternative Fuels* specified in **Schedule E** of this *Approval.*

2.3 Condition 2.1 of this *Approval* shall expire ten (10) years from the date of this *Approval*, unless this *Approval* is revoked prior to the expiry date. The *Company* may apply for renewal of Condition 2.1 of this *Approval* by including an *ESDM Report* and an *Acoustic Assessment Report* that describes the *Facility* as of the date of the renewal application.

3. REQUIREMENT TO REQUEST AN *ACCEPTABLE POINT OF IMPINGEMENT CONCENTRATION*

3.1 Prior to making a *Modification* to the *Facility* that satisfies Condition 2.1 (a) and (b), the *Company* shall prepare a proposed update to the *ESDM Report* to reflect the proposed *Modification*.

3.2 The *Company* shall request approval of an *Acceptable Point of Impingement Concentration* for a *Compound of Concern* if the *Compound of Concern* does not have a *Ministry Point of Impingement Limit* and a proposed update to an *ESDM Report* indicates that one of the following changes with respect to the concentration of the *Compound of Concern* may occur:

(a) The *Compound of Concern* was not a *Compound of Concern* in the previous version of the *ESDM Report* and

(i) the concentration of the *Compound of Concern* is higher than the *Jurisdictional Screening Level* for the contaminant; or

(ii) there is no *Jurisdictional Screening Level* for the contaminant.

(b) The concentration of the *Compound of Concern* in the updated *ESDM Report* is higher than:

(i) the most recent *Acceptable Point of Impingement Concentration*, and

(ii) the *Jurisdictional Screening Level* if a *Jurisdictional Screening Level* exists.

3.3 The request required by Condition 3.2 shall propose a concentration for the *Compound of Concern* and shall contain an assessment, performed by a *Toxicologist*, of the likelihood of the proposed concentration causing an adverse effect at *Points of Impingement*.

3.4 If the request required by Condition 3.2 is a result of a proposed *Modification* described in Condition 3.1, the *Company* shall submit the request, in writing, to the *Director* at least 30 days prior to commencing to make the *Modification*. The *Director* shall provide written confirmation of receipt of this request to the *Company*.

3.5 If a request is required to be made under Condition 3.2 in respect of a proposed *Modification* described in Condition 3.1, the *Company* shall not make the *Modification* mentioned in Condition 3.1 unless the request is approved in writing by the *Director*.

3.6 If the *Director* notifies the *Company* in writing that the *Director* does not approve the request, the *Company* shall,

(a) revise and resubmit the request; or

(b) notify the *Director* that it will not be making the *Modification*.

3.7 The re-submission mentioned in Condition 3.6 shall be deemed a new submission under Condition 3.2.

3.8 If the *Director* approves the request, the *Company* shall update the *ESDM Report* to reflect the *Modification.*

3.9 Condition 3 does not apply if Condition 2.1 has expired.

4. PERFORMANCE LIMITS

4.1. Subject to Condition 4.2, the *Company* shall not discharge or cause or permit the discharge of a *Compound of Concern* into the air if,

(a) the *Compound of Concern* has a *Ministry Point of Impingement Limit* and the discharge results in the concentration at a *Point of Impingement* exceeding the *Ministry Point of Impingement Limit;* or

(b) the *Compound of Concern* does not have a *Ministry Point of Impingement Limit* and the discharge results in the concentration at a *Point of Impingement* exceeding the higher of,

(i) if an *Acceptable Point of Impingement Concentration* exists the most recent *Acceptable Point of Impingement Concentration*, and

(ii) the *Jurisdictional Screening Level* if a *Jurisdictional Screening Level* exists.

4.2 Condition 4.1 does not apply if the *Ministry Point of Impingement Limit* has a 10-minute averaging period and no ambient monitor indicates an exceedance at a *Point of Impingement* where human activities regularly occur at a time when those activities regularly occur.

4.3 The *Company* shall, at all times, ensure that the noise emissions from the *Facility* comply with the limits set in *Ministry Publications NPC-300.*

4.4 The *Company* shall ensure that the vibration emissions from the *Facility* comply with the limits set out in *Ministry Publication NPC-207.*

4.5 The *Company* shall operate any *Equipment with Specific Operational Limits* approved by this *Approval* in accordance with the *Original ESDM Report.*

4.6 The *Company* shall ensure that at all times when *Alternative Fuels* are co-fired with *Conventional Fuels* in the *Cement Kiln,* the discharge from the *Cement Kiln* complies with the performance requirements specified in **Schedule B** of this *Approval.*

4.7 The *Company* shall ensure that there is no increase in the emissions of sulphur dioxide and oxides of nitrogen when *Alternative Fuels* are co-fired with *Conventional Fuels* in the *Cement Kiln,* as demonstrated by the *CEM System.*

5. DOCUMENTATION REQUIREMENTS

5.1. The *Company* shall maintain an up-to-date *Log.*

5.2. No later than April 30 in each year, the *Company* shall update the *Acoustic Assessment Report* and shall update the *ESDM Report* in accordance with section 26 of *O. Reg. 419/05* so that the information in the reports is accurate as of December 31 in the previous year.

5.3. The *Company* shall make the *Emission Summary Table* (see section 27 of *O. Reg. 419/05)* and *Acoustic Assessment Summary Table* available for examination by any person, without charge, by posting it on the Internet or by making it available during regular business hours at the *Facility*.

5.4 The *Company* shall, within three (3) months after the expiry of Condition 2.1 of this *Approval,* update the *ESDM Report* and the *Acoustic Assessment Report* such that the information in the reports is accurate as of the date that Condition 2.1 of this *Approval* expired.

5.5. Conditions 5.1 and 5.2 do not apply if Condition 2.1 has expired.

6. REPORTING REQUIREMENTS

6.1 Subject to Condition 6.2, the *Company* shall provide the *Director* no later than July 31 of each year, a *Written Summary Form* to be submitted through the *Ministry's* website that shall include the following:

(a) a declaration of whether the *Facility* was in compliance with section 9 of the *EPA, O. Reg. 419/05* and the conditions of this *Approval;*

(b) a summary of each *Modification* satisfying Condition 2.1 (a) and (b) that took place in the previous calendar year that resulted in a change in the previously calculated concentration at a *Point of Impingement* for any *Compound of Concern* or resulted in a change in the sound levels reported in the *Acoustic Assessment Summary Table* at any *Point of Reception.*

6.2 Condition 6.1 does not apply if Condition 2.1 has expired.

7. OPERATION AND MAINTENANCE

7.1 The *Company* shall prepare, update as necessary and implement, not later than six (6) months from the date of this *Approval,* operating procedures and maintenance programs for all *Processes with Significant Environmental Aspects*, which shall specify as a minimum:

(a) frequency of inspections and scheduled preventative maintenance;

(b) procedures to prevent upset conditions;

(c) procedures to minimize all fugitive emissions;

(d) procedures to prevent and/or minimize odorous emissions;

(e) procedures to prevent and/or minimize noise emissions;

(f) acceptable ranges of the static pressure drop for the process dust control equipment listed in **Schedule C** of this *Approval;*

(g) program to monitor and record the pressure differential across each of the primary dust collectors as specified in **Schedule C** of this *Approval,* including the frequency of measurement and procedures to investigate and correct the cause of any anomalous measurements of the static pressure drop;

(h) list of management and supervisory personnel responsible for the operation and maintenance of process dust control equipment specified in **Schedule C** of this *Approval;* and

(i) procedures for record keeping activities relating to the operation and maintenance programs.

7.2 The company shall maintain and update to keep current, a list of all process dust control equipment, including the following details:

Source identification; Production building/area served; Process/location served; Stack gas flow rate; Filter area; Stack diameter and Stack height above grade.

7.3 The *Company* shall ensure that all *Processes with Significant Environmental Aspects* are operated and maintained in accordance with this *Approval,* the operating procedures and maintenance programs.

8.0 START-UPS, SHUTDOWN AND UPSET PROCEDURES

8.1 The *Company* shall update as necessary, not later than six (6) months from the date of issue of this *Approval,* operating procedures which address kiln start-ups, shut down and any upset conditions.

9.0 MATERIAL ANALYSIS AND CRITERIA FOR ACCEPTANCE

The *Company* shall ensure that a material analysis program to measure and record the concentration of contaminants for the following material is implemented:

9.1 *Industrial By-Product Material* or *Fuel Adjunct Material*

(a) For each material used as *Fuel Adjunct Materials,* the *Company* shall obtain a metals/metal hydrides scan, including at a minimum the contaminants listed in **Schedule D** on a quarterly or Lot basis, as applicable. The *Company* shall ensure that the standard sampling methods outlined in the document "Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario, Ontario Ministry of the Environment and Energy, Standards Development Branch, December, 1996" are used, and that the samples are submitted to a *CAEAL* certified laboratory for analysis.

(b) For each material used as *Industrial By-Product Materials*, the *Company* shall obtain a metals/metal hydrides scan, including at a minimum the contaminants listed in **Schedule D**, on a quarterly or Lot basis, as applicable. The *Company* shall ensure that the standard sampling methods outlined in the document "Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario, Ontario Ministry of the Environment and Energy, Standards Development Branch, December, 1996" are used, and that the samples are submitted to a *CAEAL* certified laboratory for analysis.

(c) At any time, should the *Company* either independently or through other sources reasonably expect other metal/metal hydrides not outlined under **Schedule D** to be present in any material at greater than the trace concentrations, the *Company* shall obtain the appropriate analysis forthwith.

(d) Upon receipt of the analysis, the *Company* shall ensure that the *Point of Impingement* concentrations of metal/metal hydrides identified in (c) above do not exceed the respective limit based on the *Maximum Emissions Scenario.*

(e) The *Company* shall limit the accumulation of *Industrial By-Product Materials* and other raw materials in exterior storage piles to amounts which may reasonably be expected to be necessary for use in the cement manufacturing processes.

(f) The *Company* shall ensure that any *Industrial By-Product Material* stored at the *Facility* which the *Company* determines cannot be utilized in ongoing cement manufacturing processes, is managed in accordance with applicable waste management regulations, and, where an *Industrial By-Product Material* becomes unusable, the *Company* shall advise the *District Manager* in writing, of the type and quantity of such material, the reasons why it cannot be used and the specific manner in which the material is to be managed as a waste.

10.0 *ALTERNATIVE FUELS*

10.1 The *Company* shall ensure that the *Facility/Equipment* is properly designed and operated at all times while firing *Alternative Fuels* and comply with the operational requirements set out in **Schedule E** of this *Approval.*

10.2 The *Company* shall, in consultation with the *District Manager*, update as necessary and implement, not later than three (3) months from the date of first firing of *Alternative Fuels* in the *Cement Kiln,* operating procedures provided in section 8 of the Design and Operations Report specified in **Schedule A** of this *Approval,* which addresses *Alternate Fuels* start-up and shut-down, emergency and contingency measures and termination of *Alternative Fuel* processing. *Alternative Fuels* shall be fired in accordance with these operating procedures and shall only be fired once the *Cement Kiln* has achieved normal operation, temperatures and production and shall be introduced only in the high-temperature combustion zones of the kiln and the calciner.

10.3 The firing of *Alternative Fuels* shall be stopped (following appropriate procedures) if:

(a) the temperature, residual oxygen or pressure as measured by the specified measuring equipment do not meet the operational requirements outlined in **Schedule E** of this *Approval* for more than four (4) consecutive hours; or

(b) the measuring equipment such as the *CEM System* for one or more of the parameters specified in condition 10.3 (a) are down or malfunctioning for more than four (4) consecutive hours.

10.4 Analysis and Criteria for Acceptance

(a) A *Low Carbon Alternative Fuels* testing protocol over a minimum six (6) month period shall be implemented in accordance with sections 6.1.3 and 10.3 of the Design and Operations Report specified in **Schedule A** of this *Approval*, to establish consistency in the *Low Carbon Alternative Fuels* characteristics.

(b) After the successful completion of the testing protocol described in condition 10.4 (a), the *Company* shall update the procedure as necessary for sampling and analysis titled "Alternative Low-Carbon Fuel Sampling Methodology, Revision 1" provided as Appendix G of the Design and Operations Report. The updated procedure shall be provided to the *District Manager* not later than two (2) months before the planned first use of *Alternative Fuels* at the *Facility*.

(c) During the regular use of *Alternative Fuels*, the *Company* shall conduct sampling and analysis in accordance with the updated sampling and analysis procedure in condition 10.4 (b).

10.5 If the results of the analysis specified in condition 10.4 (c) indicate that emission rates of contaminants from the Kiln Stack are higher than the maximum emission rates identified in the *Maximum Emission Scenario*, the *Company* shall update the *ESDM Report* with the emission rates derived from this analysis.

10.6 The *Company* shall record the following data during *Cement Kiln* Operation:

(a) hourly combined raw feed;

(b) *Fuel Adjunct Material* and *Industrial By-Product Material* for relevant period;

(c) hourly *Alternative Fuels* and *Conventional Fuels* firing rates in the kiln and calciner;

(d) hourly clinker production; and

(e) records of incidents specified in condition 10.3 of this *Approval.*

11. SOURCE TESTING

11.1 The *Company* shall perform *Source Testing* in accordance with the procedure in **Schedule F** to determine the rate of emission of the test contaminants from the sources specified in **Schedule G**. The first *Source Testing* shall be conducted not later than six (6) months after the first use of any of the *Alternative Fuels* in the *Cement Kiln.*

11.2 Subsequent *Source Testing* shall be conducted once every calendar year in accordance with the procedure in **Schedule F** to determine the rate of emission of the test contaminants from the sources specified in **Schedule G**, for the use of *Low Carbon Alternative Fuels* and/or Woodwaste as defined under *O.Reg.347,* if any of these materials are used in the previous calendar year.

11.3 The *District Manager* may relax the frequency and/or scope of *Source Testing* if the results of the annual *Source Testing* indicate that the emissions and *Point of Impingement* concentrations of *Compounds of Concern* are insignificant when substituting a portion of *Conventional Fuel* with *Alternative Fuels.*

12. CONTINUOUS EMISSIONS MONITORING

12.1 Continuous Emissions Monitoring in the Kiln Stack

(a) The *Company* shall ensure that the existing *CEM System* is fully operational at all times to continuously monitor the following parameters in the exhaust gas stream from the Kiln Stack:

(i) Nitrogen Oxides
(ii) Sulphur Dioxide
(iii) Opacity

(b) The *CEM System* for nitrogen oxides and sulphur dioxide shall comply with the requirements of O.Reg. 194/05 – Industry Emissions – Nitrogen Oxides and Sulphur Dioxide, as amended from time to time.

(c) The *CEM System* for monitoring opacity shall comply with the requirements outlined in **Schedule H.**

12.2 Continuous Emissions Monitoring of Process Conditions

12.2.1 The *Company* shall install, operate and maintain a *CEM System* to continuously monitor:

(a) the concentration of residual oxygen and carbon monoxide in the backend of the kiln and calciner down comer duct;

(b) the temperatures of gases leaving the kiln at a point where the gas temperature reaches a minimum of 1000 Deg. C for a period of not less than 6 seconds;

(c) the temperatures of gases leaving the calciner at a point where the gas temperature reaches a minimum of 850 Deg. C for not less than 3 seconds; and

(d) Total Hydrocarbon (as methane) in the gases leaving the Kiln Stack.

12.2.2 The *Company* shall submit to the *Manager,* not later than ninety (90) days prior to the first use of *Alternative Fuels* in the *Cement Kiln,* a detailed continuous monitoring plan, complete with specifications for the *CEM System* for the parameters specified in condition 12.2.1 of this *Approval.* The *Company* shall finalize the continuous monitoring plan in consultation with the *Manager.*

12.2.3 The *Company* shall ensure that the *CEM System* specified in condition 12.2.1 are installed, commissioned, operated and maintained in accordance with the finalized monitoring plan referenced in condition 12.2.2 prior to the first use of *Alternative Fuels*.

12.3 Continuous Emissions Monitoring Documentation

12.3.1 The *Company* shall prepare and retain on site monthly reports of the data monitored during the preceding month by the *CEM System,* summarizing the following as a minimum:

(a) the daily minimum, maximum and average readings for the parameters specified in condition 12 of this *Approval;*

(b) the type and hourly firing rate of fuels used during the period the readings were taken;

(c) the percent availability of the *CEM System* for the parameters specified in condition 12 of this *Approval.*

(d) operational status (on/off) of the raw mill and the fuel mill.

12.3.2 The *Company* shall establish the normal operating total hydrocarbons range for *Baseline Conditions.* After the first use of any of the *Alternative Fuels,* the *Company* shall, at a minimum on a quarterly basis, review the *CEM System* monthly reports and identify and investigate any anomalous total hydrocarbons data. The investigations report shall be prepared and retained on site.

12.3.3 The *Company* shall retain on site, all raw data generated by the *CEM System.*

13. FUGITIVE EMISSIONS CONTROL

13.1 The *Company* shall update as necessary and implement the *Best Management Practices Plan* for the control of fugitive dust emissions.

Documentation Requirements - *Best Management Practices Plan*

13.2 The *Company* shall record and retain such records, each time a specific preventative and control measure described in the *Best Management Practices Plans* is implemented. The *Company* shall record, as a minimum:

(a) the date when each emission control measure is implemented, including a description of the control measure;

(b) the date when each new preventative measure or operating procedure to minimize emissions is implemented, including a description of the preventative measure or operating procedure; and

(c) the date, time of commencement, and time of completion of each periodic activity conducted to minimize emissions, including a description of the preventative measure/procedure and the name of the individual performing the periodic activity.

14. COMPLAINTS RECORDING AND REPORTING

14.1 If at any time, the *Company* receives an environmental complaint from the public regarding the operation of the *Equipment* approved by this *Approval,* the *Company* shall take the following steps:

(a) Record and number each complaint, either electronically or in a log book. The record shall include the following information: the time and date of the complaint and incident to which the complaint relates, the nature of the complaint, wind direction at the time and date of the incident to which the complaint relates and, if known, the address of the complainant.

(b) Notify the *District Manager* of the complaint within two (2) business days after the complaint is received, or in a manner acceptable to the *District Manager.*

(c) Initiate appropriate steps to determine all possible causes of the complaint and take the necessary actions to appropriately deal with the cause of the subject matter of the complaint attributable to the operations at the *Facility.*

(d) Complete and retain on-site a report written within one (1) week of the complaint date. The report shall list the actions taken to appropriately deal with the cause of the complaint and set out steps to be taken to avoid the recurrence of similar incidents.

15. RECORD KEEPING REQUIREMENTS

15.1 Any information pertaining to compliance with the *EPA, Regulation 419/05* and this *Approval* requested by any employee in or agent of the *Ministry,* concerning the *Facility* and its operation under this *Approval,* including, but not limited to, any records required to be kept by this *Approval,* shall be provided to the employee in or agent of the *Ministry,* upon request, in a timely manner.

15.2 Unless otherwise specified in this *Approval,* the *Company* shall retain, for a minimum of five (5) years from the date of their creation all reports, records and information described in this *Approval,* including,

(a) a copy of the *Original ESDM Report* and each updated version*;*

(b) a copy of each version of the *Acoustic Assessment Report;*

(c) supporting information used in the emission rate calculations performed in the *ESDM Reports* and *Acoustic Assessment Reports;*

(d) the records in the *Log;*

(e) copies of each *Written Summary Form* provided to the *Ministry* under Condition 6.1 of this *Approval;*

(f) records of maintenance, repair and inspection of *Equipment* related to all *Processes with Significant Environmental Aspects;*

(g) all records related to environmental complaints made by the public as required by Condition 14 of this *Approval;*

(h) records related to *Source Testing* events specified under section titled “Source Testing” of this *Approval;*

(i) records related to the operation of the *CEM System* specified under section titled “Continuous Emission Monitoring” of this *Approval;*

(j) records related to the preventative and control measures implemented as specified under section titled “Fugitive Emissions Control” of this *Approval;* and

(k) records related to sampling and analysis specified under sections titled “Material Analysis and Criteria of Acceptance” and “Alternative Fuels” of this *Approval.*

16. REVOCATION OF PREVIOUS APPROVALS

This *Approval* replaces and revokes all Certificates of Approval (Air) issued under section 9 *EPA* and Environmental Compliance Approvals issued under Part II.1 *EPA* to the *Facility* in regards to the activities mentioned in subsection 9(1) of the *EPA* and dated prior to the date of this *Approval,* except Environmental Compliance Approval No. 4614-826K9W dated November 5, 2014.

SCHEDULE A

Supporting Documentation

(a) Application for Environmental Compliance Approval (Air & Noise), dated May 9, 2014, signed by Ruben Plaza and submitted by the C*ompany.*

(b) Emission Summary and Dispersion Modelling Report, prepared by BCX Environmental Consulting and dated May 10, 2014.

(c) Additional air emissions and dispersion modelling related information provided by BCX Environmental Consulting dated April 1, 2015, May 26 & 27, 2015 and July 23, 2015.

(d) Report titled "Bowmanville Cement Plant - Design and Operations Report, Environmental Compliance Approval for Regular Use of Low Carbon Alternative fuel (Woody Biomass)", prepared by HDR Engineering and dated May 2014.

(e) Acoustic Assessment Report, prepared by Corey Kinart, P.Eng. / HGC Engineering, dated May 13, 2014.

SCHEDULE B

Performance Requirements- In-Stack Emission Limits

Parameter	Kiln Stack Emission Limit	Verification of Compliance
Particulate Matter (PM)	50 mg/Rm^3	Results from compliance source testing
Cadmium (Cd)	7 µg/Rm3	Results from compliance source testing
Lead (Pb)	60 µg/Rm3	Results from compliance source testing
Mercury (Hg)	20 µg/Rm3	Results from compliance source testing
Dioxins and Furans	80 pg/Rm^3 as ITEQ	Results from compliance source testing; results expressed as I-TEQ.
Hydrochloric Acid (HCl)	27 mg/Rm^3	Results from compliance source testing
Opacity	In accordance with s. 46 of *O.Reg 419/05*	Calculated as the rolling arithmetic average of 6 minutes of data measured by a *CEM System* that provides data at least once every minute.

Notes:

R - Reference flue gas conditions, defined as follows:
- Temperature 25 °C
- Pressure 101.3 kPa
- Oxygen content 11%
- Water content nil (dry conditions)

mg/Rm3 - milligrams per cubic metre of gas at Reference conditions.
µg/Rm3 - micrograms per cubic metre of gas at Reference conditions.
pg/Rm3 - picograms per cubic metre of gas at Reference conditions.
I-TEQ - a toxicity equivalent concentration calculated using the toxic equivalency factors (I-TEFs) derived for each dioxin and furan congener by comparing its toxicity to the toxicity of 2,3,7,8 tetrachloro dibenzo-p-dioxin, recommended by the World Health Organization (WHO) dioxin toxicity equivalence factors (TEFs) in 2005, and adopted by Ontario in April 2012.

SCHEDULE C

PROCESS DUST CONTROL EQUIPMENT OPERATIONAL REQUIREMENTS

Primary Dust Control Equipment

Primary dust control equipment includes the Kiln Baghouse; Bypass Baghouse, Fuel Mill Baghouse; Cooler Baghouse and Finish Mill Baghouses.

The static pressure drop across the primary dust control equipment filter bag compartments shall be measured and recorded continuously by the *Facility's* automated control system.

Secondary Dust Control Equipment

Secondary dust control equipment includes all other fabric filter dust collectors which are not primary dust control equipment.

The static pressure drop across the secondary dust control equipment filter bag compartments shall be measured and recorded at least quarterly.

Where applicable, the static pressure drop must be referenced to the value recorded during previous testing. In the absence of previous testing values, the parameter must be referenced to the value or normal range representing normal operation, recorded as soon as possible.

SCHEDULE D

MATERIAL ANALYSIS CONTAMINANTS

1. Antimony
2. Arsenic
3. Barium
4. Beryllium
5. Cadmium
6. Chromium
7. Cobalt
8. Iron
9. Lead
10. Manganese
11. Mercury
12. Nickel
13. Selenium
14. Silver
15. Tin
16. Vanadium
17. Total Halogens

SCHEDULE E

ALTERNATE FUELS OPERATIONAL REQUIREMENTS

Parameter	Limits	Measurement
Total Quantity of *Alternative Fuels* combusted in the *Cement Kiln.*	No more than the lesser of: (a) 4 tonnes per hour, or (b) 4% substitution of *Conventional fuels*, based on heating value.	Measured continuously.
Temperature in the *Cement Kiln*	Greater than 1000 Deg. C at a gas residence time of more than 6 seconds in the kiln. Greater than 850 Deg. C at a gas residence time of more than 3 seconds in the calciner.	Measured by the *CEM System.* Calculated as a rolling 1-hour arithmetic average measured by the *CEM System.*
Residual oxygen	>1% residual oxygen at the backend (raw material feed end) of the kiln. >3% residual oxygen at the calciner down comer duct (raw material feed end of the calciner)	Measured by the *CEM System* and calculated by volume on a dry basis in the undiluted gases leaving the kiln and calciner. Calculated as a rolling 1-hour arithmetic average measured by the *CEM System.*
Pressure Control	Kiln, Calciner, Preheater tower and Raw Mill must be operated under negative pressure at all times.	Measured at the top of the preheater towers and in Raw Mill by continuous monitor.
Start-Up, Shut-down and Upset Operating Conditions	No *Alternative Fuels* shall be used.	-

SCHEDULE F

Procedure for *Source Testing*

1. The *Company* shall submit, not later than three (3) months prior to the *Source Testing*, to the *Manager* a *Pre-Test Plan* for the *Source Testing* required under this *Approval*. The *Company* shall finalize the *Pre-Test Plan* in consultation with the *Manager*.

2. The first *Source Testing* shall be carried out for the following individual fuel firing scenarios at the maximum approved fuel firing rate in the kiln and the calciner. The characteristics of *Low Carbon Alternative Fuels* used during *Source Testing* shall be within the range established under Condition 10.4 - Analysis and Criteria for Acceptance of this *Approval:*

   (1) *Baseline Conditions;*
   (2) Approved substitution rate of *Conventional Fuels* with *Low Carbon Alternative Fuels;* and/or
   (3) Approved substitution rate of *Conventional Fuels* with Woodwaste as defined under *O.Reg.347*.

3. Subsequent annual *Source Testing* as described in condition 11.2 of this *Approval* shall be carried out for the maximum approved substitution rate of *Low Carbon Alternative Fuels* and/or Woodwaste as defined under *O.Reg.347*, as applicable.

4. The *Company* shall not commence the *Source Testing* required under this *Approval* until the *Manager* has approved the *Pre-Test Plan.*

5. The *Company* shall notify the *Manager*, the *District Manager* and the *Director* in writing of the location, date and time of any impending *Source Testing* required by this *Approval*, at least fifteen (15) days prior to the *Source Testing.*

6. The *Company* shall submit a report (hardcopy and electronic format) on the *Source Testing* to the *Manager and* the *District Manager* not later than four (4) months after completing the *Source Testing*, or not later than a time frame agreed in writing with the *Manager*. The report shall be in the format described in the *Source Testing Code*, and shall also include, but not be limited to:

   (1) an executive summary;
   (2) records of operating conditions at the time of *Source Testing* and other information including but not limited to:

      (i) clinker production rate in tonnes/hour;
      (ii) *Conventional fuel, Low Carbon Alternative Fuels* and/or Woodwaste firing rate in tonnes/hour separately in the kiln and calciner;
      (iii) quantity and type of *Fuel Adjunct Materials* and *Industrial By-Product Materials* used; and
      (iv) any other records that may affect the *Source Testing* results;

SCHEDULE F (Continued)

Procedure for *Source Testing*

(3) results of *Source Testing,* including the emission rate, emission concentration and relevant emission factor of the Test Contaminants;

(4) a summary of all records of the *CEM System* available for the parameters specified in condition 12 of this *Approval* at the time of *Source Testing;*

(5) a summary table that compares the *Source Testing* results to the emission estimates described in the *Company* 's application, the *ESDM Report* and the Performance Limits; and

(6) a comparison of stack analysis data between use of *Conventional fuel, Low Carbon Alternative Fuels* and Woodwaste for the first *Source Testing* of the relevant material; and a description and explanation of any statistically significant changes in emissions of the Test Contaminants, resulting from the use of *Alternative Fuel,* relative to *Baseline Conditions.*

7. The *Company* shall ensure that the *Source Testing* report is made available and easily accessible for review by the public at the *Facility,* immediately after the document is submitted to the *Ministry.*

8. The *Director* may not accept the results of the *Source Testing* if:

(1) the *Source Testing Code* or the requirements of the *Manager* were not followed;

(2) the *Company* did not notify the *District Manager,* the *Manager* and the *Director* of the *Source Testing;* or

(3) the *Company* failed to provide a complete report on the *Source Testing.*

9. If the *Director* does not accept the results of the *Source Testing,* the *Director* may require re-testing. If re-testing is required, the *Pre-Test Plan* strategies need to be revised and submitted to the *Manager* for approval. The actions taken to minimize the possibility of the *Source Testing* results not being accepted by the *Director* must be noted in the revision.

10. If the *Source Testing* results are higher than the emission estimates in the *Company's ESDM Report,* the *Company* shall update their *ESDM Report* in accordance with Section 26 of *O. Reg. 419/05* with the results from the *Source Testing* report and make these records available for review by staff of the *Ministry* upon request. The updated Emission Summary Table from the updated *ESDM Report* shall be submitted with the report on the *Source Testing.*

SCHEDULE G

Test Sources and Test Contaminants - *Source Testing*

Test Sources

Source ID	Description	Frequency
Kiln Stack	Main stack serving the *Cement Kiln*	In accordance with condition 11 of this *Approval.* The schedule between two consecutive tests should not be less than six (6) months

Test Contaminants

Total Suspended Particulate Matter
Ammonia
Hydrogen Chloride

Metals		Volatile Organic Matter
Cd	Cadmium	Acetone
Be	Beryllium	Acrolein
Pb	Lead	Benzene
Mo	Molybdenum	Bromodichloromethane
Cr	Chromium	Bromoform
Ni	Nickel	Bromomethane
V	Vanadium	Butadiene, 1,3 -
Al	Aluminum	Butanone, 2 -
Ti	Titanium	Carbon Tetrachloride
Mg	Magnesium	Chloroform
B	Boron	Cumene
Ba	Barium	Dibromochloromethane
P	Phosphorus	Dichlorodifluoromethane
K	Potassium	Dichloroethane, 1,2 -
Hg	Mercury	Dichloroethene, Trans - 1,2
As	Arsenic	Dichloroethene, 1,1 -
Zn	Zinc	Dichloropropane, 1,2 -
Sb	Antimony	Ethylbenzene
Mn	Manganese	Ethylene Dibromide
Co	Cobalt	Mesitylene
Se	Selenium	Methylene Chloride
Cu	Copper	Styrene
Ag	Silver	Tetrachloroethene
Sn	Tin	Toluene
Sr	Strontium	Trichloroethane, 1,1,1 -
Tl	Thalium	Trichloroethene
Fe	Iron	Trichloroethylene, 1,1,2 -
		Trichlorotrifluoroethane
		Trichlorofluoromethane
		Xylenes, M-, P- and O
		Vinyl Chloride

SCHEDULE G (Continued)

Polycyclic Organic Matter
Acenaphthylene
Acenaphthene
Anthracene
Benzo(a)anthracene
Benzo(b)fluoranthene
Benzo(k)fluoranthene
Benzo(a)fluorene
Benzo(b)fluorene
Benzo(ghi)perylene
Benzo(a)pyrene *
Benzo(e)pyrene
Biphenyl
2-Chloronaphthalene
Chrysene
Coronene
Dibenzo(a,c)anthracene
Dibenzo(a,h)anthracene
Dibenzo(a,e)pyrene
9,10-Dimethylanthracene
7,12-Dimethylbenzo(a)anthracene
Fluoranthene
Fluorene
Indeno(1,2,3-cd)pyrene
2-Methylanthracene
3-Methylcholanthrene
1-Methylnaphthalene
2-Methylnaphthalene
1-Methylphenanthrene
9-Methylphenanthrene
Naphthalene
Perylene
Phenanthrene
Picene
Pyrene
Tetralin
M-terphenyl
O-terphenyl
P-terphenyl
Triphenylene

* Benzo(a)Pyrene (B(a)P) standard and upper Risk Threshold (URT) are considered surrogate for all POMs that do not have their own standards or guidelines. For O.Reg.419/05 reporting, before July 2016, if the existing guideline is exceeded, B(a)P as a surrogate will be assessed against the URT. After July 1, 2016, it will be assessed against the new standard.

SCHEDULE G (Continued)
Dioxins, Furans and Dioxin-like PCBs (Polychlorinated Biphenyls)

Toxicity equivalency factors (TEFs) are applied to 29 isomers of dioxins, furans and dioxin-like PCBs to convert them into 2,3,7,8-CDD (tetrachlorodibenzo-p-dioxin) toxicity equivalents. The conversion involves multiplying the concentration of the isomer by the appropriate TEF to yield the TEQ for this isomer. Summing the individual TEQ values for each of the isomers provides the total toxicity equivalent level for the sample mixture.

A table listing the 29 isomers and their TEFs can be found in the MOE publication titled: Summary of Standards and Guidelines to Support Ontario Regulation 416-05 – Air Pollution - Local Air Quality, PIBS 6569e01 dated April 2012 and as noted below.

Example:

No.	Dioxins, Furans, and Dioxin-like PCBs	CASRN	WHO_{2005} Toxic Equivalency Factors [TEFs]
1	2,3,7,8-Tetrachlorodibenzo-p-dioxin [2,3,7,8-TCDD]	1746-01-6	1
2	1,2,3,7,8-Pentachlorodibenzo-p-dioxin [1,2,3,7,8-PeCDD]	40321-76-4	1
3	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin [1,2,3,4,7,8-HxCDD]	39227-28-6	0.1
4	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin [1,2,3,6,7,8-HxCDD]	57653-85-7	0.1
5	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin [1,2,3,7,8,9-HxCDD]	19408-74-3	0.1
6	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin [1,2,3,4,6,7,8-HpCDD]	35822-46-9	0.01
7	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin [1,2,3,4,6,7,8,9-OCDD]	3268-87-9	0.0003
8	2,3,7,8-Tetrachlorodibenzofuran [2,3,7,8-TCDF]	51207-31-9	0.1
9	1,2,3,7,8-Pentachlorodibenzofuran [1,2,3,7,8-PeCDF]	57117-41-6	0.03
10	2,3,4,7,8-Pentachlorodibenzofuran [2,3,4,7,8-PeCDF]	57117-31-4	0.3
11	1,2,3,4,7,8-Hexachlorodibenzofuran [1,2,3,4,7,8-HxCDF]	70648-26-9	0.1

12	1,2,3,6,7,8-Hexachlorodibenzofuran [1,2,3,6,7,8-HxCDF]	57117-44-9	0.1
13	1,2,3,7,8,9-Hexachlorodibenzofuran [1,2,3,7,8,9-HxCDF]	72918-21-9	0.1
14	2,3,4,6,7,8-Hexachlorodibenzofuran [2,3,4,6,7,8-HxCDF]	60851-34-5	0.1
15	1,2,3,4,6,7,8-Heptachlorodibenzofuran [1,2,3,4,6,7,8-HpCDF]	67562-39-4	0.01
16	1,2,3,4,7,8,9-Heptachlorodibenzofuran [1,2,3,4,7,8,9-HpCDF]	55673-89-7	0.01
17	1,2,3,4,6,7,8,9-Octachlorodibenzofuran [1,2,3,4,6,7,8,9-OCDF]	39001-02-0	0.0003
18	3,3',4,4'-Tetrachlorobiphenyl [3,3',4,4'-tetraCB (PCB 77)]	32598-13-3	0.0001
19	3,4,4',5- Tetrachlorobiphenyl [3,4,4',5-tetraCB (PCB 81)]	70362-50-4	0.0003
20	3,3',4,4',5- Pentachlorobiphenyl (PCB 126) [3,3',4,4',5-pentaCB (PCB 126)]	57465-28-8	0.1
21	3,3',4,4',5,5'- Hexachlorobiphenyl [3,3',4,4',5,5'-hexaCB (PCB 169)]	32774-16-6	0.03
22	2,3,3',4,4'- Pentachlorobiphenyl [2,3,3',4,4'-pentaCB (PCB 105)]	32598-14-4	0.00003
23	2,3,4,4',5- Pentachlorobiphenyl [2,3,4,4',5-pentaCB (PCB 114)]	74472-37-0	0.00003
24	2,3',4,4',5- Pentachlorobiphenyl [2,3',4,4',5-pentaCB (PCB 118)]	31508-00-6	0.00003
25	2',3,4,4',5- Pentachlorobiphenyl [2',3,4,4',5-pentaCB (PCB 123)]	65510-44-3	0.00003
26	2,3,3',4,4',5- Hexachlorobiphenyl [2,3,3',4,4',5-hexaCB (PCB 156)]	38380-08-4	0.00003

27	2,3,3',4,4',5'- Hexachlorobiphenyl [2,3,3',4,4',5'-hexaCB (PCB 157)]	69782-90-7	0.00003
28	2,3',4,4',5,5'- Hexachlorobiphenyl [2,3',4,4',5,5'-hexaCB (PCB 167)]	52663-72-6	0.00003
29	2,3,3',4,4',5,5'- Heptachlorobiphenyl [2,3,3',4,4',5,5'-heptaCB (PCB 189)]	39635-31-9	0.00003

NOTE:

* Sum of toxicity equivalents of individual isomers

The TEF scheme is intended to be used with isomer specific analytical results. In cases where results are reported by congener group only, staff at *Ministry's* Standards Development Branch shall be contacted for appropriate procedures to convert non-isomer specific data to TEQs.

SCHEDULE H
CEM System Requirements - Opacity

INSTALLATION: The *CEM System* shall be installed at an accessible location where the measurements are representative of the total emissions from the Kiln Main Stack, and shall meet the following installation specifications:

	PARAMETERS	SPECIFICATION
1	Wavelength at Peak Spectral Response (nanometres, nm):	500 - 600
2	Wavelength at Peak Spectral Response (nanometres, nm):	500 - 600
3	Detection angle of view:	≤ 5 degrees
4	Angle of projection:	≤ 5 degrees
5	Range (percent of opacity):	0 -100

PERFORMANCE: The *CEM System* for opacity monitoring shall meet the following minimum performance specifications for the following parameters.

	PARAMETERS	SPECIFICATION
1	Span Value (percent opacity):	2 times the average normal opacity of the source
2	Calibration Error:	≤ 3 percent opacity
3	Attenuation Calibration:	≤ 2 percent opacity
4	Response Time (95 percent response to a step change)	≤ 10 seconds
5	Schedule for Zero and Calibration Checks:	daily minimum
6	Procedure for Zero and Calibration Checks:	all system components checked
7	Zero Calibration Drift (24-hours):	≤ 2 percent opacity
8	Span Calibration Drift (24-hours):	≤ 2 percent opacity
9	Conditioning Test Period:	≥ 168 hours without corrective maintenance
10	Operational Test Period:	≥ 168 hours without corrective maintenance

CALIBRATION: The monitor shall be calibrated, to ensure that it meets the drift limits specified above, during the periods of the operation of the Equipment. The results of all calibrations shall be recorded at the time of calibration.

DATA RECORDER: The data recorder must be capable of registering continuously the measurement of the monitor with an accuracy of 0.5 percent of a full scale reading or better and with a time resolution of 30 seconds or better.

RELIABILITY: The monitor shall be operated and maintained so that accurate data is obtained during a minimum of 90 percent of the time for each calendar quarter during the first full year of operation, and 95 percent, thereafter.

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

GENERAL

1. Condition No. 1 is included to require the *Approval* holder to build, operate and maintain the *Facility* in accordance with the Supporting Documentation in Schedule A considered by the *Director* in issuing this *Approval.*

LIMITED OPERATIONAL FLEXIBILITY, REQUIREMENT TO REQUEST AN *ACCEPTABLE POINT OF IMPINGEMENT CONCENTRATION* AND *PERFORMANCE LIMITS*

2. Condition Nos. 2, 3 and 4 are included to limit and define the *Modifications* permitted by this *Approval,* and to set out the circumstances in which the *Company* shall request approval of an *Acceptable Point of Impingement Concentration* prior to making *Modifications.* The holder of the *Approval* is approved for operational flexibility for the *Facility* that is consistent with the description of the operations included with the application up to the *Facility Production Limit.* In return for the operational flexibility, the *Approval* places performance based limits that cannot be exceeded under the terms of this *Approval. Approval* holders will still have to obtain other relevant approvals required to operate the *Facility,* including requirements under other environmental legislation such as the *Environmental Assessment Act.*

DOCUMENTATION REQUIREMENTS

3. Condition No. 5 is included to require the *Company* to maintain ongoing documentation that demonstrates compliance with the *Performance Limits* of this *Approval* and allows the *Ministry* to monitor on-going compliance with these *Performance Limits.* The *Company* is required to have an up to date *ESDM Report* and *Acoustic Assessment Report* that describe the *Facility* at all times and make the *Emission Summary Table* and *Acoustic Assessment Summary Table* from these reports available to the public on an ongoing basis in order to maintain public communication with regard to the emissions from the *Facility.*

REPORTING REQUIREMENTS

4. Condition No. 6 is included to require the *Company* to provide a yearly *Written Summary Form* to the *Ministry,* to assist the *Ministry* with the review of the site's compliance with the *EPA,* the regulations and this *Approval.*

OPERATION AND MAINTENANCE

5. Condition Nos. 7, 8, 9 and 10 and are included to require the *Company* to properly operate and maintain the *Processes with Significant Environmental Aspects* to minimize the impact to the environment from these processes.

TESTING

6. Condition Nos. 11 and 12 are included to require the *Company* to gather and retain accurate information so that compliance with the *EPA, Regulation 419/05* and this *Approval* may be verified.

FUGITIVE EMISSIONS CONTROL

7. Condition No. 13 is included to emphasize that the *Equipment* and *Facility* must be maintained and operated in accordance with a procedure that will result in compliance with the *EPA, Regulation 419/05* and this *Approval* and to require the *Company* to keep records and to provide information to staff of the *Ministry* so that compliance with the *EPA, Regulation 419/05* and this *Approval* may be verified.

COMPLAINTS RECORDING AND REPORTING

9. Condition No. 14 is included to require the *Company* to respond to any environmental complaints regarding the operation of the *Equipment,* according to a procedure that includes methods for preventing recurrence of similar incidents and a requirement to prepare and retain a written report.

RECORD KEEPING REQUIREMENTS

10. Condition No. 15 is included to require the *Company* to retain all documentation related to this *Approval* and provide access to employees in or agents of the *Ministry,* upon request, so that the *Ministry* can determine if a more detailed review of compliance with the *Performance Limits* is necessary.

REVOCATION OF PREVIOUS APPROVALS

11. Condition No. 16 is included to identify that this *Approval* replaces all Section 9 Certificate(s) of Approval and Part II.1 Approvals in regards to the activities mentioned in subsection 9(1) of the *EPA* and dated prior to the date of this *Approval,* except Environmental Compliance Approval No. 4614-826K9W dated November 5, 2014.

Upon issuance of the environmental compliance approval, I hereby revoke Approval No(s). 3779-9BMQW4 issued on December 5, 2013.

In accordance with Section 139 of the Environmental Protection Act, you may by written Notice served upon me, the Environmental Review Tribunal and in accordance with Section 47 of the Environmental Bill of Rights, 1993, S.O. 1993, c. 28 (Environmental Bill of Rights), 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 environmental compliance approval or each term or condition in the environmental compliance 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.

Pursuant to subsection 139(3) of the Environmental Protection Act, a hearing may not be required with

respect to any terms and conditions in this environmental compliance approval, if the terms and conditions are substantially the same as those contained in an approval that is amended or revoked by this environmental compliance approval.

The Notice should also include:

3. The name of the appellant;
4. The address of the appellant;
5. The environmental compliance approval number;
6. The date of the environmental compliance approval;
7. The name of the Director, and;
8. The municipality or municipalities within which the project is to be engaged in.

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

This Notice must be served upon:

The Secretary*****
Environmental Review Tribunal
655 Bay Street, Suite 1500
Toronto, Ontario
M5G 1E5

AND

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

AND

The Director appointed for the purposes of
Part II.1 of the Environmental Protection Act
Ministry of the Environment and
Climate Change
135 St. Clair Avenue West, 1st Floor
Toronto, Ontario
M4V 1P5

*** Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 212-6349, Fax: (416) 326-5370 or www.ert.gov.on.ca**

This instrument is subject to Section 38 of the Environmental Bill of Rights, 1993, 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.ebr.gov.on.ca , you can determine when the leave to appeal period ends.

The above noted activity is approved under s.20.3 of Part II.1 of the Environmental Protection Act.

DATED AT TORONTO this 25th day of November, 2015

Rudolf Wan, P.Eng.
Director
appointed for the purposes of Part II.1 of the
Environmental Protection Act

SA/
c: District Manager, MOECC York-Durham
Xiaoxi (Winnie) Song, M. Sc., P.Eng., BCX Environmental Consulting

APPENDIX B

1.2 Facility Description

The Bowmanville plant is located on Waverley Road south Highway 401, at the south west corner of South Service Road and Waverley Road in Bowmanville, Ontario. The original wet process cement manufacturing facility, which was established in the early 1970s, was located at grade adjacent to an onsite limestone quarry. In the early 1990s the cement manufacturing process was changed from wet to dry. At this time the wet process kiln was decommissioned and replaced with a dry pre-calciner kiln system (a rotary kiln system which includes a multi-stage cyclonic pre-heatet tower including a pre-calciner unit to promote further calcination during preheating). Other equipment common to both the wet and dry process (i.e., cement finishing, product storage and load-out) remains in operation to date with minor upgrades.

The original limestone quarry, which now extends east along the north portion of the site, continues to supply crushed limestone to the cement plant. At the southern tip of St. Marys' property, a separate entity, Cargo Dockers, operates a raw material and fuel cargo dock, which supplies gypsum and solid fuel to the cement plant.

The St. Marys Technical Centre and Hutton Transport (the trucking division of St. Marys Cement) maintain offices and a truck depot at the north east corner of the site.

The cement plant operates 12 months per year typically on a 24 hours per day, 7 days per week schedule, with a maximum production capacity of 6,500 tonnes of clinker per day.

The fundamental process of cement manufacturing consists of combining materials bearing calcium oxide, silica, alumina and iron oxide at high temperatures to produce cement clinker. The clinker is subsequently ground with finishing materials such as gypsum, limestone, clay and slag to produce cement. A detailed description of the cement process equipment and operations, as well as supporting maintenance activities are presented in Section 2.0.

The zoning maps (Municipality of Clarington By-Law 84-63, Schedule 1 and Schedule 3) provided in Appendix B indicates that there are no residences or sensitive receptors within

1,000m of the major sources of noise (i.e., cement plant, main storage piles and quarry). Letters of incorporation for St Marys Cement Inc. (Canada) are included in Appendix C.

2.0 PROCESS DESCRIPTION

Operations at the St. Marys site can be separated into the following aspects:

- limestone extraction;
- construction grade limestone processing;
- cement manufacturing;
- maintenance;
- secondary docking operations;
- comfort heating and domestic hot water; and
- emergency diesel generators.

2.1 Limestone Extraction

Limestone is currently extracted from the quarry via blasting of one of four limestone benches. Blasting operations currently occur in the south and southeast section the quarry at the closest point that the quarrying activities can be to the property line. Up to 150 holes can be drilled along the blast face covering a maximum horizontal surface area of approximately 2,000 m^2 (i.e., 100,000 tonnes/blast). Blasting typically occurs between one to three times per week.

Two front-end loaders transfer the fragmented stone from the blast face onto four mining tractors. The fragmented stone is transported either to the cement plant's underground primary crusher which feeds the primary surge pile (two bank rock storage pile) for the cement plant or to the construction grade limestone stock pile.

2.2 Construction Grade Limestone Processing

The composition of limestone extracted from the quarry varies with depth and location. A portion of the extracted limestone is sorted, processed and transferred offsite by CBM Aggregates, a division of St. Marys Cement Inc.

CBM Aggregates operates one diesel-fuelled front-end loader and two crushers in the construction grade limestone processing area. This area is currently located west of the cement plant in close proximity to the facility's western property line. As a part of Bowmanville's dust management plan, this processing area is to be re-located into the quarry.

Construction grade limestone from the construction grade storage pile in the quarry will be transferred by CBM's front-end loader into CBM's primary crusher. From this point

material will be conveyed to CBM's secondary crusher and screen and to the product stockpiles by a series of conveyors. The limestone will be crushed into six types of material (i.e., HL6, 19mm clear run, 19mm crusher run, 50mm clear run, 50mm crusher run and screenings).

The construction grade limestone processing area will typically operate 12 hours per day, 7 days per week, with a maximum processing capacity of 300 tonnes/hour.

2.3 Cement Manufacturing Operations

A simplified process flow diagram is attached – see Figure 1.

The cement manufacturing process can be divided into five primary stages;

- raw materials and kiln fuel acquisition and handling (including quarry operations);
- raw meal (kiln feed) preparation;
- pyroprocessing (calcination and clinkerization);
- processing of clinker; and
- product load-out.

2.1.1 Raw Materials and Kiln Fuel Acquisition and Handling

For the purposes of identifying how the various raw materials are delivered, stored and handled, to raw material categories have been defined: "low moisture" and "high moisture." Materials that are categorized as "low moisture" typically include ashes, iron bearing materials and silicas, and are stored in silos or daily use stockpiles. Materials that are defined as "high moisture" typically include limestone, gypsum and clay,[2] and are stored in various stockpiles (which may include temporary, main and daily use stockpiles).

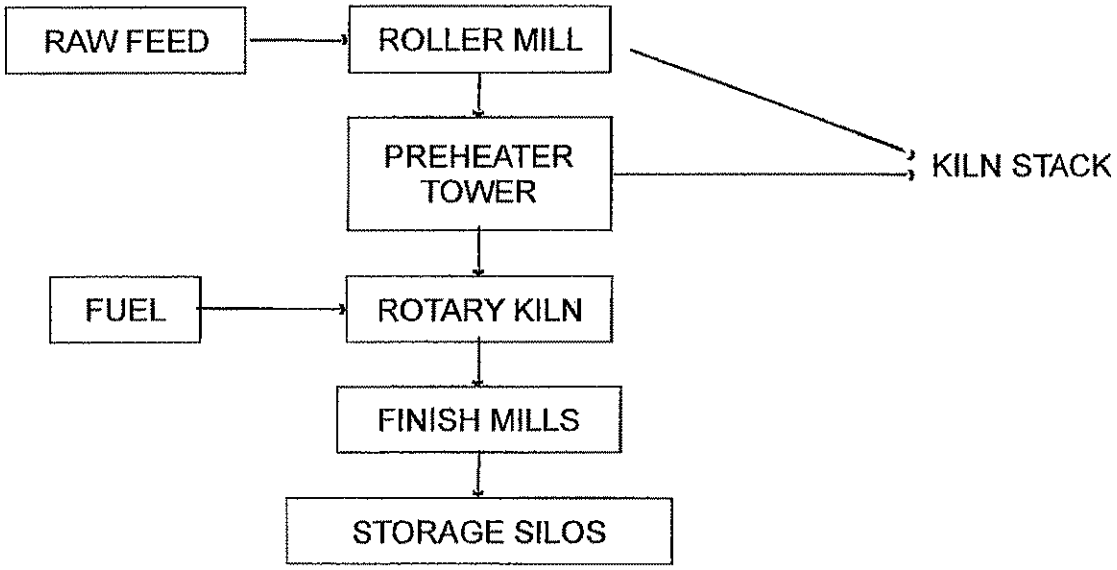
2.1.1.1 Acquisition and Handling of Raw Materials with Low Water Content

"Low moisture" raw materials (i.e., ash, iron and silica) can be stored in either silos or as daily-use stockpiles. Materials to be stored in silos are pneumatically transferred directly from the raw material delivery tankers into their corresponding storage silos. The storage silo capacities and locations are presented in Appendix D.

Materials to be stored in daily-use stockpiles are delivered in trucks and stored outside in small stockpiles. A diesel-fuelled front-end loader transfers these materials into a partially enclosed hopper. An elevator system transfers the material into storage silos (same ones as if the material were pneumatically delivered).

---

[2] The Bowmanville plant does not currently use clay as an alternative silica source. However, since the facility wishes to use clay material in the future this material has been included in the ESDM. Clay materials are approved for use at the Bowmanville plant's sister facility in St. Marys, Ontario.



PROCESS FLOW DIAGRAM - ENTIRE PLANT

St Mary's Cement Plant, Bowmanville, ON

ST. MARY'S CEMENT INC.

File No.: 2764-01.01

Date: April 2006

Dwg No.: 2764-01.01-fig1

Drawn by: M.W.

—

FIGURE 1

2.1.1.2 Acquisition and Handling of Raw Materials with High Moisture Content

Coarse limestone is delivered directly to the cement plant from the quarry, located on site, on a shrouded conveyor and deposited onto the two bank rock storage pile. An underground conveyor located below the stockpile transfers the coarse limestone to an enclosed secondary crusher and screen. Processed limestone is then fed by another enclosed conveyor to one of:

a) three raw meal limestone storage silos, located south of the cement plant; or

b) three additive limestone silos located near the finish mills.

The location of these silos and their capacity are presented in Appendix D.

Gypsum is delivered by ship and stored in piles located at the shoreline. Diesel-fuelled front-end loaders transfer the material onto one of four Volvo trucks, which then transport the gypsum to the main storage piles located south of the quarry. As required by the cement plant production, the gypsum is re-loaded onto one International truck which moves between the main stockpile and the cement plant. At the plant gypsum is deposited into the gypsum underground hopper through a partially enclosed surface grate (grizzly). The gypsum is transferred by an enclosed conveyor to the gypsum crusher, where it is reduced in size prior to being pneumatically transferred to the gypsum storage silo (as described in Appendix D).

Clay will be delivered by truck and stored in small stockpiles located south of the raw material silos. A front-end loader will transfer the clay into the same partially enclosed hopper and associated elevator system that services the "low moisture" content raw materials.

2.1.1.3 Acquisition and Handling of Kiln Fuel

The pre-calciner kiln system is fired with solid fuel (i.e., a mixture of coal and pet-coke).

Pet-coke and coal are delivered to the facility by ship and deposited into temporary stockpiles. Diesel-fuelled front-end loaders transfer the fuel onto one of four Volvo trucks, which then transport the fuel to the main storage piles located south of the quarry. As required by the cement plant production the fuel is re-loaded onto one International truck (same truck as for gypsum) which moves between the main stockpiles and the cement plant. At the plant fuel is deposited into the fuel underground hopper through a partially enclosed surface grate (grizzly).

Petroleum coke may also be delivered by rear-dump trucks, which transfer the material directly into the fuel underground hopper.

Fuel from the underground fuel hopper travels along an enclosed conveyor up into the fuel storage silo. The fuel is extracted from the silo and fed to the fuel milling system. Petroleum coke is proportionally mixed with coal (0–100%) in the fuel milling system. Milled fuel is temporarily stored in a bin prior to being fed to the kiln burner (at a maximum rate of 13 tonnes/hr) and calciner burner (at a maximum rate of 18 tonnes/hr).

2.1.1.4 Raw Meal (Kiln Feed) Preparation

In this stage of the process, limestone, silica and iron are proportionately fed from the raw material storage silos via an enclosed conveyor belt system to a raw mill. Raw meal formulations can contain up to 95% limestone, 0.5% silica, 2.7% iron. In the raw mill, the raw materials are mixed together, ground to a uniform particle size and dried. The raw mill uses the hot exhaust gases from the pre-heater tower to dry the raw meal. The dried raw meal is stored in Kiln Feed Silo, (see Appendix D).

Dried raw meal is fed, via air slides and bucket elevators, up to a dual string pre-heater tower. Each pre-heater string consists of a series of five cyclones. As the raw meal progressively passes through a pre-heater string and its cyclones, it encounters hotter and hotter gases from the kiln. Prior to being directed into the kiln, a portion of the pre-heated material is fed into a pre-calciner where the moisture content is effectively reduced to zero, and the material temperature is raised to 840 °C.

2.1.2 Pyroprocessing Stage

In the kiln, the raw meal temperature is gradually raised to over 1,500°C. The chemical reactions and physical processes transform the raw meal into clinker (grey, glass-hard, spherically shaped nodules).

With the exception of a bypass stream, flue gases from the kiln pass through the pre-heater strings and raw mill to the main baghouse and are exhausted to the atmosphere via the main kiln stack adjacent to the pre-heater tower.

In an effort to reduce nitrogen oxides (NOx) and sulphur oxides (SOx) emissions to comply with Regulation 194/05, a Selective Non-Catalytic NOx Reduction (SNCR) ammonia solution injection system and hydrated limestone injection system was installed after the bypass piping (in the lower calciner and upper riser) and before the pre-heater strings. While reducing NOx emissions, the SNCR system may release unreacted ammonia into the atmosphere.. Hydrated lime associated with the hydrated limestone injection system is captured in the main kiln baghouse.

The final stage of pyroprocessing is clinkerization. This stage involves cooling of the molten product into solid spheres (termed clinker) by passing ambient air across the clinker and into the kiln for use as combustion air. The Bowmanville plant uses a reciprocating grate cooler, which achieves a lower clinker discharge temperature by passing an additional quantity of air

through the clinker. This additional air passes through the Cooler Baghouse prior to being exhausted to the atmosphere through the cooler stack located south of the finish mills.

2.1.3 Processing of Clinker to Cement

The final step in the process involves a sequence of blending and grinding operations that transform clinker into finished cement.

Clinker exits the kiln at a maximum rate of 260 tonnes/hr and an average temperature of 350°C onto an enclosed conveyor system, which feeds one of four clinker storage silos.

Cooled clinker from the clinker storage silos is conveyed to the roller press where it is pre-ground. Pre-ground clinker is then transferred into of three cement finish mill feed silos.

Cement finishing is accomplished in three individual ball mill grinding systems located north of the kiln. Clinker, limestone and gypsum are milled together to produce cement. Finish mills #1 and #3 exhaust though a common stack. Finish mill #2 exhausts though a dedicated stack.

2.1.4 Product Load-Out

Following cement finishing, cement is ttansferred on an enclosed conveyor belt into product storage silos located north of the kiln and at the shoreline (as described in Appendix D). Product stored in silos located north of the kiln can be dispatched from the product silos in bulk, via tanker trucks or railroad tankers. Product stored in the silos at the dock are shipped by boat.

In addition to finished cement product, the plant also ships unfinished clinker to its sister plant in Detroit. The unfinished clinker uses the same enclosed conveyor system as the finished cement product.

2.4 Maintenance

There is one maintenance shop located east of the kiln and west of the quarry. The maintenance shop stores spare parts and equipment. The shop performs welding activities, which typically take place outside.

The automotive repair garage is located west of the primary crusher. This garage performs scheduled maintenance on the trucks (oil changes, tire changes, etc.). The shop can maintain only one vehicle at a time.

2.5 Secondary Docking Operations

Cargo Dockers maintains the main gypsum and fuel storage area located south of the plant, near the shoreline. The company owns five trucks (4 Volvo trucks and 1 International tuck) and three diesel-fuelled front-end loaders. The mobile equipment works simultaneously to transfer gypsum and fuel delivered by ship to the main stockpiles located south of the quarry. The International truck then transfers the gypsum and fuel to the plant.

In addition to handling materials for the cement plant, Cargo Dockers also maintains a separate storage area for raw materials (primarily coal, petcoke and salt) delivered by ship for a number of other companies. These stockpiles are covered by tarps except for the coal storage piles.

2.6 Comfort Heating and Domestic Hot Water

All comfort heat, with the exception of the quarry garage, is provided by electrical units. At the quarry garage comfort heat is provided by propane-fired radiant heaters with a total capacity of 0.1 scf/hr.

Domestic hot water in the lunchroom, service room and Hutton Transport are provided by No. 2 oil-fired boilers having a total capacity of 34.65 U.S. gal/hr.

Equipment specifications are presented in Appendix E.

2.7 Emergency Diesel Generators

There are three emergency diesel-fired generators. One CAT, Model D355 Series E, 450 HP, diesel-fired generator is located east of the kiln in a separate building. The generator is used to provide electricity to the facility during main power failures.

One John Deere, Model CD 6359D705575, 200 HP, diesel-fired generator located south of the plant in the pump house. This generator is used to provide electricity to the equipment located near the shoreline during main power failures.

Finally, one CAT, Model 81Z09016, 749 HP, diesel-fired generator is located west of the kiln in a separate building. The generator provides electricity to rotate the kiln during main power failures.

Monthly tests and maintenance are performed.

2.8 QA/QC Fume Hoods

The facility operates eight quality assurance/quality control (QA/QC) fume hoods located in the QA/QC laboratory in the main building east of the kiln. The fume hoods exhaust

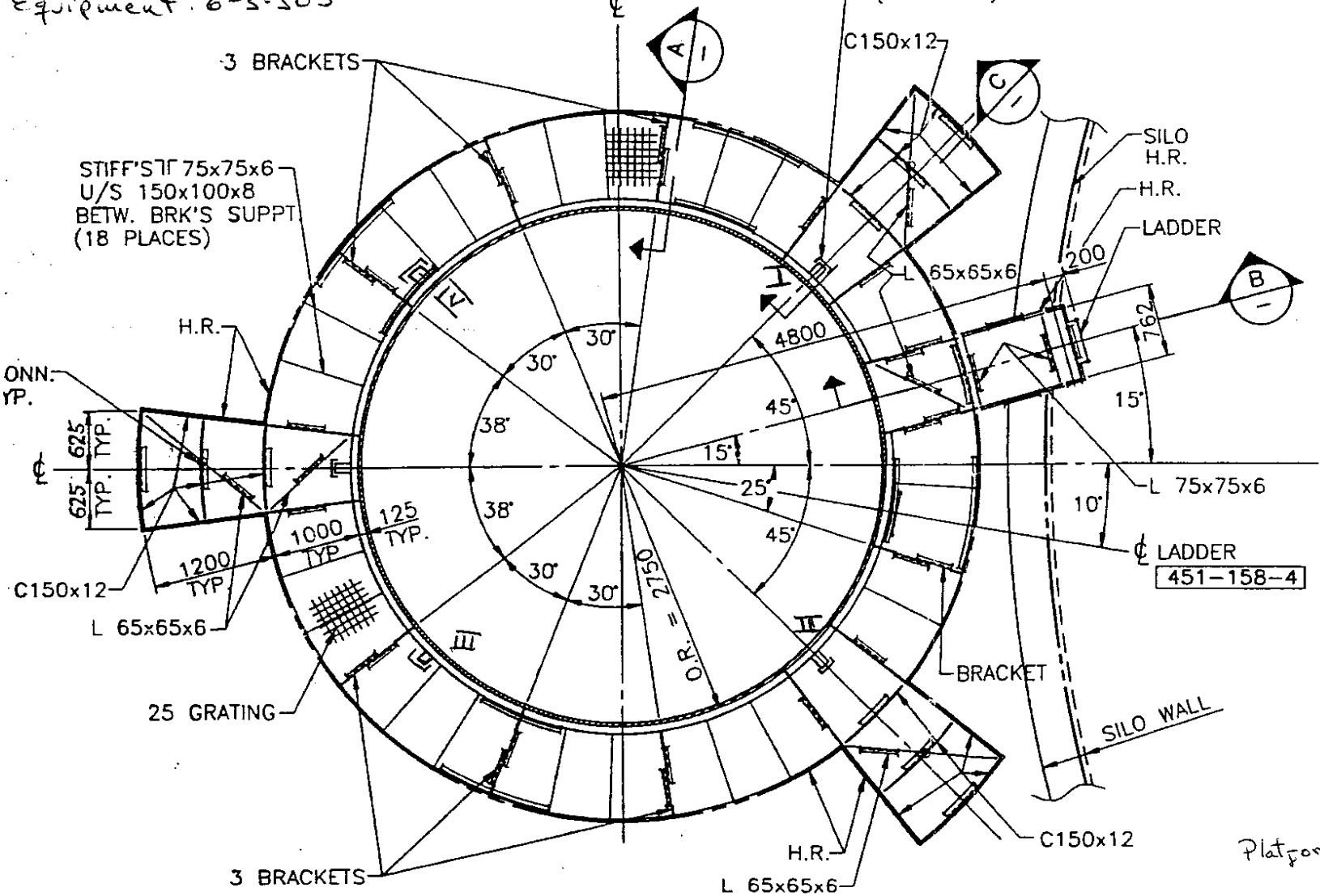
through one exhaust stack located on the roof of the building. Five tests are typically performed:

1. Material Composition – these tests involve collecting samples of clinker, flyash, slag, limestone and sand, and then leaching metals and sulphur with a suitable acid (either nitric, hydrochloric, hydrofluoric, boric, sulphuric or acetic acid) to ensure proper chemical composition of the end product. Chemicals used in material composition tests are stored in closed containers in storage cabinets that also vent through the fume hood stacks.
2. Crushing – A small crusher (up to 1kg capacity) is used under a fume hood to create crushed material for further testing.
3. Sieve Analysis – these tests are performed on sand, flyash and slag. The materials placed in the sieves. Ambient air is drawn down through the sieves, filtered and then vented through the fume hood exhaust.
4. Fusion – Cement fusion tests are conducted to evaluate the bond strength of the cured cement. The test uses a small propane heater and small quantities of flux and cement; and
5. Moisture – Small electric drying ovens are used for moisture testing.

Drawing
6-3-2168
1707158
Equipment: 6-3-365

Old Sample Ports
(3) – 4" DIA. THREADED PIPE NIPPLES c/w PIPE CAP (3 PLACES) @ ℄ EL.169.190
(3) – 2" EYBOLTS WELDED TO SHELL @ ℄ EL.170.700 (3 PLACES)

New Sample Ports
(4) 6" DIA Threaded Pipe
located at 90°
EL. 169.5
Locations: I, II, III, IV



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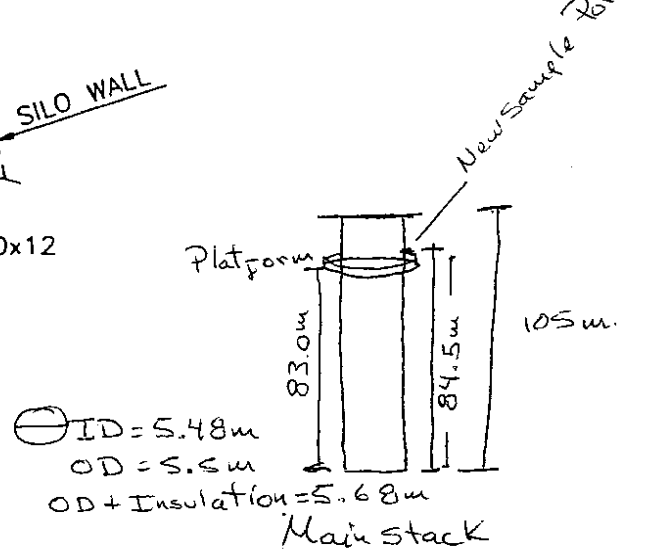
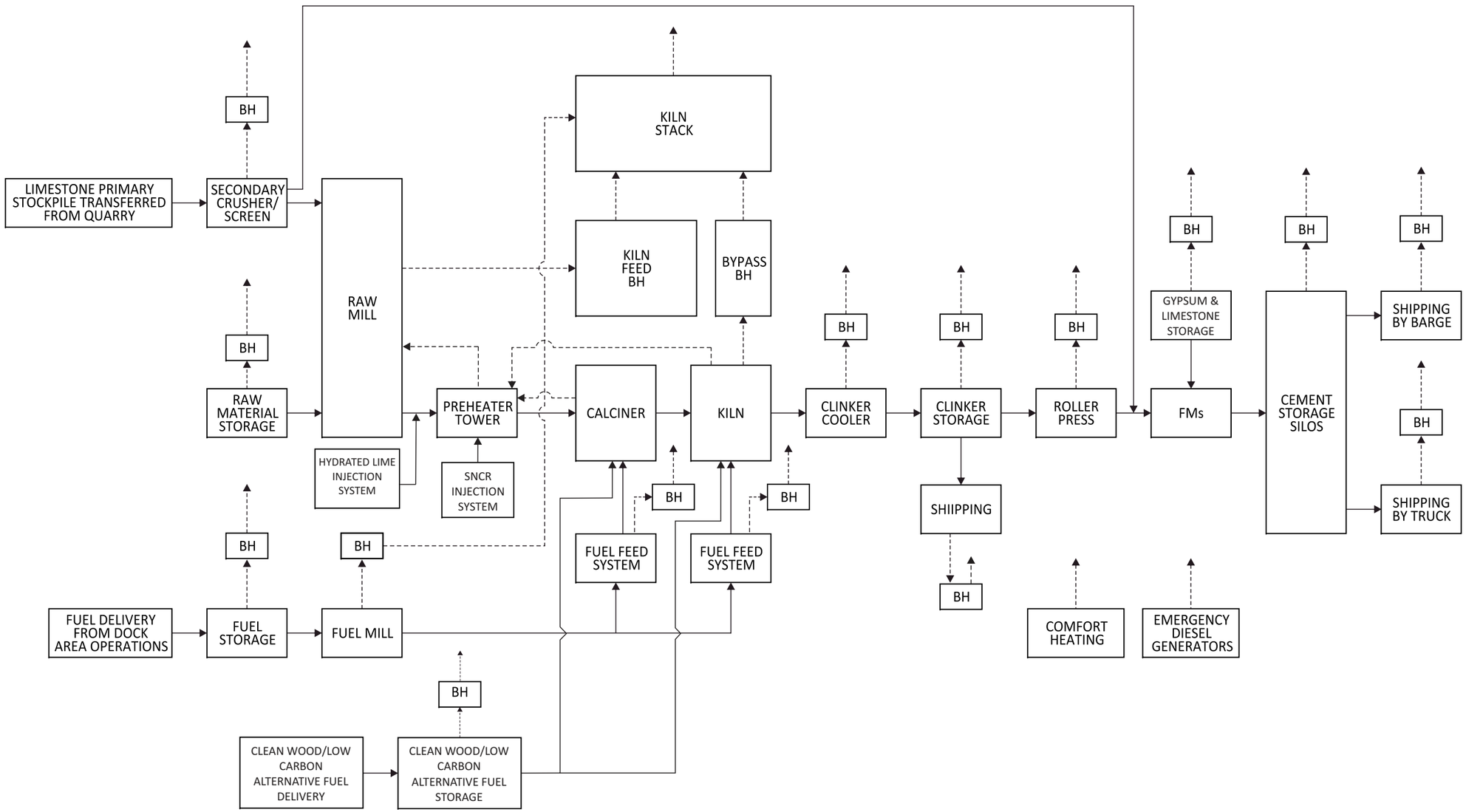
PLAN @ EL.168.023 T/GRT'G

SCALE 1:50





NOTES:

BH Baghouse

FM Finish Mill

Material

Emissions
- Kiln Stack: PM, metals, organics, NOx, SO_2, CO, chlorides, ammonia, etc.
- Other sources: PMs and metals,
- Comfort Heating: PM, NOx, SO_2, CO,
- Emergency Diesel Generator: NOx

PROCESS FLOW DIAGRAM FOR BOWMANVILLE CEMENT PLANT

Bowmanville Cement Plant
400 Waverley Road, Bowmanville, ON

BCX

ENVIRONMENTAL COMPLIANCE APPROVAL (Air & Noise)

File No.: 1003-01.39
Date: August 2017
Dwg.: 1003-01.39_1B
Drawn By: AD

FIGURE **1B**

Appendix N

Stack testing and ambient testing program (demonstration)

PRE-TEST PLAN

ST MARYS CEMENT INC. (CANADA)

BOWMANVILLE, ONTARIO

PRE-TEST PLAN
COMPLIANCE SOURCE TESTING ECA # 4614-826K9W
RWDI #1702401
August 30, 2018

SUBMITTED TO
Ministry of the Environment, Conservation and Parks
Technology Standards Section
6th Floor
40 St. Clair Ave. W.
Toronto, ON M4V1M2
source.testing@ontario.ca

CC TO
St. Marys Cement Inc.
Luis Urbina
Environmental Manager
luis.urbina@vcimentos.com

SUBMITTED BY
Kirk Easto
Senior Project Manager / Principal
kirk.easto@rwdi.com

RWDI
600 Southgate Drive,
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F: 519.823.1316

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APPENDICES

1 INTRODUCTION

1.1 Summary of Test Program

RWDI AIR Inc. (RWDI) has been retained by St. Marys Cement Inc. (Canada), (St Marys) to conduct emission sampling on the kiln exhaust at their facility in Bowmanville, Ontario. The testing is required under the Environmental Compliance Approval (ECA) #4614-826K9W. The ECA is provided in Appendix A. Also required as part of the demonstration ECA is an Ambient Monitoring Program, which has also been included in this pre-test plan.

The ECA permit requires the following:

1. Stack Testing under Baseline Conditions;
1. Stack Testing with Approved substitution rate of Alternative Fuels; and
2. Ambient Air Quality Monitoring Program.

This stack testing study will consist of the following parameters, as listed in the Schedule B2 of the ECA. The testing will consist of three tests for each parameter:

- Total particulate matter (TPM)
- PM_{10}, and $PM_{2.5}$ (filterable)
- Metals (as listed in ECA)
- Semi-Volatile Organic Compounds (SVOC's) (listed as Polycyclic Organic Matter in ECA)
- Dioxins, Furans and Dioxin-like PCB's (as listed in ECA)
- Chlorinated Organics (as listed in ECA)
- Hydrogen chloride (HCl)
- Ammonia (NH_3)
- Volatile Organic Matter (VOC's as listed in the ECA)
- Oxygen (O_2)
- Carbon dioxide (CO_2)
- Carbon Monoxide (CO)

Total calcium and total iron measured in the Method 29 train will be used to calculate calcium oxide and ferric oxide, with adjusted for Molecular weight. Nitrogen Oxides and Sulphur Dioxide will be monitored by the facilities Continuous Emission Monitor (CEM) system. The facility completes an annual Relative Accuracy Test Audit, a copy of the most recent RATA report will be included in the final stack testing report.

This ambient air quality program will consist of the following parameters, as listed in the Schedule B1 of the ECA.

- Metals (as listed in ECA)
- Semi-Volatile Organic Compounds (SVOC's) (listed as Polycyclic Organic Matter in ECA)
- Dioxins and Furans (as listed in ECA)
- Volatile Organic Matter (VOC's as listed in the ECA)

1.2 Schedule

The testing is currently scheduled to take place during a two-week period starting September 30th to October 14th, 2018. Fifteen days' notice will be provided to the Ministry of the Environment, Conservation and Parks (MECP) via e-mail.

Testing will be conducted under the following schedule:

Baseline Condition

Test Day 1(Sept 30)
- Test 1 for TPM / Metals Train
- Test 1 for $PM_{10}/PM_{2.5}$
- Test 1 for (Dioxins/Furans and SVOC's)
    - Tests 1 for VOC's, HCl and Ammonia
    - O_2, CO, CO_2 continuous during above testing

Test Day 2 (Oct 1)
- Test 2 for TPM / Metals Train
- Test 2 for $PM_{10}/PM_{2.5}$
- Test 2 for (Dioxins/Furans and SVOC's)
    - Tests 2 for VOC's, HCl and Ammonia
    - O_2, CO, CO_2 continuous during above testing

Test Day 3(Oct 2)
- Test 3 for TPM / Metals Train
- Test 3 for $PM_{10}/PM_{2.5}$
- Test 3 for (Dioxins/Furans and SVOC's)
    - Tests 3 for VOC's, HCl and Ammonia
    - O_2, CO, CO_2 continuous during above testing

Firing Alternative Fuels Condition

Test Day 4(Oct 3)
- Test 1 for TPM / Metals Train
- Test 1 for $PM_{10}/PM_{2.5}$
- Test 1 for (Dioxins/Furans and SVOC's)
    - Tests 1 for VOC's, HCl and Ammonia
    - O_2, CO, CO_2 continuous during above testing

Test Day 2(Oct 4) -
Test 2 for TPM / Metals Train
- Test 2 for $PM_{10}/PM_{2.5}$
- Test 2 for (Dioxins/Furans and SVOC's)
    - Tests 2 for VOC's, HCl and Ammonia
    - O_2, CO, CO_2 continuous during above testing

Test Day 3(Oct 5) -
Test 3 for TPM / Metals Train
- Test 3 for $PM_{10}/PM_{2.5}$/CPM train
- Test 3 for (Dioxins/Furans and SVOC's)
- Tests 3 for VOC's, HCl and Ammonia
- O_2, CO, CO_2 continuous during above testing

1.3 Test Program Organization

Details with respect to the key individuals involved with the stack sampling survey are provided below.

Company Name:	St. Marys Cement Inc. (Canada)
Company Address:	55 Industrial Street
	Toronto, Ontario
Plant Location:	400 Waverly Road
	Bowmanville, Ontario
Plant Coordinator:	Luis Urbina
Telephone Number:	905 623 3341 Ext 248
E-mail:	luis.urbina@vcimentos.com
MECP District Office:	York-Durham
Sampling Company:	RWDI AIR Inc.
Project Manager:	Kirk Easto
Telephone Number:	519-823-1311 x2482
Cellular Number:	705-772-5944
Fax Number:	519-823-1316
Email:	kirk.easto@rwdi.com
Laboratory:	Maxxam Analytics
Project Manager:	Clayton Johnson
Telephone Number:	905-817-5769

2 SOURCE DESCRIPTION

2.1 Plant Location

The Bowmanville facility is located along Lake Ontario, south of Highway 401 at Waverly Road.

2.2 Facility Description

The fundamental process of cement manufacturing consists of combining materials bearing calcium oxide, silica, alumina and iron oxide at high temperatures to produce cement clinker. The clinker is subsequently ground with finishing materials such as gypsum, limestone, clay and slag to produce cement.

The cement plant operates 12 months per year typically on 24 hours per day, 7 days per week schedule, with a maximum production capacity of 6,300 tonnes of clinker per day.

The proposed fuel supply during the demonstration project would be a blend of permitted fuel materials. This blend would consist: of "Alternative Fuel" as defined in ECA 4614-826K9W being 5.5 tonnes/hour of post-composting plastic polymers and woody residuals as well as 6.5 tonnes/hour of plastic polymers, paper fibres and

woody residuals derived from industrial and/or post consumer sources; as well as up to 4 tonnes/hour of "Low Carbon Alternative Fuels" as defined in ECA 0469-9YUNSK. These materials would be received, shredded and blended off-site at a permitted facility, prior to delivery to the demonstration Facility.

A more detailed process description and process flow diagram for the Bowmanville Plant are included in Appendix B.

3 TEST PROGRAM

3.1 Sample Location

The sampling location on the kiln stack is located 84.5 metres above grade equipped with a proper sampling platform and four 90° offset sample ports. This sampling location is considered 'ideal' as per the Ontario Source Test Code Method 1 since the nearest flow disturbances were greater than eight (8) duct diameters downstream and two (2) duct diameters upstream. A diagram of the stack is provided in Appendix B. The stack height is 105 m, the diameter at the testing location is 5.48 m and the outside diameter is 5.68 m, including the layer of insulation.

3.2 Testing Methodology

The following table summarizes the test methodologies that will be followed during this program.

Table 1: Summary of Test Methodology

Parameter	Proposed Reference Test Method
Flow Rate, Temperature, Moisture	OSTC [1] Methods ON-1 to ON-4
Total Particulate Matter	OSTC [1] Method ON-5
Metals (including Hg)	US EPA [2] Method 29
PM_{10}, and $PM_{2.5}$	US EPA [2] Method 201A
SVOC's	Environment Canada RM/2
Dioxins and Furans	Environment Canada RM/2
Chlorinated Organics	Environment Canada RM/2
Oxygen and Carbon Dioxide	US EPA [2] Method 3A
Carbon Monoxide	US EPA Method 10
Volatile Organic Matter	US EPA SW 846 0030 VOST
Hydrogen Chloride and Ammonia	US EPA [2] Method 26 (non-isokinetic)

Notes: [1] OSTC = Ontario Source Testing Code, version 3
[2] USEPA = United States Environmental Protection Agency

3.3 Description of Testing Methodology

The following section provides brief descriptions of the proposed sampling methods and discusses any proposed modifications to the reference test methods.

Stack Velocity, Temperature, and Volumetric Flow Rate Determination

The exhaust velocities and flow rates will be determined following the Ontario Source Testing Code version 3 (OSTC) Method ON-2, "Determination of Stack Gas Velocity and Volumetric Flow Rate". Velocity measurements will be taken with a pre-calibrated Stausscheibe type (S-Type) pitot tube and incline manometer. Volumetric flow rates will be determined following the equal area method as outlined in OSTC Method ON-2. Temperature measurements will be made simultaneously with the velocity measurements and will be conducted using a chromel-alumel type "k" thermocouple in conjunction with a digital temperature indicator.

The dry molecular weight of the stack gas will be determined following calculations outlined in OSTC Method ON-3, "Determination of Molecular Weight of Dry Stack Gas". Stack moisture content will be determined through direct condensation and according to OSTC Method ON-4, "Determination of Moisture Content of Stack Gas".

Sampling for Total Particulate Matter and Metals

Sampling for TPM and metals on the kiln will be performed in accordance with OSTC Method 5, "Sampling of Total Particulate Matter from Stationary Sources" and U.S. EPA Method 29 "Determination of Metals Emissions from Stationary Sources", respectively. Sampling will be conducted using an Environmental Supply C-5000 Source Sampling System. Both TPM and metals will be sampled concurrently using the same sampling train. Triplicate sampling runs will be conducted. Calcium Oxide will be analyzed as calcium and Iron oxide will be analyzed as iron.

The sample will be drawn through a glass lined sample probe and quartz fibre filter, which will be maintained at a temperature of 120 ± 14°C (248 ± 25°F). The sample will then be introduced into the impinger train. The impinger train will include two 5% HNO_3/10% H_2O_2 absorbing solution impingers, one empty impinger, two impingers containing $KMnO_4$ solution and one impinger containing silica gel.

Upon completion of the test, the sampling train will be recovered, as in the procedures detailed in the reference method, and the samples will be packaged for transport to Maxxam Analytical Services in Burlington, Ontario for analysis.

> Testing will be conducted over 32 points, 7.5 minutes per point and 2.5 minutes reading per point. The total test time will be 240 minutes with approximate sample volumes of 180 cubic feet.

SAMPLING FOR PM_{10} AND $PM_{2.5}$

Sampling of PM_{10} and $PM_{2.5}$ will be performed in accordance with U.S EPA Method 201A. Sampling will be conducted using an Environmental Supply C-5000 Source Sampling System, and in-stack sizing cyclones. A gas sample will be extracted at a constant flow rate through an in-stack cyclone. The sizing cyclone separates particles with nominal aerodynamic diameters of 10 micrometers and 2.5 micrometers. The particulate mass is determined gravimetrically.

Sample duration for the PM_{10} and $PM_{2.5}$ tests will be 2 hours, collected over 24 points

Sampling for Semi-Volatile Organic Compounds and Dioxin and Furan Isomers

Sampling for SVOC's and dioxin and furan isomers, dioxin like PCB's and Chlorinated Organics will be done in accordance with Environment Canada RM/2. Both compound categories and will be determined concurrently using the same sampling train. Triplicate sampling runs will be conducted.

The sample will be drawn through a glass lined sample probe and proofed glass fibre filter. Both of these will be maintained at a temperature of 120 ± 14°C (248 ± 25°F). The sample will then pass through a water cooled condenser and an XAD-2 absorbent module. The temperature of the XAD-2 module will be kept below 20°C. The stack gas sample will then be introduced into the impinger train. The impinger train will be configured as specified in the reference method. As indicated in the method, the water impingers will not be recovered for analysis.

Upon completion of the test, the samples will be kept cool and delivered to Maxxam Analytical Services in Burlington, Ontario. The filter, XAD-2 module and all rinses will be analysed for the target compounds using high resolution mass spectrometry.

Testing will be conducted over 32 points, 7.5 minutes per point and 2.5 minutes reading per point. The total test time will be 240 minutes with approximate sample volumes of 180 cubic feet.

Sampling for Hydrogen Chloride and Ammonia

Sampling for hydrogen chloride and ammonia will be completed following U.S. EPA Method 26 "Determination of Hydrogen Halide and Halogen Emissions from Stationary Sources - Non-Isokinetic Method". The sampling will be conducted using a midget impinger sampling train. The sample will be drawn through a Teflon lined probe, glass fibre filter and three-way stopcock which will be maintained at a temperature of 120 ± 14°C (248 ± 25°F). The sample will then enter the impinger train which consists of three impingers. The impingers in order include, two (2) acidic impingers, and a final silica impinger to dry the sample.

Upon completion of the testing, samples will be kept cool and submitted to Maxxam Analytical Services in Burlington, Ontario for analysis for hydrogen chloride and ammonia.

Testing will be conducted as a single located near the centre of the stack and collected over one (1) hour.

SAMPLING FOR VOLATILE ORGANIC COMPOUNDS

Sampling for volatile organic compounds (VOC) will be conducted using a volatile organic sampling train (VOST) following U.S. EPA SW846 Method 0030. Sample gas will be collected on a pair of adsorbent tubes, the first containing Tenex, and the second, a combination of Tenex/charcoal. Since it is expected that no visible condensate will buildup in the knock out flask located after the first tube, it will not be recovered for analysis. As done in the past sampling projects at St. Marys, one pair of tubes will make up one test, and three tests will be performed. Samples will be submitted to Maxxam Analytical Services for analysis.

Each set of tubes will be sampled over a 60-minute period at 0.25 L/min. To ensure that no breakthrough has occurred through the VOST tubes, one test will involve analysing the tubes separately.

Continuous Emissions Monitoring for O_2, CO and CO_2

Testing for O_2, CO and CO_2 will be accomplished using continuous emission monitors (CEMs). The exhaust gas sample will be withdrawn from a single point at the centre of the stack using a stainless steel probe. The sample will then proceed to a heated filter, where particulate matter is removed, and then transferred via a heated Teflon line to a sample conditioner. The Teflon line will be heated to 120°C (250°F) to prevent any condensation. The sample conditioner will remove any moisture in the exhaust. The sample will then be routed through a manifold system and introduced to the individual CEM's for measurement.

Prior to testing, sample system bias checks and instrument linearity checks (calibration error) will be conducted. In addition, the analysers will be calibrated (zeroed and span checked) at the completion of each run. Data acquisition will be provided using a National Instruments data logger system programmed to collect and record data at 1-second intervals. Average 1-minute concentrations will be calculated from the 1-second measurements.

3.4 Ambient Monitoring Methodology

The ambient air quality monitoring program is required under section 7 of the ECA. Three locations will be chosen based on historical meteorological data and air dispersion modelling of the kiln stack. The three locations will ensure both upwind and downwind concentrations from the site on each day of testing. The ambient program will provide 24-hour measurements for the parameters listed in Schedule B1, during both the base line and alternative fuels stack testing days.

The three locations are present in Appendix C. Ambient station #3 represents the most frequent location of the maximum POI in the predominant wind direction, based on dispersion modelling. The other two locations offer an upwind sample (station #1) and an alternative downwind location (station #2).

The three sites have been visited and reviewed to ensure that there no physical obstruction for the samplers, or any possible contaminating sources near the samplers that could influence the results of the program. During the sampling program, wind directions and speeds will be monitored by the already existing meteorological station located at the facility.

Ambient Sampling for Metals

Sampling for the metals listed in schedule B1 of the ECA will be completed following U.S. EPA Method IO2. The metals analyzed will follow procedures listed in IO3 and IO5. The sample will be collected using a High Volume sampler (Hi-Vol). Each Hi-Vol is equipped with a flow controller, which ensures a flow rate of 40 cubic feet per minute (CFM) and a timer for starting and stopping each sample. Each Hi-Vol is calibrated before the program ensure accuracy and validity of its data.

Calcium oxide will be analyzed as total calcium and iron oxide will be analyzed as total iron.

Mercury in gaseous form, will be collected separately from above. Collection media will be the same as listed in NIOSH Method 6009. Two tubes will be connected in series and analyzed separately to ensure no breakthrough has occurred. A small filter will be placed in front of the tubes to remove any particulate based mercury. The

tubes will be placed at a height of 1.2m with air collected at a rate of 1.0 litre per minute. The sample rate will be controlled with a rotameter and sample volume measured with a calibrated dry gas meter. After completion of the sample the tubes will be recovered and kept cool prior to analysis.

Each location will be on a 24-hour sampling schedule, ensuring the media switch is not conducted while the stack testing is occurring.

Ambient Sampling PAH's and Dioxins and Furans

Sampling for PAH's and Dioxins, Furans listed in Schedule B1 will be conducted using General Metal Works PS-1 samplers which are listed as reference devices for U.S. EPA Methods TO-9 and TO-13. The samplers use a collection filter that is 'backed-up' by a polyurethane foam (PUF) plug. The airborne compounds present in the particulate phase are collected on the filter. Any compounds present in the vapour phase are absorbed in the PUF plug. Each PUF sampler is equipped with a flow controller, which can sustain 8 cubic feet per minute (CFM) of flow over the sampling period, and a timer for starting and stopping each sample. Each PUF sampler is calibrated before the program to ensure accuracy and validity of its data.

Each location will be on a 24-hour sampling schedule, ensuring the media switch is not conducted while the stack testing is occurring.

Ambient Sampling for VOC's

Sampling for the VOC's listed in Schedule B1 will be collected in specially prepared canisters as specified in EPA Compendium Method TO-14/15. Flow controllers are used to maintain a constant flow rate over the sampling period of 24 hours. The flow controllers are equipped with stainless steel sintered filters and stainless steel pressure gauges to ensure that the canisters remain under slightly negative pressure at the completion of each testing period. These controllers also are equipped with automated air sampling timers that can be set to allow the valve in the flow controller to open and close over a given time period. These flow controllers are checked with a flow calibrator before the start of the program to ensure a suitable flow rate for the sampling period.

Each location will be on a 24-hour sampling schedule, ensuring the media switch is not conducted while the stack testing is occurring.

3.5 Process Data

Operating conditions during the sampling will be monitored by St. Marys personnel. All equipment will be operated under normal (desired) conditions.

At the time of the sampling program, St. Marys will be operating as close to maximum production as possible. The normal production rate for the facility is 5,700 tonnes/day of clinker. Due to the nature of the process, St. Marys will try and keep the process as stable as possible over the testing program as operating at a constant rate is the ideal process scenario for St. Marys. Continuously making changes to the process can affect the quality of St. Marys end products. St. Marys will monitor the Kiln Feed Uniformity Index throughout the program and will monitor parameters such as kiln RPM, kiln temperature and process variability. This information will be included in the final report. Other process conditions that will be monitored during the sampling program and will be included in an Appendix in the final report are:

- Oxygen;
- Opacity;
- Nitrogen Oxides;
- Sulphur Dioxide;
- Hourly combined raw feed;
- Hourly Alternative Fuels and Conventional Fuels firing rates in the kiln and calciner;
- Hourly clinker production;
- The concentration of the oxygen and Carbon Monoxide in the backend of the kiln and calciner down comer duct;
- Temperature of the gases leaving the kiln;
- Temperature of the gases leaving the calciner.

Radio contact will be kept between the process operators and the sampling team. A member of the RWDI sampling team will contact the operator before each test, to ensure that the process is at normal (desired) operating conditions.

4 INTERNAL QUALITY ASSURANCE/QUALITY CONTROL ACTIVITIES

4.1 Overview

Applicable quality assurance measures will be implemented during both the stack and ambient sampling programs to ensure the integrity of the results. These measures will include detailed documentation of field data, equipment calibrations for all measured parameters, completion of Chain of Custody forms when submitting laboratory samples, and submission of field blank samples to the laboratories.

Quality control procedures specific to the CEM monitoring will include linearity checks, to determine the instrument performance, and reproducibility checks prior to its use in the field. Regular performance checks on the analyser will also be carried out during the testing program by performing hourly zero checks and span calibration checks using primary gas standards. Sample system bias checks will also be conducted. These checks will be used to verify the ongoing precision of the monitor and sampling system over time. Pollutant-free (zero) air will be introduced to perform the zero checks, followed by a known calibration (span) gas into the monitor. The response of the monitor to pollutant-free air and the corresponding sensitivity to the span gas will be recorded regularly during the tests.

All samplers will be bench tested and calibrated in RWDI's Guelph office prior to field deployment and, in many cases, calibrated again in the field before use. For each sample collected with a Method 5 sampling train, both pre- and post- leak checks will be conducted by plugging the inlet and drawing a vacuum of 380 mm of water for at least one minute. Dry gas meter reading leakage rates greater than 4% of the average sampling rate or 0.00057 m^3/min (0.02 cfm), whichever is less, are unacceptable. Similar leak check procedures for the Pitot tube and pressure lines will be conducted. A number of blanks are included in the methods and will be submitted for analyses as well

Chain of custody forms will be completed and submitted along with the samples to the laboratory. All sampling media will be provided or prepared by the laboratory responsible for its subsequent analysis. All quality control and quality assurance measures will be recorded and will be included in the final report.

4.2 Sample Identification and Custody

The following person is responsible for sample handling and recording during this study:

Person Responsible:	Kirk Easto, RWDI AIR Inc.
Sample Identification:	Kirk Easto, RWDI AIR Inc.
Sample Log Sheet:	Kirk Easto, RWDI AIR Inc.

5 REPORTING REQUIREMENTS

5.1 Report Format – Stack Testing

The stack testing report will include, as a minimum, the following:

- an executive summary;
- date, time and duration of each test;
- records of operating conditions;
- average of emission concentrations, rates, and calculations;
- Records of operating conditions; including a summary of the results of the Raw Feed and Fuels Analysis and Monitoring Program as required by Condition 4 of the ECA (separate report);
- Records produced by the continuous monitoring systems during the demonstration project;
- Summary table showing measured stack concentrations and Operating Conditions compared to the applicable limits set out in Schedule A1 and A2;

Included in a separate report will be:

- Results of air dispersion calculations in accordance with regulation 419/05.
- Summary table comparing the measured results to the ESDM report and Performance limits;
- A comparison of the measured emission results collected during the baseline and alternative fuels firing conditions. The comparison will provide a description and possible explanation of any statistically significant changes in the measured values.

5.2 Report Format – Ambient Monitoring Program

The ambient monitoring report will include, as a minimum, the following:

- an executive summary;
- date, time and duration of each test;
- Records of operating conditions; including a summary of the results of the Raw Feed and Fuels Analysis and Monitoring Program as required by Condition 4 of the ECA (separate report);

- Information on the exact location of samplers, including the analysis to site them. A map will be provided showing the locations;
- A description of the specifications of the monitors used in the ambient monitoring program;
- A description of the specifications of the meteorological equipment used in the ambient monitoring program;

Included in a separate report will be:

- Results of ambient air monitoring program for the Test Contaminants listed in B1;
- Summary table comparing the measured results to the ESDM report and Performance limits;
- A comparison of the measured results collected during the baseline and alternative fuels firing conditions. The comparison will provide a description and possible explanation of any statistically significant changes in the measured values.

6 SAFETY

The following table outlines the additional safety requirements for this testing as identified by RWDI and St. Marys.

Head Protection	Required
Foot Protection	Required
Eye Protection	Required
Hearing Protection	Required
Safety Belt or Harness	Not Required
Respiratory Equipment	Not Required
Other Protective Clothing or Equipment	Not required
Safety Training Session	Required
Date of Session, if Required	First day of testing program
Sampling Location	Stack Platform
Temperature of Sampling Location	Ambient
Work Area	Ambient
Other Safety Requirements	n/a

7 PERSONNEL RESPONSIBILITIES AND TEST SCHEDULE

7.1 Test Site Organization

The following individuals are responsible for the key tasks during the survey.

Task	Individual
Project Management:	Mr. Kirk Easto, RWDI AIR Inc.
Test Preparation/Site Restoration:	Luis Urbina, St. Marys Cement Inc.
Modifications to Facility/Services:	Luis Urbina, St. Marys Cement Inc.
Sample Site Accessibility:	Luis Urbina, St. Marys Cement Inc.
Data Recovery:	Mr. Kirk Easto, RWDI AIR Inc.
Sample Schedule:	Mr. Kirk Easto, RWDI AIR Inc.

7.2 Test Preparations

Personnel at the St. Marys plant will ensure that the plant is operating at acceptable capacity during the source testing. St. Marys personnel will also ensure that RWDI field crew have access to shelter, sampling ports and electrical power.

APPENDIX C

Ontario

Ministry of the Environment
Ministère de l'Environnement

ENVIRONMENTAL COMPLIANCE APPROVAL
NUMBER 4614-826K9W
Issue Date: November 5, 2014

St. Marys Cement Inc. (Canada)
410 Waverly Rd R.R. 2
Bowmanville, Ontario
L1C 3K3

Site Location: 400 Waverly Road South
Clarington, Ontario

You have applied under section 20.2 of Part II.1 of the Environmental Protection Act, R.S.O. 1990, c. E. 19 (Environmental Protection Act) for approval of:

A time-limited Demonstration Project to gather site specific air quality data, where up to 30% of the conventional fuel, based on total energy input, is substituted with the following Alternative Fuels:

Alternative Fuel	Description	Maximum Input Rate (tonnes/hour)
Post-composting plastic polymers and woody residuals.	Shredded and dried plastic film and other plastic materials and woody materials removed from finished compost.	5.5
Plastic polymers, paper fibres and woody residuals derived from industrial and/or post consumer sources.	Shredded plastic and other materials removed from post consumer recycling or from industrial manufacturing process.	6.5

all in accordance with the application for an Approval (Air & Noise), signed by Martin Vroegh and all supporting information, including Emission Summary and Dispersion Modelling Report dated September 29, 2008, prepared by Pottinger Gaherty Environmental Consultants.

For the purpose of this environmental compliance approval, the following definitions apply:

1. "Approval" means this Environmental Compliance Approval, including the application and all supporting documentation;

2. "Alternative Fuel" means plastic polymers, paper fibres and woody residuals derived from industrial and/or post consumer sources, received as single streams, or blends of these material types, classified as Municipal Solid Waste under Ontario Regulation 347, written under the EPA, to be used as a substitute fuel source in the Cement Kiln;

3. "Ambient Air Quality Monitoring Program" means the ambient air quality monitoring program outlined in the report titled "Ambient Air Sampling Program", prepared for St. Marys Cement Inc, by Pottinger Gaherty Environmental Consultants Ltd., July 2008 and Addendum dated December *10, 2008, signed* by Bridget Mills;

4. "Baseline Conditions" means operating conditions where only Conventional Fuel is used in the Cement Kiln;

5. "CEM System" means the continuous monitoring and recording systems used to measure the emissions from the Cement Kiln, as described in the Company's application, this Approval and in the supporting documentation referred to herein, to the extent approved by this Approval;

6. "Company" means St. Marys Cement Inc. (Canada) that is responsible for the construction or operation of the Facility and includes any successors and assigns;

7. "Cement Kiln" means the Cement Kiln, the Calciner and associated control equipment and continuous emissions monitoring systems, firing Conventional Fuel and Alternative Fuel, described in the Company's application, this Approval and in the supporting documentation referred to herein, to the extent approved by this Approval;

8. "Conventional Fuel" means solid fuels such as, petroleum coke and coal;

9. "Demonstration Project" means the demonstration project where up to 30 % of Conventional Fuel is substituted with Alternative Fuel in the Cement Kiln, as described in the Company's application, this Approval and in the supporting documentation referred to herein, to the extent approved by this Approval;

10. "District Manager" means the District Manager of the appropriate local district office of the Ministry, where the Facility is geographically located;

11. "EPA" means the Environmental Protection Act, R.S.O. 1990, c.E.19, as amended;

12. "Equipment" means the equipment and operations associated with the Demonstration Project, located on the property where the Cement Kiln is located, as described in the Company's application, this Approval and in the supporting documentation referred to herein, to the extent approved by this Approval;

13. "Facility" means the entire operation located on the property where the Equipment is located;

14. "Manager" means the Manager, Technology Standards Section, Standards Development Branch, who has been appointed under Section 5 of the EPA for the purposes of Section 11(1)2 of O.Reg. 419, or any other person who represents and carries out the duties of the Manager, Technology Standards Section, Standards Development Branch, as those duties relate to the conditions of this Approval;

15. "Manual" means a document or a set of documents that provide written instructions to staff of the Company;

16. "Ministry" means the ministry of the government of Ontario responsible for the EPA and includes all officials, employees or other persons acting on its behalf;

17. "Point of Impingement" means any point in the natural environment. The point of impingement for the purposes of verifying compliance with the EPA with respect to the Demonstration Project, shall be chosen as the point located outside the Company's property boundaries at which the highest concentration is expected to occur, when that concentration is calculated in accordance with a method accepted by the Director;

18. "Pre-test Information" means the information outlined in Section 1.1 of the Source Testing Code;

19. "Source Testing" means sampling and testing to measure emissions resulting from operating the Cement Kiln at a level of typical maximum production within the approved operating range of the Cement Kiln which satisfies paragraph 1 of subsection 11(1) of O. Reg. 419;

20. "Source Testing Code" means the Source Testing Code, Version 2, Report No. ARB-66-80, dated November 1980, prepared by the Ministry, as amended;

21. "Test Contaminants" means those contaminants set out in Schedules "B1" and "B2" attached to this Approval;

22. "Publication NPC-205" means the Ministry Publication NPC-205, "Sound level Limits for Stationary Sources in Class 1 & 2 Areas (Urban)", October, 1995 as amended; and

23. "Publication NPC-232" means the Ministry Publication NPC-232, "Sound Level Limits for Stationary Sources in Class 3 Areas (Rural)", October, 1995 as amended.

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

TERMS AND CONDITIONS

OPERATION AND MAINTENANCE

1. (1) The Company shall ensure that the Facility is properly operated and maintained at all times while firing any amount of Alternative Fuel in the Cement Kiln during the Demonstration Project, so that operations of the Cement Kiln shall meet the operational limits set out in Schedule "A1". Alternative Fuel is to be stopped (following appropriate procedures) if one or more of Operational Limits is exceeded for more than one consecutive hour.

   (2) The Performance Objectives for emissions from the Cement Kiln Exhaust Stack are set out in Schedule "A2".

2. Unless otherwise approved in writing by the Director due to unforeseen delays in carrying out the Demonstration Project, the Company shall limit the combustion of Alternative Fuel in the Cement Kiln to the following:

   (1) Thirty (30) days for stack testing at the maximum fuel substitution (up to 30%);

   (2) Thirty (30) days for ramping up, stabilization, and ramping down.

3. The Company shall ensure that the Facility is properly operated and maintained at all times during the Demonstration Project. The Company shall:

   (1) prepare and update as necessary, prior to commencement of the Demonstration Project, a Design and Operations Manual specific to all aspects of the Facility, including the handling of Alternative Fuel and the use of Alternative Fuel in the Cement Kiln during the Demonstration Project, outlining the following:

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

      (c) emergency procedures;

      (d) procedures for any record keeping activities relating to the operations of the Facility;

      (e) all appropriate measures to minimize odour, noise and dust emissions from all potential sources from the Facility;

   (2) implement the recommendations of the Design and Operations Manual during the Demonstration Project.

4. The Company shall, at all times, ensure that the noise emissions from the Facility comply with the limits set out in Ministry Publication NPC-205 or Ministry Publication NPC-232, as applicable, during the Demonstration Project.

RAW FEED AND FUELS - ANALYSIS AND MONITORING

5. The Company shall prepare and implement, prior to the firing of Alternative Fuel in the Cement Kiln, a Raw Feed and Fuels Analysis and Monitoring Program to record the properties and quantities of the Raw Feed and Fuels used in the Cement Kiln during the Demonstration Project. The Raw Materials and Fuels Analysis and Monitoring Program shall specify as a minimum:

   (1) sampling methodology and frequency and chemical analysis of raw feed, Conventional Fuel and Alternative Fuel directed to the Cement Kiln;

   (2) hourly feed rate of the raw feed, Conventional Fuel and Alternative Fuel in the Cement Kiln during the Demonstration Project.

MONITORING

CONTINUOUS EMISSIONS MONITORING

6. The Company shall ensure that the existing Continuous Emissions Monitoring Systems, are fully operational during the Demonstration Project, to continuously monitor the following parameters in the exhaust gas stream of the Cement Kiln Exhaust Stack:

   (a) Nitrogen Oxides;
   (b) Sulphur Dioxide;
   (c) Opacity;

   The Continuous Emissions Monitoring Systems for Nitrogen Oxides and Sulphur Dioxide shall comply with the requirements of O. Reg. 194/05, EPA – "Industry Emissions – Nitrogen Oxides and Sulphur Dioxide" . The Continuous Emissions Monitoring System for Opacity shall comply with the requirements outlined in Schedule "D" attached to this Approval.

AMBIENT AIR QUALITY MONITORING

7. The Company shall conduct an Ambient Air Quality Monitoring Program during the Demonstration Project to determine the concentrations of the Test Contaminants listed in Schedule "B1", in accordance with the Ambient Air Quality Monitoring Program. Upwind and downwind sampling locations will be selected based on historical meteorological data and air dispersion modelling of the Cement Kiln stack. Ambient air sampling and monitoring will occur during both Baseline Conditions and with the use of Alternative Fuel in the Cement Kiln.

SOURCE TESTING

8. The Company shall conduct, a Source Testing Program, following the Source Testing Procedures listed in Schedule "C", during the Demonstration Project, to determine the rate of emission of the Test Contaminants listed in Schedule "B2" from the Cement Kiln Exhaust Stack. The Source Testing Program shall be designed to include both the Baseline Conditions and with the use of Alternative Fuel in the Cement Kiln.

REPORTING

9. The Company shall prepare and submit to the Director and District Manager, no later than six (6) months after the completion of the Demonstration Project, a Demonstration Project Summary Report. The Demonstration Project Summary Report shall include, as a minimum, but not limited to:

    (1) a summary of emission data and analysis obtained through the Source Testing Program, the Ambient Air Quality Monitoring Program and the Continuous Emissions Monitoring Program, conducted during the Demonstration Project, prepared in accordance with the requirements of the Reporting Procedures described in Schedule "C" attached to this Approval, as applicable;

    (2) a summary of all comments received by the Company during the Demonstration Project that pertain to the Demonstration Project from the public, the Ministry, or any other party.

10. The Company shall ensure that the above mentioned Demonstration Project Summary Report is made available and easily accessible for review by the public at the Facility and via an internet website, immediately after the document is submitted to the Ministry.

RECORD KEEPING REQUIREMENTS

11. The Company shall retain, for a minimum of five (5) years from the date of their creation and provide to the Ministry, upon request, in a timely manner, all reports, records and information required by this Approval and shall include but not be limited to:

    (1) time, date and duration of the Demonstration Project;

    (2) all records and reports produced from the Raw Feed and Fuels Analysis and Monitoring Program, the Source Testing Program, the Ambient Air Quality Monitoring Program and the Continuous Emissions Monitoring Program required under this Approval;

    (3) all records and reports produced as part of the assessments of emissions and impacts from the operation of the Cement Kiln, as a result of the utilization of Alternative Fuel for the Cement Kiln;

    (4) all records related to all environmental complaints made by the public during the Demonstration Project;

    (5) a copy of the Demonstration Project Summary Report required under Condition 8.

NOTIFICATION

12. The Company shall notify the District Manager, in writing, at least fifteen (15) business days prior to commencement of the Demonstration Project.

COMPLAINTS RESPONSE PROCEDURE

13. If at any time, the Company receives any environmental complaints from the public regarding the operation of the Facility during the Demonstration Project, the Company shall respond to these complaints according to the following procedure:

    (1) The District Manager shall be notified forthwith upon receipt of any complaint;

    (2) Each complaint shall be recorded and numbered, and shall include the following information, as a minimum:

        (a) nature of the complaint;
        (b) weather conditions and wind direction at the time of the complaint;
        (c) name and address of the complainant (if provided); and
        (d) time and date of the complaint;

    (3) Appropriate steps shall be taken forthwith to determine all possible causes of the complaint and to eliminate the cause of the complaint. A written reply shall be provided to the complainant, if known and if requested by the complainant, within 3 business days of receipt of the complaint by the Company.

SCHEDULE "A1"

OPERATIONAL LIMITS

Parameter	Limits	Comments
Quantity of Alternative Fuel	No more than 30% substitution (based on heating value).	Measured continuously.
Raw Material Feed Rate	>250 tonnes/hour	Measured continuously.
Temperature	>1000°C at a residence time of more than 6 seconds in the Kiln >850°C at a residence time of more than 3 seconds in the calciner	Measured by a continuous monitor Calculated as a rolling 1-hour arithmetic average measured by a continuous monitoring system that provides data at least once every 1 minute
Residual oxygen	>1% Residual oxygen at the backend of the kiln. >3% Residual oxygen at the calciner down comer duct.	Measured by a continuous monitor and calculated by volume on a dry basis in the undiluted gases leaving the Kiln. Calculated as a rolling 1-hour arithmetic average measured by a continuous monitoring system that provides data at least once every 1 minute
Pressure Control	Kiln must be operated under negative pressure at all times during the Demonstration Project.	Measured at the top of the preheater towers by continuous monitor.
Start-Up, Shut-down and Upset Operating conditions	No Alternative Fuel to be used.	-

SCHEDULE "A2"

PERFORMANCE OBJECTIVES

Parameter	Emission Limit	Comments
Particulate Matter (PM)	50 mg/Rm^3	calculated as the arithmetic average of three stack tests conducted in accordance with standard methods
Dioxins and Furans	80 pg/Rm^3 as ITEQ	calculated as the arithmetic average of three stack tests conducted in accordance with standard methods
Hydrochloric Acid (HCl)	27 mg/Rm^3	calculated as the arithmetic average of three stack tests conducted in accordance with standard methods
Cadmium	7 ug/Rm3	calculated as the arithmetic average of three stack tests conducted in accordance with standard methods
Lead	60 ug/Rm3	calculated as the arithmetic average of three stack tests conducted in accordance with standard methods
Mercury	20 ug/Rm3	calculated as the arithmetic average of three stack tests conducted in accordance with standard methods

Notes:

R - Reference flue gas conditions, defined as follows:
- Temperature 25 °C
- Pressure 101.3 kPa
- Oxygen content 11%
- Water content nil (dry conditions)

mg/Rm3 - milligrams per cubic metre of gas at Reference conditions.
ug/Rm3 - micrograms per cubic metre of gas at Reference conditions.
pg/Rm3 - picograms per cubic metre of gas at Reference conditions.
I-TEQ - a toxicity equivalent concentration calculated using the toxic equivalency factors (I-TEFs) derived for each dioxin and furan congener by comparing its toxicity to the toxicity of 2,3,7,8 tetrachloro dibenzo-p-dioxin, recommended by the North Atlantic Treaty Organizations's Committee on Challenges to Modern Society [NATO/CCMS] in 1989 and adopted by Canada in 1990.

SCHEDULE "B1"
TEST CONTAMINANTS
Ambient Air Quality Monitoring Program

Metals	Polycyclic Aromatic Hydrocarbons	Dioxins and Furans	Volatile Organic Compounds
Antimony (Sb)	1-Methyl naphthalene	2,3,7,8-Tetrachlorodibenzo-p-dioxin	acetone
Aluminum (Al)		1,2,3,7,8-Pentachlorodibenzo-p-dioxin	benzene
Arsenic (As)	1-Methyl phenanthrene	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	chloromethane
Barium (Ba)	2-Chloronaphthalene	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	bromomethane
Beryllium (Be)	2-Methylanthracene	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	chloroethane
Boron (B)	2-Methylnaphthalene	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	1,1- dichloroethylene (vinyl chloride)
Cadmium (Cd)	3-Methylcholanthrene	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin	methylene chloride
Chromium (Cr)	7,12-Dimethylbenzo(a)anthrace		1,1- dichloroethane
Cobalt (Co)	ne	2,3,7,8-Tetrachlorodibenzofuran	trans - 1,2 -dichloroethylene
Copper (Cu)	9,10-Dimethylanthracene	2,3,4,7,8-Pentachlorodibenzofuran	cis - 1,2 -dichloroethylene
Lead (Pb)	Acenaphthene	1,2,3,7,8-Pentachlorodibenzofuran	chloroform
Manganese (Mn)	Acenaphthylene	1,2,3,4,7,8-Hexachlorodibenzofuran	1,2 -dichloroethane
Mercury (Hg)	Anthracene	1,2,3,6,7,8-Hexachlorodibenzofuran	2- butanone
Molybdenum (Mo)	Benzo(a)anthracene	1,2,3,7,8,9-Hexachlorodibenzofuran	1,1,1 –trichloroethane
Nickel (Ni)	Benzo(b)fluoranthene	2,3,4,6,7,8-Hexachlorodibenzofuran	carbon tetrachloride
Phosphorus (P)	Benzo(k)fluoranthene	1,2,3,4,6,7,8-Heptachlorodibenzofuran	1,1,2- trichloroethane
Potassium (K)	Benzo(a)fluorene	1,2,3,4,7,8,9-Heptachlorodibenzofuran	1,2- dichloropropane
Selenium (Se)	Benzo(b)fluorene	1,2,3,4,6,7,8,9-Octachlorodibenzofuran	trichloroethylene
Silver (Ag)	Benzo(g,h,i)perylene		bromodichloromethane
Strontium (Sr)	Benzo(a)pyrene		dibromochloromethane
Thalium (Tl)	Benzo(e)pyrene		toluene
Tin (Sn)	Chrysene		tetrachloroethylene
Titanium (Ti)	Coronene		chlorobenzene
Vanadium (V)	Dibenzo(a,e)pyrene		ethylbenzene
Zinc (Z)	Dibenzo(a,h)anthracene		m/p xylene
Calcium Oxide (CaO)	Fluoranthene		o - xylene
Iron Oxide (FeO)	Fluorene		styrene
	Indeno(1,2,3-cd)pyrene		bromoform
	Naphthalene		1,1,1,2 -tetrachloroethane
	Perylene		1,1,2,2 -tetrachloroethane
	Phenanthrene		cumene (isopropyl benzene)
	Pyrene		1,2-dibromoethane (ethylene dibromide)
	Tetralin		
	Dibenzo(a,c)anthracene + Picene (sum of 2)		

SCHEDULE "B2"

TEST CONTAMINANTS

Source Testing Program

Nitrogen Oxides
Sulphur Dioxide
Carbon Monoxide
Carbon Dioxide
Total Suspended Particulate Matter
PM 10
PM 2.5
Hydrogen Chloride
Ammonia
Calcium Oxide
Ferric Oxide

Metals		Volatile Organic Matter
Cd	Cadmium	acetone
Be	Beryllium	benzene
Pb	Lead	bromodichloromethane
Mo	Molybdenum	bromoform
Cr	Chromium	bromomethane
Ni	Nickel	butanone, 2 -
V	Vanadium	carbon tetrachloride
Al	Aluminum	chlorobenzene
Ti	Titanium	chloroethane
Mg	Magnesium	chloroform
B	Boron	chloromethane
Ba	Barium	cumene (isopropyl benzene)
P	Phosphorus	dibromochloromethane
K	Potassium	dichloroethane, 1,1 -
Hg	Mercury	dichloroethane, 1,2 -
As	Arsenic	dichloroethene, trans - 1,2 -
Zn	Zinc	dichloroethene, 1,1 – (vinyl chloride)
Sb	Antimony	dichloroethylene, cis - 1,2 -
Mn	Manganese	dichloropropane, 1,2 -
Co	Cobalt	ethylbenzene
Se	Selenium	ethylene dibromide (1,2-dibromoethane)
Cu	Copper	methylene chloride
Ag	Silver	styrene
Sn	Tin	tetrachloroethane, 1,1,1,2 -
Sr	Strontium	tetrachloroethane, 1,1,2,2 -
Tl	Thalium	tetrachloroethene
		toluene
		trichloroethane, 1,1,1 –
		trichloroethane, 1,1,2 -
		trichloroethene (trichloroethylene, 1,1,2 -)
		xylenes

Dioxins, Furans and Dioxin-like PCBs

2,3,7,8-Tetrachlorodibenzo-p-dioxin [2,3,7,8-TCDD]
1,2,3,7,8-Pentachlorodibenzo-p-dioxin [1,2,3,7,8-PeCDD]
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin [1,2,3,4,7,8-HxCDD]
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin [1,2,3,6,7,8-HxCDD]
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin [1,2,3,7,8,9-HxCDD]
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin [1,2,3,4,6,7,8-HpCDD]
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin [1,2,3,4,6,7,8,9-OCDD]
2,3,7,8-Tetrachlorodibenzofuran [2,3,7,8-TCDF]
2,3,4,7,8-Pentachlorodibenzofuran [2,3,4,7,8-PeCDF]
1,2,3,7,8-Pentachlorodibenzofuran [1,2,3,7,8-PeCDF]
1,2,3,4,7,8-Hexachlorodibenzofuran [1,2,3,4,7,8-HxCDF]
1,2,3,6,7,8-Hexachlorodibenzofuran [1,2,3,6,7,8-HxCDF]
1,2,3,7,8,9-Hexachlorodibenzofuran [1,2,3,7,8,9-HxCDF]
2,3,4,6,7,8-Hexachlorodibenzofuran [2,3,4,6,7,8-HxCDF]
1,2,3,4,6,7,8-Heptachlorodibenzofuran [1,2,3,4,6,7,8-HpCDF]
1,2,3,4,7,8,9-Heptachlorodibenzofuran [1,2,3,4,7,8,9-HpCDF]
1,2,3,4,6,7,8,9-Octachlorodibenzofuran [1,2,3,4,6,7,8,9-OCDF]

3,3',4,4'-Tetrachlorobiphenyl [3,3',4,4'-tetraCB (PCB 77)]
3,4,4',5- Tetrachlorobiphenyl [3,4,4',5-tetraCB (PCB 81)]
3,3',4,4',5- Pentachlorobiphenyl (PCB 126) [3,3',4,4',5-pentaCB (PCB 126)]
3,3',4,4',5,5'- Hexachlorobiphenyl [3,3',4,4',5,5'-hexaCB (PCB 169)]
2,3,3',4,4'- Pentachlorobiphenyl [2,3,3',4,4'-pentaCB (PCB 105)]
2,3,4,4',5- Pentachlorobiphenyl [2,3,4,4',5-pentaCB (PCB 114)]
2,3',4,4',5- Pentachlorobiphenyl [2,3',4,4',5-pentaCB (PCB 118)]
2',3,4,4',5- Pentachlorobiphenyl [2',3,4,4',5-pentaCB (PCB 123)]
2,3,3',4,4',5- Hexachlorobiphenyl [2,3,3',4,4',5-hexaCB (PCB 156)]
2,3,3',4,4',5'- Hexachlorobiphenyl [2,3,3',4,4',5'-hexaCB (PCB 157)]
2,3',4,4',5,5'- Hexachlorobiphenyl [2,3',4,4',5,5'-hexaCB (PCB 167)]
2,3,3',4,4',5,5'- Heptachlorobiphenyl [2,3,3',4,4',5,5'-heptaCB (PCB 189)]

Polycyclic Organic Matter:
Acenaphthylene
Acenaphthene
Anthracene
Benzo(a)anthracene
Benzo(b)fluoranthene
Benzo(k)fluoranthene
Benzo(a)fluorene
Benzo(b)fluorene
Benzo(ghi)perylene
Benzo(a)pyrene
Benzo(e)pyrene
2-Chloronaphthalene
Chrysene
Coronene
Dibenzo(a,c)anthracene
9,10-Dimethylanthracene
7,12-Dimethylbenzo(a)anthracene

Fluoranthene
Fluorene
Indeno(1,2,3-cd)pyrene
2-Methylanthracene
3-Methylcholanthrene
1-Methylnaphthalene
2-Methylnaphthalene
1-Methylphenanthrene
9-Methylphenanthrene
Naphthalene
Perylene
Phenanthrene
Picene
Pyrene
Tetralin
Triphenylene

Chlorinated Organics

total dichlorobenzenes
total trichlorobenzenes (1,3,5-; 1,2,3-; 1,2,4-)
total tetrachlorobenzenes (1,2,4,5-; 1,2,3,5-)
pentachlorobenzene
hexachlorobenzene
total dichlorophenols (2,3-; 2,4-; and 2,6-)
total trichlorophenols (2,3,4-; 2,4,5-; 2,4,6-; 3,4,5-)
total tetrachlorophenols (2,3,4,6-;2,3,5,6)
total pentachlorophenols

SCHEDULE "C"

MONITORING AND REPORTING PROCEDURES

A. SOURCE TESTING PROCEDURES

1. The Company shall submit, to the Manager a test protocol including the Pre-Test Information required by the Source Testing Code, at least thirty (30) days prior to the scheduled dates of the Source Testing Program.

2. The Company shall finalize the test protocol in consultation with the Manager.

3. The Company shall not commence the Source Testing until the Manager has accepted the test protocol.

4. The Company shall notify the District Manager and the Manager in writing of the location, date and time of any impending Source Testing required by this Approval, at least fifteen (15) days prior to the Source Testing.

5. The Director may not accept the results of the Source Testing Program if:
   (1) the Source Testing Code or the requirements of the Manager were not followed; or
   (2) the Company did not notify the District Manager and the Manager of the Source Testing; or
   (3) the Company failed to provide a complete report on the Source Testing.

B. REPORTING PROCEDURES

SOURCE TESTING PROGRAM

1. The Company shall submit a report on the Source Testing Program to the District Manager and the Manager not later than six (6) months after completing the Source Testing Program. The report shall be in the format described in the Source Testing Code, and shall also include, but not be limited to:

   (1) an executive summary;
   (2) records of operating conditions; including a summary of the results of the Raw Feed and Fuels Analysis and Monitoring Program as required by Condition 4 of this Approval;
   (3) all records produced by the continuous monitoring systems during the Demonstration *Project;*
   (4) assessment of compliance with the Cement Kiln Exhaust Stack Operating Limits for the parameters listed in Schedule "A1" attached to this Approval;
   (5) the results of source testing and air dispersion calculations in accordance with regulation 419/05, indicating the maximum concentration of the Test Contaminants emitted from the Cement Kiln Stack at the Point of Impingement and an assessment of compliance with Regulation 419/05 Schedule 3 standards; and
   (6) a description and explanation of any statistically significant changes in emissions from the Cement Kiln Exhaust Stack and Point of Impingement Concentrations of the Test Contaminants, if any, resulting from the use of Alternative Fuel, relative to the Baseline Conditions.

AMBIENT AIR MONITORING PROGRAM

2. The Company shall submit a report on the results of the Ambient Air Quality Monitoring Program, to the District Manager not later than six (6) months after completing the Demonstration Project . The report shall include, but not be limited to:

(1) an executive summary;
(2) records of operating conditions; including a summary of the results of the Raw Feed and Fuels Analysis and Monitoring Program;
(3) sample dates, frequency and duration;
(4) information on the exact location of samplers, including the analysis to site them. A map must be included, clearly showing where each monitoring station is located.
(5) a description of the specifications of the monitors used in the Ambient Air Quality Monitoring Program;
(6) a description of the specifications of the meteorological stations used to monitor and record meteorological conditions and analysis of wind direction
(7) results of the Ambient Air Monitoring Program for the Test Contaminants listed in Schedule B1;
(8) a description and explanation of any statistically significant changes in ambient air concentrations of the Test Contaminants, if any, resulting from the use of Alternative Fuel, relative to the Baseline Conditions.

SCHEDULE "D"

Continuous Monitoring System Requirements

PARAMETER: **Opacity**

INSTALLATION:
The Continuous Opacity Monitor shall be installed at an accessible location where the measurements are representative of the actual opacity of the gases leaving the *Cement Kiln Exhaust Stack* and shall meet the following design and installation specifications:

PARAMETERS	SPECIFICATION
1. Wavelength at Peak Spectral Response (nanometres, nm):	500 - 600
2. Wavelength at Mean Spectral Response (nm):	500 - 600
3. Detector Angle of View:	≤ 5 degrees
4. Angle of Projection:	≤ 5 degrees
5. Range (percent of opacity):	0 -100

PERFORMANCE:
The Continuous Opacity Monitor shall meet the following minimum performance specifications for the following parameters.

PARAMETERS	SPECIFICATION
1. Span Value (percent opacity):	80 percent
2. Calibration Error:	≤ 3 percent opacity
3. Attenuator Calibration:	≤ 2 percent opacity
4. Response Time (95 percent response to a step change):	≤ 10 seconds
5. Schedule for Zero and Calibration Checks:	daily minimum
6. Procedure for Zero and Calibration Checks:	all system components checked
7. Zero Calibration Drift (24-hours):	≤ 2 percent opacity
8. Span Calibration Drift (24-hours):	≤ 2 percent opacity
9. Conditioning Test Period:	≥ 168 hours without corrective maintenance
10. Operational Test Period:	≥ 168 hours without corrective maintenance

CALIBRATION:
The monitor shall be calibrated, to ensure that it meets the drift limits specified above, during the Demonstration Project . The results of all calibrations shall be recorded at the time of calibration.

DATA RECORDER:
The data recorder must be capable of registering continuously the measurement of the monitor with an accuracy of 0.5 percent of a full scale reading or better and with a time resolution of 30 seconds or better.

RELIABILITY:
The monitor shall be operated and maintained so that accurate data is obtained during a minimum of 90 percent of the time during the Demonstration Project.

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

1. Condition No. 1 is included to outline the minimum performance requirements considered necessary to prevent an adverse effect resulting from the utilization of any Alternative Fuel for the Cement Kiln during the Demonstration Project.

2. Condition Nos. 2, 3 and 4 are included to require the Company to operate and maintain the Facility in accordance with the terms and conditions of this Approval.

3. Condition Nos. 5, 6, 7 and 8 are included to require the Company to gather accurate information so that the environmental impact and subsequent compliance with the EPA, Regulation 419/05 and this Approval can be verified.

4. Condition Nos. 9, 10, 11 and 12 are included to require the Company to retain records of information gathered during the Demonstration Project and to provide easy public access to information related to the Demonstration Project, so that the environmental impact and subsequent compliance with the EPA, the regulations and this Approval can be verified.

5. Condition No. 13 is included to require the Company to respond to any environmental complaints related to the Demonstration Project, according to procedures that include methods for preventing recurrence of similar incidents.

In accordance with Section 139 of the Environmental Protection Act, you may by written Notice served upon me and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 142 of the Environmental Protection Act provides that the Notice requiring the hearing shall state:

1. The portions of the environmental compliance approval or each term or condition in the environmental compliance 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 environmental compliance approval number;
6. The date of the environmental compliance approval;
7. The name of the Director, and;
8. The municipality or municipalities within which the project is to be engaged in.

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

This Notice must be served upon:

The Secretary*
Environmental Review Tribunal
655 Bay Street, Suite 1500
Toronto, Ontario
M5G 1E5

AND

The Director appointed for the purposes of
Part II.1 of the Environmental Protection Act
Ministry of the Environment
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) 212-6349, Fax: (416) 314-4506 or www.ert.gov.on.ca**

The above noted activity is approved under s.20.3 of Part II.1 of the Environmental Protection Act.

DATED AT TORONTO this 5th day of November, 2014

THIS APPROVAL WAS MAILED
ON November 7, 2014
H.A.
(Signed)

Rudolf Wan

Rudolf Wan, P.Eng.
Director
appointed for the purposes of Part II.1 of the
Environmental Protection Act

QN/
c: District Manager, MOE York-Durham
Bridget Mills, P.Eng., BCX Environmental Consulting. ✓

APPENDIX B

APPENDIX A

1.2 Facility Description

The Bowmanville plant is located on Waverley Road south Highway 401, at the south west corner of South Service Road and Waverley Road in Bowmanville, Ontario. The original wet process cement manufacturing facility, which was established in the early 1970s, was located at grade adjacent to an onsite limestone quarry. In the early 1990s the cement manufacturing process was changed from wet to dry. At this time the wet process kiln was decommissioned and replaced with a dry pre-calciner kiln system (a rotary kiln system which includes a multi-stage cyclonic pre-heatet tower including a pre-calciner unit to promote further calcination during preheating). Other equipment common to both the wet and dry process (i.e., cement finishing, product storage and load-out) remains in operation to date with minor upgrades.

The original limestone quarry, which now extends east along the north portion of the site, continues to supply crushed limestone to the cement plant. At the southern tip of St. Marys' property, a separate entity, Cargo Dockers, operates a raw material and fuel cargo dock, which supplies gypsum and solid fuel to the cement plant.

The St. Marys Technical Centre and Hutton Transport (the trucking division of St. Marys Cement) maintain offices and a truck depot at the north east corner of the site.

The cement plant operates 12 months per year typically on a 24 hours per day, 7 days per week schedule, with a maximum production capacity of 6,500 tonnes of clinker per day.

The fundamental process of cement manufacturing consists of combining materials bearing calcium oxide, silica, alumina and iron oxide at high temperatures to produce cement clinker. The clinker is subsequently ground with finishing materials such as gypsum, limestone, clay and slag to produce cement. A detailed description of the cement process equipment and operations, as well as supporting maintenance activities are presented in Section 2.0.

The zoning maps (Municipality of Clarington By-Law 84-63, Schedule 1 and Schedule 3) provided in Appendix B indicates that there are no residences or sensitive receptors within

1,000m of the major sources of noise (i.e., cement plant, main storage piles and quarry). Letters of incorporation for St Marys Cement Inc. (Canada) are included in Appendix C.

2.0 PROCESS DESCRIPTION

Operations at the St. Marys site can be separated into the following aspects:

- limestone extraction;
- construction grade limestone processing;
- cement manufacturing;
- maintenance;
- secondary docking operations;
- comfort heating and domestic hot water; and
- emergency diesel generators.

2.1 Limestone Extraction

Limestone is currently extracted from the quarry via blasting of one of four limestone benches. Blasting operations currently occur in the south and southeast section the quarry at the closest point that the quarrying activities can be to the property line. Up to 150 holes can be drilled along the blast face covering a maximum horizontal surface area of approximately 2,000 m^2 (i.e., 100,000 tonnes/blast). Blasting typically occurs between one to three times per week.

Two front-end loaders transfer the fragmented stone from the blast face onto four mining tractors. The fragmented stone is transported either to the cement plant's underground primary crusher which feeds the primary surge pile (two bank rock storage pile) for the cement plant or to the construction grade limestone stock pile.

2.2 Construction Grade Limestone Processing

The composition of limestone extracted from the quarry varies with depth and location. A portion of the extracted limestone is sorted, processed and transferred offsite by CBM Aggregates, a division of St. Marys Cement Inc.

CBM Aggregates operates one diesel-fuelled front-end loader and two crushers in the construction grade limestone processing area. This area is currently located west of the cement plant in close proximity to the facility's western property line. As a part of Bowmanville's dust management plan, this processing area is to be re-located into the quarry.

Construction grade limestone from the construction grade storage pile in the quarry will be transferred by CBM's front-end loader into CBM's primary crusher. From this point

material will be conveyed to CBM's secondary crusher and screen and to the product stockpiles by a series of conveyors. The limestone will be crushed into six types of material (i.e., HL6, 19mm clear run, 19mm crusher run, 50mm clear run, 50mm crusher run and screenings).

The construction grade limestone processing area will typically operate 12 hours per day, 7 days per week, with a maximum processing capacity of 300 tonnes/hour.

2.3 Cement Manufacturing Operations

A simplified process flow diagram is attached – see Figure 1.

The cement manufacturing process can be divided into five primary stages;

- raw materials and kiln fuel acquisition and handling (including quarry operations);
- raw meal (kiln feed) preparation;
- pyroprocessing (calcination and clinkerization);
- processing of clinker; and
- product load-out.

2.1.1 Raw Materials and Kiln Fuel Acquisition and Handling

For the purposes of identifying how the various raw materials are delivered, stored and handled, to raw material categories have been defined: "low moisture" and "high moisture." Materials that are categorized as "low moisture" typically include ashes, iron bearing materials and silicas, and are stored in silos or daily use stockpiles. Materials that are defined as "high moisture" typically include limestone, gypsum and clay,[2] and are stored in various stockpiles (which may include temporary, main and daily use stockpiles).

2.1.1.1 Acquisition and Handling of Raw Materials with Low Water Content

"Low moisture" raw materials (i.e., ash, iron and silica) can be stored in either silos or as daily-use stockpiles. Materials to be stored in silos are pneumatically transferred directly from the raw material delivery tankers into their corresponding storage silos. The storage silo capacities and locations are presented in Appendix D.

Materials to be stored in daily-use stockpiles are delivered in trucks and stored outside in small stockpiles. A diesel-fuelled front-end loader transfers these materials into a partially enclosed hopper. An elevator system transfers the material into storage silos (same ones as if the material were pneumatically delivered).

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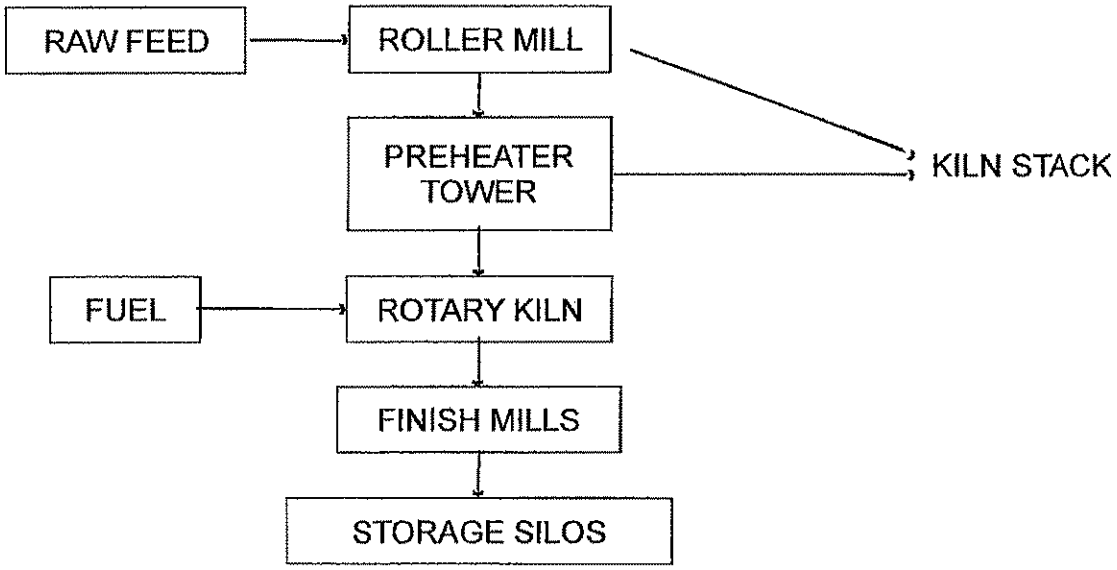
[2] The Bowmanville plant does not currently use clay as an alternative silica source. However, since the facility wishes to use clay material in the future this material has been included in the ESDM. Clay materials are approved for use at the Bowmanville plant's sister facility in St. Marys, Ontario.



PROCESS FLOW DIAGRAM - ENTIRE PLANT

St Mary's Cement Plant, Bowmanville, ON

ST. MARY'S CEMENT INC.

File No.: 2764-01.01

Date: April 2006

Dwg No.: 2764-01.01-fig1

Drawn by: M.W.

—

FIGURE 1

2.1.1.2 Acquisition and Handling of Raw Materials with High Moisture Content

Coarse limestone is delivered directly to the cement plant from the quarry, located on site, on a shrouded conveyor and deposited onto the two bank rock storage pile. An underground conveyor located below the stockpile transfers the coarse limestone to an enclosed secondary crusher and screen. Processed limestone is then fed by another enclosed conveyor to one of:

a) three raw meal limestone storage silos, located south of the cement plant; or

b) three additive limestone silos located near the finish mills.

The location of these silos and their capacity are presented in Appendix D.

Gypsum is delivered by ship and stored in piles located at the shoreline. Diesel-fuelled front-end loaders transfer the material onto one of four Volvo trucks, which then transport the gypsum to the main storage piles located south of the quarry. As required by the cement plant production, the gypsum is re-loaded onto one International truck which moves between the main stockpile and the cement plant. At the plant gypsum is deposited into the gypsum underground hopper through a partially enclosed surface grate (grizzly). The gypsum is transferred by an enclosed conveyor to the gypsum crusher, where it is reduced in size prior to being pneumatically transferred to the gypsum storage silo (as described in Appendix D).

Clay will be delivered by truck and stored in small stockpiles located south of the raw material silos. A front-end loader will transfer the clay into the same partially enclosed hopper and associated elevator system that services the "low moisture" content raw materials.

2.1.1.3 Acquisition and Handling of Kiln Fuel

The pre-calciner kiln system is fired with solid fuel (i.e., a mixture of coal and pet-coke).

Pet-coke and coal are delivered to the facility by ship and deposited into temporary stockpiles. Diesel-fuelled front-end loaders transfer the fuel onto one of four Volvo trucks, which then transport the fuel to the main storage piles located south of the quarry. As required by the cement plant production the fuel is re-loaded onto one International truck (same truck as for gypsum) which moves between the main stockpiles and the cement plant. At the plant fuel is deposited into the fuel underground hopper through a partially enclosed surface grate (grizzly).

Petroleum coke may also be delivered by rear-dump trucks, which transfer the material directly into the fuel underground hopper.

Fuel from the underground fuel hopper travels along an enclosed conveyor up into the fuel storage silo. The fuel is extracted from the silo and fed to the fuel milling system. Petroleum coke is proportionally mixed with coal (0–100%) in the fuel milling system. Milled fuel is temporarily stored in a bin prior to being fed to the kiln burner (at a maximum rate of 13 tonnes/hr) and calciner burner (at a maximum rate of 18 tonnes/hr).

2.1.1.4 Raw Meal (Kiln Feed) Preparation

In this stage of the process, limestone, silica and iron are proportionately fed from the raw material storage silos via an enclosed conveyor belt system to a raw mill. Raw meal formulations can contain up to 95% limestone, 0.5% silica, 2.7% iron. In the raw mill, the raw materials are mixed together, ground to a uniform particle size and dried. The raw mill uses the hot exhaust gases from the pre-heater tower to dry the raw meal. The dried raw meal is stored in Kiln Feed Silo, (see Appendix D).

Dried raw meal is fed, via air slides and bucket elevators, up to a dual string pre-heater tower. Each pre-heater string consists of a series of five cyclones. As the raw meal progressively passes through a pre-heater string and its cyclones, it encounters hotter and hotter gases from the kiln. Prior to being directed into the kiln, a portion of the pre-heated material is fed into a pre-calciner where the moisture content is effectively reduced to zero, and the material temperature is raised to 840 °C.

2.1.2 Pyroprocessing Stage

In the kiln, the raw meal temperature is gradually raised to over 1,500°C. The chemical reactions and physical processes transform the raw meal into clinker (grey, glass-hard, spherically shaped nodules).

With the exception of a bypass stream, flue gases from the kiln pass through the pre-heater strings and raw mill to the main baghouse and are exhausted to the atmosphere via the main kiln stack adjacent to the pre-heater tower.

In an effort to reduce nitrogen oxides (NOx) and sulphur oxides (SOx) emissions to comply with Regulation 194/05, a Selective Non-Catalytic NOx Reduction (SNCR) ammonia solution injection system and hydrated limestone injection system was installed after the bypass piping (in the lower calciner and upper riser) and before the pre-heater strings. While reducing NOx emissions, the SNCR system may release unreacted ammonia into the atmosphere.. Hydrated lime associated with the hydrated limestone injection system is captured in the main kiln baghouse.

The final stage of pyroprocessing is clinkerization. This stage involves cooling of the molten product into solid spheres (termed clinker) by passing ambient air across the clinker and into the kiln for use as combustion air. The Bowmanville plant uses a reciprocating grate cooler, which achieves a lower clinker discharge temperature by passing an additional quantity of air

through the clinker. This additional air passes through the Cooler Baghouse prior to being exhausted to the atmosphere through the cooler stack located south of the finish mills.

2.1.3 Processing of Clinker to Cement

The final step in the process involves a sequence of blending and grinding operations that transform clinker into finished cement.

Clinker exits the kiln at a maximum rate of 260 tonnes/hr and an average temperature of 350°C onto an enclosed conveyor system, which feeds one of four clinker storage silos.

Cooled clinker from the clinker storage silos is conveyed to the roller press where it is pre-ground. Pre-ground clinker is then transferred into of three cement finish mill feed silos.

Cement finishing is accomplished in three individual ball mill grinding systems located north of the kiln. Clinker, limestone and gypsum are milled together to produce cement. Finish mills #1 and #3 exhaust though a common stack. Finish mill #2 exhausts though a dedicated stack.

2.1.4 Product Load-Out

Following cement finishing, cement is ttansferred on an enclosed conveyor belt into product storage silos located north of the kiln and at the shoreline (as described in Appendix D). Product stored in silos located north of the kiln can be dispatched from the product silos in bulk, via tanker trucks or railroad tankers. Product stored in the silos at the dock are shipped by boat.

In addition to finished cement product, the plant also ships unfinished clinker to its sister plant in Detroit. The unfinished clinker uses the same enclosed conveyor system as the finished cement product.

2.4 Maintenance

There is one maintenance shop located east of the kiln and west of the quarry. The maintenance shop stores spare parts and equipment. The shop performs welding activities, which typically take place outside.

The automotive repair garage is located west of the primary crusher. This garage performs scheduled maintenance on the trucks (oil changes, tire changes, etc.). The shop can maintain only one vehicle at a time.

2.5 Secondary Docking Operations

Cargo Dockers maintains the main gypsum and fuel storage area located south of the plant, near the shoreline. The company owns five trucks (4 Volvo trucks and 1 International tuck) and three diesel-fuelled front-end loaders. The mobile equipment works simultaneously to transfer gypsum and fuel delivered by ship to the main stockpiles located south of the quarry. The International truck then transfers the gypsum and fuel to the plant.

In addition to handling materials for the cement plant, Cargo Dockers also maintains a separate storage area for raw materials (primarily coal, petcoke and salt) delivered by ship for a number of other companies. These stockpiles are covered by tarps except for the coal storage piles.

2.6 Comfort Heating and Domestic Hot Water

All comfort heat, with the exception of the quarry garage, is provided by electrical units. At the quarry garage comfort heat is provided by propane-fired radiant heaters with a total capacity of 0.1 scf/hr.

Domestic hot water in the lunchroom, service room and Hutton Transport are provided by No. 2 oil-fired boilers having a total capacity of 34.65 U.S. gal/hr.

Equipment specifications are presented in Appendix E.

2.7 Emergency Diesel Generators

There are three emergency diesel-fired generators. One CAT, Model D355 Series E, 450 HP, diesel-fired generator is located east of the kiln in a separate building. The generator is used to provide electricity to the facility during main power failures.

One John Deere, Model CD 6359D705575, 200 HP, diesel-fired generator located south of the plant in the pump house. This generator is used to provide electricity to the equipment located near the shoreline during main power failures.

Finally, one CAT, Model 81Z09016, 749 HP, diesel-fired generator is located west of the kiln in a separate building. The generator provides electricity to rotate the kiln during main power failures.

Monthly tests and maintenance are performed.

2.8 QA/QC Fume Hoods

The facility operates eight quality assurance/quality control (QA/QC) fume hoods located in the QA/QC laboratory in the main building east of the kiln. The fume hoods exhaust

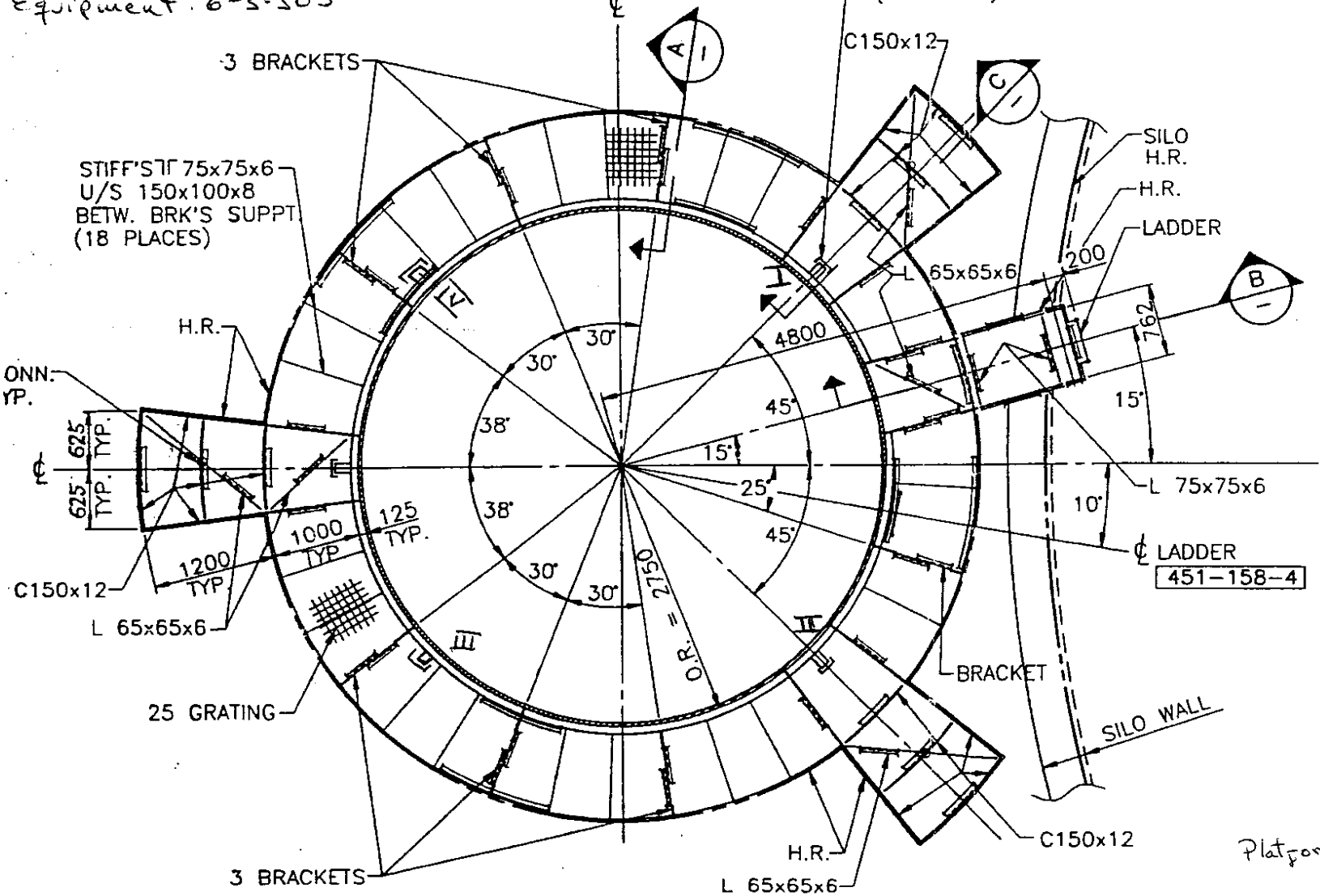
through one exhaust stack located on the roof of the building. Five tests are typically performed:

1. Material Composition – these tests involve collecting samples of clinker, flyash, slag, limestone and sand, and then leaching metals and sulphur with a suitable acid (either nitric, hydrochloric, hydrofluoric, boric, sulphuric or acetic acid) to ensure proper chemical composition of the end product. Chemicals used in material composition tests are stored in closed containers in storage cabinets that also vent through the fume hood stacks.
2. Crushing – A small crusher (up to 1kg capacity) is used under a fume hood to create crushed material for further testing.
3. Sieve Analysis – these tests are performed on sand, flyash and slag. The materials placed in the sieves. Ambient air is drawn down through the sieves, filtered and then vented through the fume hood exhaust.
4. Fusion – Cement fusion tests are conducted to evaluate the bond strength of the cured cement. The test uses a small propane heater and small quantities of flux and cement; and
5. Moisture – Small electric drying ovens are used for moisture testing.

Drawing
6-3-2168
1707158
Equipment: 6-3-365

Old Sample Ports
(3) – 4" DIA. THREADED PIPE NIPPLES c/w PIPE CAP (3 PLACES) @ ℄ EL.169.190
(3) – 2" EYBOLTS WELDED TO SHELL @ ℄ EL.170.700 (3 PLACES)

New Sample Ports
(4) 6" DIA Threaded Pipe
located at 90°
EL. 169.5
Locations: I, II, III, IV



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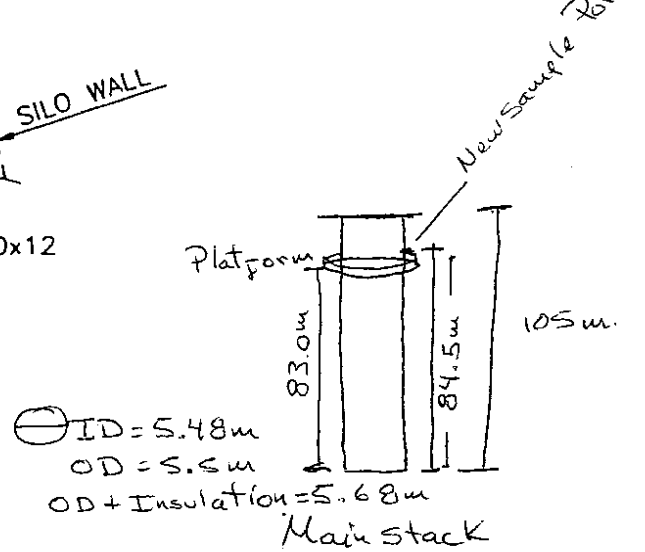
PLAN @ EL.168.023 T/GRT'G

SCALE 1:50



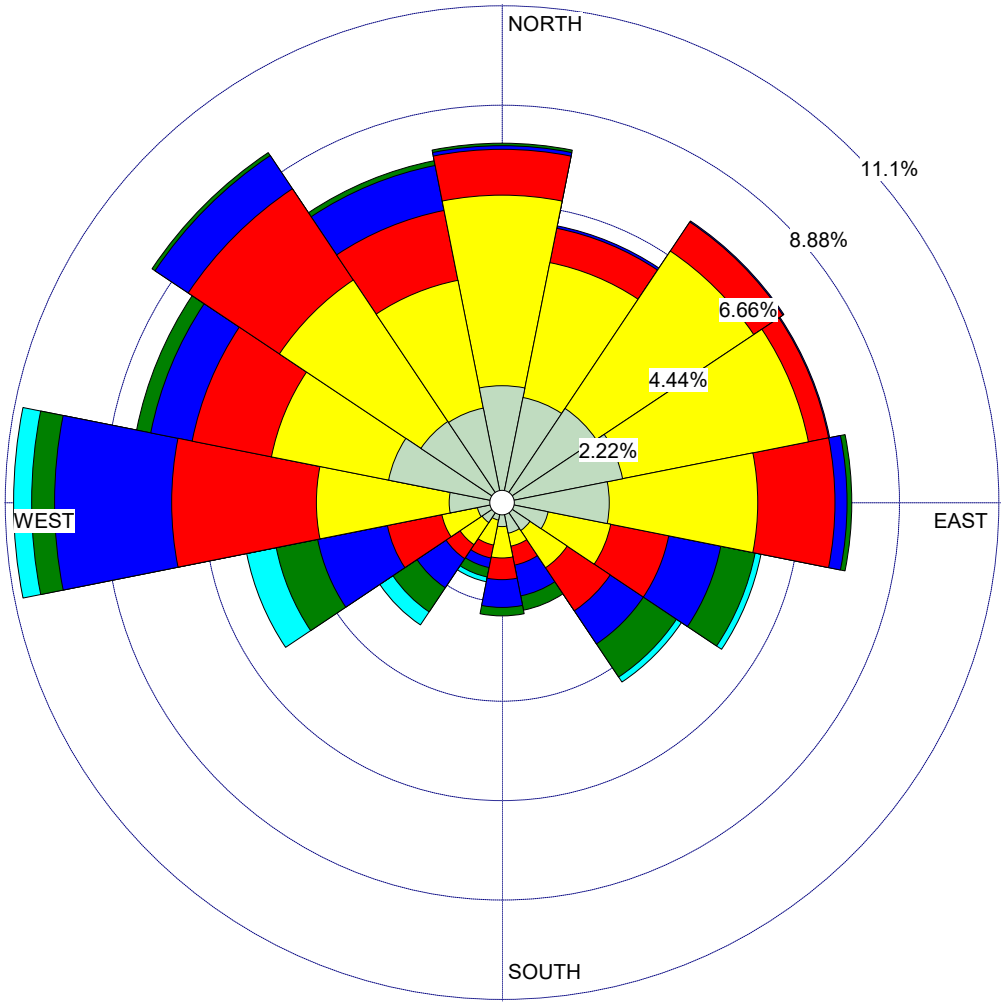
APPENDIX A

WIND ROSE PLOT:

SMC Bowmanville Plant Site-Specific Meteorological Data (2004 -2008)
October All Day

DISPLAY:

Wind Speed
Direction (blowing from)



WIND SPEED
(m/s)

- >= 11.10
- 8.80 - 11.10
- 5.70 - 8.80
- 3.60 - 5.70
- 2.10 - 3.60
- 0.50 - 2.10

Calms: 0.00%

COMMENTS: AERMET Version 16216	DATA PERIOD: **Start Date: 2004-10-01 - 00:00** **End Date: 2008-10-31 - 23:59**		
	CALM WINDS: **0.00%**	TOTAL COUNT: **3720 hrs.**	BCX ENVIRONMENTAL CONSULTING
	AVG. WIND SPEED: **3.59 m/s**	DATE: **2018-08-22**	PROJECT NO.: **1003-01.42**


Hwy of Heroes
401
Ambient Station #1
Plant Met Station
Ambient Station #3
Kiln Stack
Ambient Station #2
Dock Met Statiom

Appendix O

Process sampling and monitoring program

BCX
ENVIRONMENTAL
CONSULTING

St. Marys Cement Inc. (Canada) Bowmanville Plant
Low Carbon Alternative Fuels Source Testing Program

Raw Material and Fuel Sampling Methodology

ECA No. 0469-9YUNSK, November 25, 2015

1. Introduction

The following methodology describes how to correctly obtain material samples during the low carbon alternative fuels source testing program at St. Marys Cement Inc. (Canada)'s (SMC's) Bowmanville Plant (Facility).

Although the raw material and fuel sampling program is not required by the ECA, the program will provide more information on the impact of material/fuel input on kiln stack emissions.

2. Facility

The sampling program will be conducted at the SMC cement plant located at 400 Waverley Road South, in Bowmanville, Ontario by trained staff.

3. Material Sampling Scope

Sampling will be performed by trained staff using the methodology outlined by below.

Samples will be taken:

- Over a period of 3 days prior to the introduction of Low Carbon fuels (**Post-Baseline condition [PB]**) during which 3 source tests will take place;
- Over the entire period when maximum alternative substitution has been reached (**Low Carbon Alternative Fuel Substitution condition [LCF]**) – expected to be up to 3 days during which 3 source tests will take place.

A sample of the following materials/fuel will be taken 3 times for each of the 6 source tests (total of 18 samples for each material/fuel):

- kiln feed;
- clinker;

- cement kiln dust;
- cement product;
- conventional fuel for kiln (coal); and
- conventional fuel for calciner (petroleum coke).

Appropriate sampling locations for each material have been determined by SMC's Project Manager (See Attachment 1) and will be documented on the Material Sampling Program Summary Sheet.

The sampling intervals should be equal time interval apart (e.g. for a 12 hour test, sampling at 8:30am; 12:30 am and 4:30pm).

A summary of the Material/Fuel Sampling Program for the Bowmanville plant is attached as Table 1.

Sample Composites/Delivery to the Laboratory

BCX staff will prepare the daily sample composites using the compositing method developed for this program. BCX will complete the Chain of Custody for the composite daily samples. SMC staff will submit the daily composite samples to their laboratory of choice for analysis.

4. Sampling Methodology

The following methodology is to be followed by the site personnel responsible for collecting the material samples. These procedures will be reviewed with the SMC Project Manager who is responsible for on-site staff training.

Before Sampling

- In addition to any required personal protection equipment, put on a pair of the disposable gloves provided;
- Label the glass jars and metal pails (for clinker and cement samples only) for each material. Due to the high temperature of the clinker material, prepare 3 pails for each source test;
- Have a glass jar or metal pail ready;
- Select a Ziploc bag and attach a label;
- Clean and dry the tool provided at the sampling location with water and/or paper towel (also provided at the sampling location).

Sampling

- Collect material/fuel using a glass jar or metal pail (for clinker and cement). Obtain a minimum of 300g of sample.

- Allow the sample to cool. Once the sample reaches/is close to room temperature, use the scoop or trowel to transfer the sample into a Ziploc bag;
- Use the sharpie pen provided to circle each type of process, location, day and sample and write the date, time and sampler's initials on the label in the spaces provided. Any deviations from the sampling protocol; unexpected events; observations should be documented in the Comments column on the Sample Summary Sheet;

- Place the sample inside of a second Ziploc bag (no label required) and in the cooler provided.

After Sampling

- Clean the sampling tool immediately after each use;
- Verify the sampling information on the Ziploc bag and complete the Sample Summary Sheet provided.

5. QA/QC

The SMC Project Manager is to review the Sample Summary Sheets at the end of the day to verify that samples are being collected; that the sampling intervals are appropriate and to review/act-upon any comments. The SMC Project Manager is to periodically observe sample collections to verify that the sampling methodology is being followed.

ATTACHEMENT 1: SAMPLING LOCATIONS

Material/Fuel	Sampling Location	Comments
Kiln Feed	Figure 1	
Clinker	Figure 2	
Cement Kiln Dust	Figure 3	
Cement Product	Figure 4	Total of three locations for three finish mills, take one sample per test.
Conventional Fuel for Kiln	Figure 5	Same location for both fuels as the same fuel mill is used to grind both fuel mixes. Need to know which fuel is milled when taking samples.
Conventional Fuel for Calciner		

Figure 1: Kiln Feed Sampling Location

Kiln Feed Sample Button

Kiln Feed Sampling Location

Figure 2: Clinker Sampling Location

Clinker Sample Button

Clinker Sampling Location (in Restricted Area)

Figure 3: CKD Sampling Location

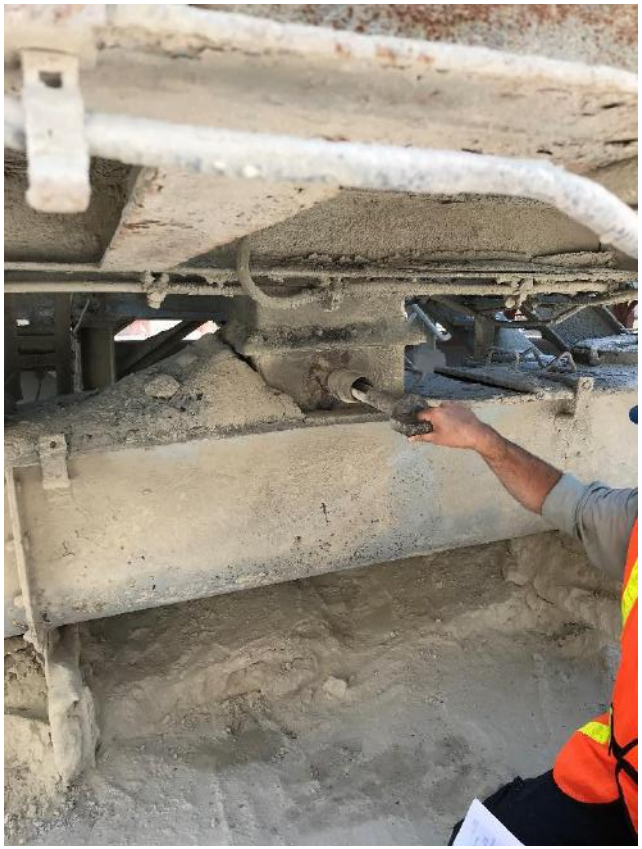
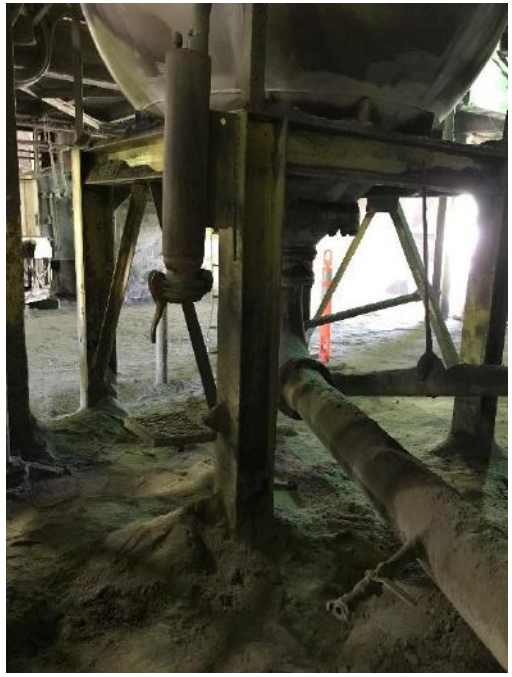


Figure 4: Cement Sampling Locations

Cement Sampling Location 1

Cement Sampling Location 2



Cement Sampling Location 3

Note: There are 3 finish mills and 3 sampling locations. Radomization of sampling locations is recommended.

Figure 5: Conventional Fuel Sampling Location

BCX
ENVIRONMENTAL
CONSULTING

St. Marys Cement Inc. (Canada) Bowmanville Plant
Low Carbon Alternative Fuels Source Testing Program

Raw Material and Fuel Sample Compositing Methodology

ECA No. 0469-9YUNSK, November 25, 2015

1. Introduction

The following methodology describes how to correctly prepare composite samples from material samples collected during the low carbon alternative fuels source testing program at St. Marys Cement Inc. (Canada)'s (SMC's) Bowmanville Plant (Facility).

Although the raw material and fuel sampling program is not required by the ECA, the program will provide more information on the impact of material/fuel input on kiln stack emissions.

2. Facility

The sample compositing program will be conducted at the SMC cement plant located at 400 Waverley Road South, in Bowmanville, Ontario by trained staff.

3. Sample Compositing Scope

The sample compositing procedure will be performed for the three daily material samples taken at each of the following sampling locations during the testing period (post-baseline and low carbon alternative fuel) as outlined in the Material/Fuel Sampling Methodology.

- kiln feed;
- clinker;
- cement kiln dust;
- cement product;
- conventional fuel for kiln – coal; and
- conventional fuel for calciner – petroleum coke.

Sample compositing will be performed by trained staff using the standard US EPA method as outlined in US EPA AP-42 Appendix C2 (sample splitting, coning and quartering). The detailed methodology is provided in Section 4 below.

4. Sampling Compositing Methodology

The following methodology is to be followed by trained staff responsible for preparing the composite material samples. These procedures will be reviewed with the SMC Project Manager who is responsible for on-site staff training.

Sample Compositing Tools

- A triangular/rectangular compositing tray with enough volume for mixing of three material samples;
- A wooden spatula; and
- Water and paper towels to clean the tools.

Before Sample Compositing

- In addition to any required personal protection equipment, put on a pair of disposable gloves, a pair of safety glasses and a dust mask;
- Select two zip-lock bags and attach a label on each bag; and
- Clean and dry the sample compositing tools with water and/or paper towel.

Sample Compositing

- Transfer all three material samples into the compositing tray;
- Use the spatula to well mix the material and shape it into a neat cone;
- Flatten the cone by pressing the top without further mixing;
- Divide the flat circular pile into equal quarters by cutting or scraping out 2 diameters at right angles;
- Discard 2 opposite quarters; and
- Thoroughly mix the 2 remaining quarters, shape them into a cone, and repeat the quartering and discarding procedures until the sample is reduced to 0.8 to 3.6 kg (2 to 8 lb).
- Divide the composite sample into two equal sized samples and put them into two zip-lock bags (one for laboratory analysis and one to be stored as a back-up sample);
- Use the sharpie pen provided to circle each type of process, location, day and composite sample ID and write the date, time and sampler's initials on the label in the spaces provided;
- Place each sample inside of a second zip-lock bag (no label required) and in the cooler.

After Sample Compositing

- Clean the mixing tool immediately after each use;
- Fill out the sample information on the chain of custody form. The chain of custody form records information including sample composite preparation date, sample IDs, material sampling location, composite sample ID, and sampler's

information. An example of the chain of custody form is presented in Appendix A.

At the End of the LCF Source Test

- SMC to ship the cooler(s) containing all of the composite samples to the laboratory for analysis and keep the back-up samples and chain of custody form on file.

5. QA/QC

The SMC Project Manager is to review the chain of custody form periodically to verify that composite samples are prepared properly and to review/act-upon any comments. The SMC manager is to periodically observe the sample compositing process to verify that the methodology is being followed.

ATTACHEMENT 1: Sampling Summary and Chain of Custody Form

Table 1 - Material and Fuel Sampling Program - Sampling Summary & Chain of Custody

Company Name: _____ Site Name: 0469-9YUNSK (ECA with LOF, Wood)

Process Condition	Source Test No.	Material/Fuel Name	Sample No.	Sampling Date	Sampling Time	Sample Code (Process Condition-Source Test No.- Feed Stock - Sample No.)	Sampler's Initials	Sampler's Name	Comments	Composite Sample IDs	Date Composite Sample Prepared	Sampler's Initials	Sampler's Name
Post-Baseline	1	Kiln Feed	1			PB-1-KF-1				PB-1-KF-L PB-1-KF-B			
Post-Baseline	1	Kiln Feed	2			PB-1-KF-2							
Post-Baseline	1	Kiln Feed	3			PB-1-KF-3							
Post-Baseline	2	Kiln Feed	1			PB-2-KF-1				PB-2-KF-L PB-2-KF-B			
Post-Baseline	2	Kiln Feed	2			PB-2-KF-2							
Post-Baseline	2	Kiln Feed	3			PB-2-KF-3							
Post-Baseline	3	Kiln Feed	1			PB-3-KF-1				PB-3-KF-L PB-3-KF-B			
Post-Baseline	3	Kiln Feed	2			PB-3-KF-2							
Post-Baseline	3	Kiln Feed	3			PB-3-KF-3							
Post-Baseline	1	Clinker	1			PB-1-CL-1				PB-1-CL-L PB-1-CL-B			
Post-Baseline	1	Clinker	2			PB-1-CL-2							
Post-Baseline	1	Clinker	3			PB-1-CL-3							
Post-Baseline	2	Clinker	1			PB-2-CL-1				PB-2-CL-L PB-2-CL-B			
Post-Baseline	2	Clinker	2			PB-2-CL-2							
Post-Baseline	2	Clinker	3			PB-2-CL-3							
Post-Baseline	3	Clinker	1			PB-3-CL-1				PB-3-CL-L PB-3-CL-B			
Post-Baseline	3	Clinker	2			PB-3-CL-2							
Post-Baseline	3	Clinker	3			PB-3-CL-3							
Post-Baseline	1	Cement Kiln Dust	1			PB-1-CKD-1				PB-1-CKD-L PB-1-CKD-B			
Post-Baseline	1	Cement Kiln Dust	2			PB-1-CKD-2							
Post-Baseline	1	Cement Kiln Dust	3			PB-1-CKD-3							
Post-Baseline	2	Cement Kiln Dust	1			PB-2-CKD-1				PB-2-CKD-L PB-2-CKD-B			
Post-Baseline	2	Cement Kiln Dust	2			PB-2-CKD-2							
Post-Baseline	2	Cement Kiln Dust	3			PB-2-CKD-3							
Post-Baseline	3	Cement Kiln Dust	1			PB-3-CKD-1				PB-3-CKD-L PB-3-CKD-B			
Post-Baseline	3	Cement Kiln Dust	2			PB-3-CKD-2							
Post-Baseline	3	Cement Kiln Dust	3			PB-3-CKD-3							
Post-Baseline	1	Conventional Fuel for Kiln	1			PB-1-CFK-1				PB-1-CFK-L PB-1-CFK-B			
Post-Baseline	1	Conventional Fuel for Kiln	2			PB-1-CFK-2							
Post-Baseline	1	Conventional Fuel for Kiln	3			PB-1-CFK-3							
Post-Baseline	2	Conventional Fuel for Kiln	1			PB-2-CFK-1				PB-2-CFK-L PB-2-CFK-B			
Post-Baseline	2	Conventional Fuel for Kiln	2			PB-2-CFK-2							
Post-Baseline	2	Conventional Fuel for Kiln	3			PB-2-CFK-3							
Post-Baseline	3	Conventional Fuel for Kiln	1			PB-3-CFK-1				PB-3-CFK-L PB-3-CFK-B			
Post-Baseline	3	Conventional Fuel for Kiln	2			PB-3-CFK-2							
Post-Baseline	3	Conventional Fuel for Kiln	3			PB-3-CFK-3							
Post-Baseline	1	Conventional Fuel for Calciner	1			PB-1-CFC-1				PB-1-CFC-L PB-1-CFC-B			
Post-Baseline	1	Conventional Fuel for Calciner	2			PB-1-CFC-2							
Post-Baseline	1	Conventional Fuel for Calciner	3			PB-1-CFC-3							
Post-Baseline	2	Conventional Fuel for Calciner	1			PB-2-CFC-1				PB-2-CFC-L PB-2-CFC-B			
Post-Baseline	2	Conventional Fuel for Calciner	2			PB-2-CFC-2							
Post-Baseline	2	Conventional Fuel for Calciner	3			PB-2-CFC-3							
Post-Baseline	3	Conventional Fuel for Calciner	1			PB-3-CFC-1				PB-3-CFC-L PB-3-CFC-B			
Post-Baseline	3	Conventional Fuel for Calciner	2			PB-3-CFC-2							
Post-Baseline	3	Conventional Fuel for Calciner	3			PB-3-CFC-3							
Post-Baseline	1	Cement	1			PB-1-CM-1				PB-1-CM-L			

Table 1 - Material and Fuel Sampling Program - Sampling Summary & Chain of Custody

Company Name: _____ Site Name: 0469-9YUNSK (ECA with LOF, Wood)

Process Condition	Source Test No.	Material/Fuel Name	Sample No.	Sampling Date	Sampling Time	Sample Code (Process Condition-Source Test No.- Feed Stock - Sample No.)	Sampler's Initials	Sampler's Name	Comments	Composite Sample IDs	Date Composite Sample Prepared	Sampler's Initials	Sampler's Name
Post-Baseline	1	Cement	2			PB-1-CM-2				PB-1-CM-L PB-1-CM-B			
Post-Baseline	1	Cement	3			PB-1-CM-3							
Post-Baseline	2	Cement	1			PB-2-CM-1				PB-2-CM-L PB-2-CM-B			
Post-Baseline	2	Cement	2			PB-2-CM-2							
Post-Baseline	2	Cement	3			PB-2-CM-3							
Post-Baseline	3	Cement	1			PB-3-CM-1				PB-3-CM-L PB-3-CM-B			
Post-Baseline	3	Cement	2			PB-3-CM-2							
Post-Baseline	3	Cement	3			PB-3-CM-3							

Table 1 - Material and Fuel Sampling Program - Sampling Summary & Chain of Custody

Company Name: _____ Site Name: 0469-9YUNSK (ECA with LOF, Wood)

Process Condition	Source Test No.	Material/Fuel Name	Sample No.	Sampling Date	Sampling Time	Sample Code (Process Condition-Source Test No.- Feed Stock - Sample No.)	Sampler's Initials	Sampler's Name	Comments	Composite Sample IDs	Date Composite Sample Prepared	Sampler's Initials	Sampler's Name
Low Carbon Alternative Fuel	1	Kiln Feed	1			LCF-1-KF-1				LCF-1-KF-L LCF-1-KF-B			
Low Carbon Alternative Fuel	1	Kiln Feed	2			LCF-1-KF-2							
Low Carbon Alternative Fuel	1	Kiln Feed	3			LCF-1-KF-3							
Low Carbon Alternative Fuel	2	Kiln Feed	1			LCF-2-KF-1				LCF-2-KF-L LCF-2-KF-B			
Low Carbon Alternative Fuel	2	Kiln Feed	2			LCF-2-KF-2							
Low Carbon Alternative Fuel	2	Kiln Feed	3			LCF-2-KF-3							
Low Carbon Alternative Fuel	3	Kiln Feed	1			LCF-3-KF-1				LCF-3-KF-L LCF-3-KF-B			
Low Carbon Alternative Fuel	3	Kiln Feed	2			LCF-3-KF-2							
Low Carbon Alternative Fuel	3	Kiln Feed	3			LCF-3-KF-3							
Low Carbon Alternative Fuel	1	Clinker	1			LCF-1-CL-1				LCF-1-CL-L LCF-1-CL-B			
Low Carbon Alternative Fuel	1	Clinker	2			LCF-1-CL-2							
Low Carbon Alternative Fuel	1	Clinker	3			LCF-1-CL-3							
Low Carbon Alternative Fuel	2	Clinker	1			LCF-2-CL-1				LCF-2-CL-L LCF-2-CL-B			
Low Carbon Alternative Fuel	2	Clinker	2			LCF-2-CL-2							
Low Carbon Alternative Fuel	2	Clinker	3			LCF-2-CL-3							
Low Carbon Alternative Fuel	3	Clinker	1			LCF-3-CL-1				LCF-3-CL-L LCF-3-CL-B			
Low Carbon Alternative Fuel	3	Clinker	2			LCF-3-CL-2							
Low Carbon Alternative Fuel	3	Clinker	3			LCF-3-CL-3							
Low Carbon Alternative Fuel	1	Cement Kiln Dust	1			LCF-1-CKD-1				LCF-1-CKD-L LCF-1-CKD-B			
Low Carbon Alternative Fuel	1	Cement Kiln Dust	2			LCF-1-CKD-2							
Low Carbon Alternative Fuel	1	Cement Kiln Dust	3			LCF-1-CKD-3							
Low Carbon Alternative Fuel	2	Cement Kiln Dust	1			LCF-2-CKD-1				LCF-2-CKD-L LCF-2-CKD-B			
Low Carbon Alternative Fuel	2	Cement Kiln Dust	2			LCF-2-CKD-2							
Low Carbon Alternative Fuel	2	Cement Kiln Dust	3			LCF-2-CKD-3							
Low Carbon Alternative Fuel	3	Cement Kiln Dust	1			LCF-3-CKD-1				LCF-3-CKD-L LCF-3-CKD-B			
Low Carbon Alternative Fuel	3	Cement Kiln Dust	2			LCF-3-CKD-2							
Low Carbon Alternative Fuel	3	Cement Kiln Dust	3			LCF-3-CKD-3							
Low Carbon Alternative Fuel	1	Conventional Fuel for Kiln	1			LCF-1-CFK-1				LCF-1-CFK-L LCF-1-CFK-B			
Low Carbon Alternative Fuel	1	Conventional Fuel for Kiln	2			LCF-1-CFK-2							
Low Carbon Alternative Fuel	1	Conventional Fuel for Kiln	3			LCF-1-CFK-3							
Low Carbon Alternative Fuel	2	Conventional Fuel for Kiln	1			LCF-2-CFK-1				LCF-2-CFK-L LCF-2-CFK-B			
Low Carbon Alternative Fuel	2	Conventional Fuel for Kiln	2			LCF-2-CFK-2							
Low Carbon Alternative Fuel	2	Conventional Fuel for Kiln	3			LCF-2-CFK-3							
Low Carbon Alternative Fuel	3	Conventional Fuel for Kiln	1			LCF-3-CFK-1				LCF-3-CFK-L LCF-3-CFK-B			
Low Carbon Alternative Fuel	3	Conventional Fuel for Kiln	2			LCF-3-CFK-2							
Low Carbon Alternative Fuel	3	Conventional Fuel for Kiln	3			LCF-3-CFK-3							
Low Carbon Alternative Fuel	1	Conventional Fuel for Calciner	1			LCF-1-CFC-1				LCF-1-CFC-L LCF-1-CFC-B			
Low Carbon Alternative Fuel	1	Conventional Fuel for Calciner	2			LCF-1-CFC-2							
Low Carbon Alternative Fuel	1	Conventional Fuel for Calciner	3			LCF-1-CFC-3							
Low Carbon Alternative Fuel	2	Conventional Fuel for Calciner	1			LCF-2-CFC-1				LCF-2-CFC-L LCF-2-CFC-B			
Low Carbon Alternative Fuel	2	Conventional Fuel for Calciner	2			LCF-2-CFC-2							
Low Carbon Alternative Fuel	2	Conventional Fuel for Calciner	3			LCF-2-CFC-3							
Low Carbon Alternative Fuel	3	Conventional Fuel for Calciner	1			LCF-3-CFC-1				LCF-3-CFC-L LCF-3-CFC-B			
Low Carbon Alternative Fuel	3	Conventional Fuel for Calciner	2			LCF-3-CFC-2							
Low Carbon Alternative Fuel	3	Conventional Fuel for Calciner	3			LCF-3-CFC-3							
Low Carbon Alternative Fuel	1	Cement	1			LCF-1-CM-1				LCF-1-CM-L			

Table 1 - Material and Fuel Sampling Program - Sampling Summary & Chain of Custody

Company Name: _____ Site Name: 0469-9YUNSK (ECA with LOF, Wood)

Process Condition	Source Test No.	Material/Fuel Name	Sample No.	Sampling Date	Sampling Time	Sample Code (Process Condition-Source Test No.- Feed Stock - Sample No.)	Sampler's Initials	Sampler's Name	Comments	Composite Sample IDs	Date Composite Sample Prepared	Sampler's Initials	Sampler's Name
Low Carbon Alternative Fuel	1	Cement	2			LCF-1-CM-2				LCF-1-CM-L LCF-1-CM-B			
Low Carbon Alternative Fuel	1	Cement	3			LCF-1-CM-3							
Low Carbon Alternative Fuel	2	Cement	1			LCF-2-CM-1				LCF-2-CM-L LCF-2-CM-B			
Low Carbon Alternative Fuel	2	Cement	2			LCF-2-CM-2							
Low Carbon Alternative Fuel	2	Cement	3			LCF-2-CM-3							
Low Carbon Alternative Fuel	3	Cement	1			LCF-3-CM-1				LCF-3-CM-L LCF-3-CM-B			
Low Carbon Alternative Fuel	3	Cement	2			LCF-3-CM-2							
Low Carbon Alternative Fuel	3	Cement	3			LCF-3-CM-3							

St. Marys Cement Bowmanville Plant
Low Carbon Fuels Program
ECA No. 0469-9YUNSK

Pre-Source Test and Post-Source Test Process Monitoring Procedure

1. Pre-test Checklist

SMC staff or designate is required to monitor all parameters listed in this checklist and complete this checklist before each source test (note there are three source tests for each sampling day for a total of 6 days).

Once all parameters listed reach steady state (i.e. Answer YES to all questions) and the checklist has been completed, the source testing crew (RWDI) needs to be notified to start the source test.

IMPORTANT NOTE: Source test may not start until SMC staff or designate completes the checklist and confirms that stable conditions have been reached for all parameters on the checklist.

2. Post-test Checklist

SMC staff or designate is required to monitor all parameters listed in this checklist during each source test and complete this checklist after each source test (note there are three source tests for each sampling day for a total of 6 days).

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St. Marys Cement Inc. (Canada) Bowmanville Plant Alternative Fuels Demonstration Source Testing Program

Raw Material and Fuel Sampling Methodology

ECA No. 4614-826K9W, November 5, 2014

1. Introduction

The following methodology describes how to correctly obtain material samples during the alternative fuels demonstration source testing program at St. Marys Cement Inc. (Canada)'s (SMC's) Bowmanville Plant (Facility) as required by Condition 5 of the ECA (ECA no. 4614-826K9W, dated November 5, 2014)

2. Facility

The sampling program will be conducted at the SMC cement plant located at 400 Waverley Road South, in Bowmanville, Ontario by trained staff.

3. Material Sampling Scope

Sampling will be performed by trained staff using the methodology outlined by below.

Samples will be taken:

- Over a period of 3 days prior to the introduction of alternative fuels (**Baseline condition [B]**) during which 3 source tests will take place;
- Over the entire period when maximum alternative substitution has been reached (**Alternative Fuel Substitution condition [ALT]**) – expected to be up to 3 days during which 3 source tests will take place.

A sample of the following materials/fuel will be taken 3 times for each of the 6 source tests (total of 18 samples for each material/fuel):

- kiln feed;
- clinker;
- cement kiln dust;
- cement product;
- conventional fuel for kiln (coal); and

- conventional fuel for calciner (petroleum coke).

Appropriate sampling locations for each material have been determined by SMC's Project Manager (See Attachment 1) and will be documented on the Material Sampling Program Summary Sheet.

The sampling intervals should be equal time interval apart (e.g. for a 12 hour test, sampling at 8:30am; 12:30 am and 4:30pm).

A summary of the Material/Fuel Sampling Program for the Bowmanville plant is attached as Table 1.

Sample Composites/Delivery to the Laboratory

BCX staff will prepare the daily sample composites using the compositing method developed for this program. BCX will complete the Chain of Custody for the composite daily samples. SMC staff will submit the daily composite samples to their laboratory of choice for analysis.

4. Sampling Methodology

The following methodology is to be followed by the site personnel responsible for collecting the material samples. These procedures will be reviewed with the SMC Project Manager who is responsible for on-site staff training.

Before Sampling

- In addition to any required personal protection equipment, put on a dust mask and a pair of the heat resistant gloves provided;
- Label the glass jars and metal pails (for clinker and cement samples only) for each material. Due to the high temperature of the clinker material, prepare 3 pails for each source test;
- Have a glass jar or metal pail ready;
- Select a Ziploc bag and attach a label;
- Clean and dry the tool provided at the sampling location with water and/or paper towel (also provided at the sampling location).

Sampling

- Collect material/fuel using a plastic sample bag or metal pail (for clinker and cement). Obtain a minimum of 300g of sample.
- Transfer hot materials to a glass jar and allow them to cool. Once the sample reaches/is close to room temperature, use the scoop or trowel to transfer the sample into a Ziploc bag;

- Use the sharpie pen provided to circle each type of process, location, day and sample and write the date, time and sampler's initials on the label in the spaces provided. Any deviations from the sampling protocol; unexpected events; observations should be documented in the Comments column on the Sample Summary Sheet;

- Place the sample inside of a second Ziploc bag (no label required) and in the cooler provided.

After Sampling

- Clean the sampling tool immediately after each use;
- Verify the sampling information on the Ziploc bag and complete the Sample Summary Sheet provided.

5. QA/QC

The SMC Project Manager is to review the Sample Summary Sheets at the end of the day to verify that samples are being collected; that the sampling intervals are appropriate and to review/act-upon any comments. The SMC Project Manager is to periodically observe sample collections to verify that the sampling methodology is being followed.

ATTACHEMENT 1: SAMPLING LOCATIONS

Material/Fuel	Sampling Location	Comments
Kiln Feed	Figure 1	
Clinker	Figure 2	
Cement Kiln Dust	Figure 3	
Cement Product	Figure 4	Total of three locations for three finish mills, take one sample per test.
Conventional Fuel for Kiln	Figure 5	Same location for both fuels as the same fuel mill is used to grind both fuel mixes. Need to know which fuel is milled when taking samples.
Conventional Fuel for Calciner		

Figure 1: Kiln Feed Sampling Location

Kiln Feed Sample Button

Kiln Feed Sampling Location

Figure 2: Clinker Sampling Location

Clinker Sample Button

Clinker Sampling Location (in Restricted Area)

Figure 3: CKD Sampling Location

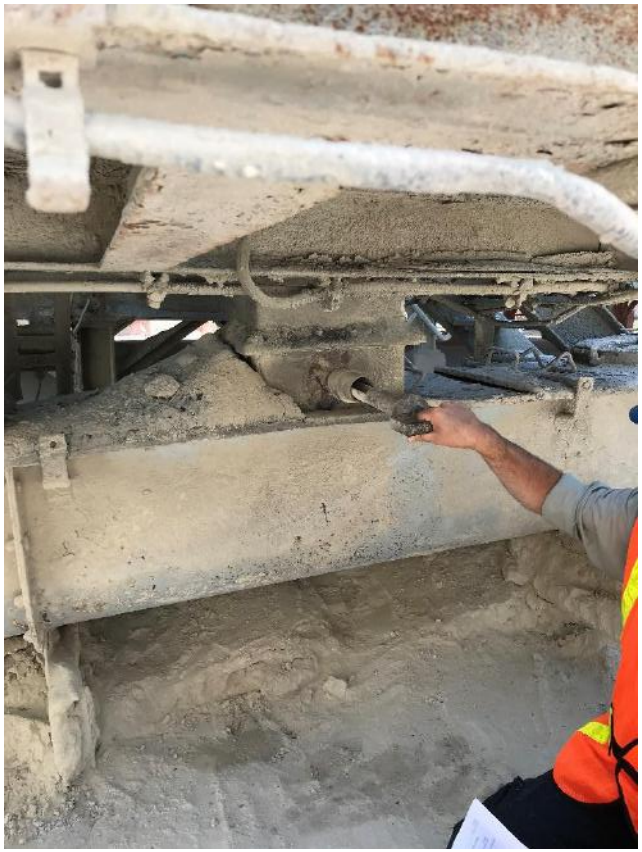
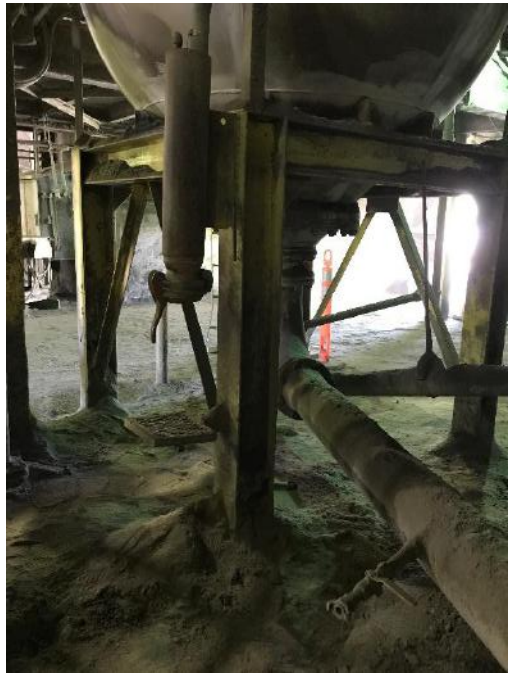


Figure 4: Cement Sampling Locations

Cement Sampling Location 1

Cement Sampling Location 2



Cement Sampling Location 3

Note: There are 3 finish mills and 3 sampling locations. Radomization of sampling locations is recommended.

Figure 5: Conventional Fuel Sampling Location

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St. Marys Cement Inc. (Canada) Bowmanville Plant Alternative Fuels Demonstration Source Testing Program

Raw Material and Fuel Sample Compositing Methodology

ECA No. 4614-826K9W, November 5, 2014

1. Introduction

The following methodology describes how to correctly prepare composite samples from material samples collected during the alternative fuels demonstration source testing program at St. Marys Cement Inc. (Canada)'s (SMC's) Bowmanville Plant (Facility) as required by Condition 5 of the ECA (ECA no. 4614-826K9W, dated November 5, 2014)

2. Facility

The sample compositing program will be conducted at the SMC cement plant located at 400 Waverley Road South, in Bowmanville, Ontario by trained staff.

3. Sample Compositing Scope

The sample compositing procedure will be performed for the three daily material samples taken at each of the following sampling locations during the testing period (baseline and alternative fuel) as outlined in the Material/Fuel Sampling Methodology.

- kiln feed;
- clinker;
- cement kiln dust;
- cement product;
- conventional fuel for kiln – coal; and
- conventional fuel for calciner – petroleum coke.

Sample compositing will be performed by trained staff using the standard US EPA method as outlined in US EPA AP-42 Appendix C2 (sample splitting, coning and quartering). The detailed methodology is provided in Section 4 below.

4. Sampling Compositing Methodology

The following methodology is to be followed by trained staff responsible for preparing the composite material samples. These procedures will be reviewed with the SMC Project Manager who is responsible for on-site staff training.

Sample Compositing Tools

- A triangular/rectangular compositing tray with enough volume for mixing of three material samples;
- A wooden spatula; and
- Water and paper towels to clean the tools.

Before Sample Compositing

- In addition to any required personal protection equipment, put on a pair of heat-resistant gloves, a pair of safety glasses and a dust mask;
- Select two zip-lock bags and attach a label on each bag; and
- Clean and dry the sample compositing tools with water and/or paper towel.

Sample Compositing

- Transfer all three material samples into the compositing tray;
- Use the spatula to well mix the material and shape it into a neat cone;
- Flatten the cone by pressing the top without further mixing;
- Divide the flat circular pile into equal quarters by cutting or scraping out 2 diameters at right angles;
- Discard 2 opposite quarters; and
- Thoroughly mix the 2 remaining quarters, shape them into a cone, and repeat the quartering and discarding procedures until the sample is reduced to 0.8 to 3.6 kg (2 to 8 lb).
- Divide the composite sample into two equal sized samples and put them into two zip-lock bags (one for laboratory analysis and one to be stored as a back-up sample);
- Use the sharpie pen provided to circle each type of process, location, day and composite sample ID and write the date, time and sampler's initials on the label in the spaces provided;
- Place each sample inside of a second zip-lock bag (no label required) and in the cooler.

After Sample Compositing

- Clean the mixing tool immediately after each use;
- Fill out the sample information on the chain of custody form. The chain of custody form records information including sample composite preparation date, sample IDs, material sampling location, composite sample ID, and sampler's information. An example of the chain of custody form is presented in Appendix A.

At the End of the ALT Source Test

- SMC to ship the cooler(s) containing all of the composite samples to the laboratory for analysis and keep the back-up samples and chain of custody form on file.

5. QA/QC

The SMC Project Manager is to review the chain of custody form periodically to verify that composite samples are prepared properly and to review/act-upon any comments. The SMC manager is to periodically observe the sample compositing process to verify that the methodology is being followed.

ATTACHEMENT 1: Sampling Summary and Chain of Custody Form

Table 1 - Material and Fuel Sampling Program - Sampling Summary & Chain of Custody

Company Name: _____ Site Name: ECA No. 4614-826K9W (Alt Fuel Demo ECA)

Process Condition	Source Test No.	Material/Fuel Name	Sample Location	Sample No.	Sampling Date	Sampling Time	Sample Code (Process Condition-Source Test No.- Feed Stock - Sample No.)	Sampler's Initials	Sampler's Name	Comments	Composite Sample IDs	Date Composite Sample Prepared	Sampler's Initials	Sampler's Name
Baseline	1	Kiln Feed		1			B-1-KF-1				B-1-KF-L B-1-KF-B			
Baseline	1	Kiln Feed		2			B-1-KF-2							
Baseline	1	Kiln Feed		3			B-1-KF-3							
Baseline	2	Kiln Feed		1			B-2-KF-1				B-2-KF-L B-2-KF-B			
Baseline	2	Kiln Feed		2			B-2-KF-2							
Baseline	2	Kiln Feed		3			B-2-KF-3							
Baseline	3	Kiln Feed		1			B-3-KF-1				B-3-KF-L B-3-KF-B			
Baseline	3	Kiln Feed		2			B-3-KF-2							
Baseline	3	Kiln Feed		3			B-3-KF-3							
Baseline	1	Clinker		1			B-1-CL-1				B-1-CL-L B-1-CL-B			
Baseline	1	Clinker		2			B-1-CL-2							
Baseline	1	Clinker		3			B-1-CL-3							
Baseline	2	Clinker		1			B-2-CL-1				B-2-CL-L B-2-CL-B			
Baseline	2	Clinker		2			B-2-CL-2							
Baseline	2	Clinker		3			B-2-CL-3							
Baseline	3	Clinker		1			B-3-CL-1				B-3-CL-L B-3-CL-B			
Baseline	3	Clinker		2			B-3-CL-2							
Baseline	3	Clinker		3			B-3-CL-3							
Baseline	1	Cement Kiln Dust		1			B-1-CKD-1				B-1-CKD-L B-1-CKD-B			
Baseline	1	Cement Kiln Dust		2			B-1-CKD-2							
Baseline	1	Cement Kiln Dust		3			B-1-CKD-3							
Baseline	2	Cement Kiln Dust		1			B-2-CKD-1				B-2-CKD-L B-2-CKD-B			
Baseline	2	Cement Kiln Dust		2			B-2-CKD-2							
Baseline	2	Cement Kiln Dust		3			B-2-CKD-3							
Baseline	3	Cement Kiln Dust		1			B-3-CKD-1				B-3-CKD-L B-3-CKD-B			
Baseline	3	Cement Kiln Dust		2			B-3-CKD-2							
Baseline	3	Cement Kiln Dust		3			B-3-CKD-3							
Baseline	1	Conventional Fuel for Kiln		1			B-1-CFK-1				B-1-CFK-L B-1-CFK-B			
Baseline	1	Conventional Fuel for Kiln		2			B-1-CFK-2							
Baseline	1	Conventional Fuel for Kiln		3			B-1-CFK-3							
Baseline	2	Conventional Fuel for Kiln		1			B-2-CFK-1				B-2-CFK-L B-2-CFK-B			
Baseline	2	Conventional Fuel for Kiln		2			B-2-CFK-2							
Baseline	2	Conventional Fuel for Kiln		3			B-2-CFK-3							
Baseline	3	Conventional Fuel for Kiln		1			B-3-CFK-1				B-3-CFK-L B-3-CFK-B			
Baseline	3	Conventional Fuel for Kiln		2			B-3-CFK-2							
Baseline	3	Conventional Fuel for Kiln		3			B-3-CFK-3							
Baseline	1	Conventional Fuel for Calciner		1			B-1-CFC-1				B-1-CFC-L B-1-CFC-B			
Baseline	1	Conventional Fuel for Calciner		2			B-1-CFC-2							
Baseline	1	Conventional Fuel for Calciner		3			B-1-CFC-3							
Baseline	2	Conventional Fuel for Calciner		1			B-2-CFC-1				B-2-CFC-L B-2-CFC-B			
Baseline	2	Conventional Fuel for Calciner		2			B-2-CFC-2							
Baseline	2	Conventional Fuel for Calciner		3			B-2-CFC-3							
Baseline	3	Conventional Fuel for Calciner		1			B-3-CFC-1				B-3-CFC-L B-3-CFC-B			
Baseline	3	Conventional Fuel for Calciner		2			B-3-CFC-2							
Baseline	3	Conventional Fuel for Calciner		3			B-3-CFC-3							
Baseline	1	Cement		1			B-1-CM-1				B-1-CM-L B-1-CM-B			
Baseline	1	Cement		2			B-1-CM-2							
Baseline	1	Cement		3			B-1-CM-3							
Baseline	2	Cement		1			B-2-CM-1				B-2-CM-L B-2-CM-B			
Baseline	2	Cement		2			B-2-CM-2							
Baseline	2	Cement		3			B-2-CM-3							

Table 1 - Material and Fuel Sampling Program - Sampling Summary & Chain of Custody

Company Name: _____ Site Name: ECA No. 4614-826K9W (Alt Fuel Demo ECA)

Process Condition	Source Test No.	Material/Fuel Name	Sample Location	Sample No.	Sampling Date	Sampling Time	Sample Code (Process Condition-Source Test No.- Feed Stock - Sample No.)	Sampler's Initials	Sampler's Name	Comments	Composite Sample IDs	Date Composite Sample Prepared	Sampler's Initials	Sampler's Name
Baseline	3	Cement		1			B-3-CM-1				B-3-CM-L B-3-CM-B			
Baseline	3	Cement		2			B-3-CM-2							
Baseline	3	Cement		3			B-3-CM-3							

Table 1 - Material and Fuel Sampling Program - Sampling Summary & Chain of Custody

Company Name: _____ Site Name: ECA No. 4614-826K9W (Alt Fuel Demo ECA)

Process Condition	Source Test No.	Material/Fuel Name	Sample Location	Sample No.	Sampling Date	Sampling Time	Sample Code (Process Condition-Source Test No.- Feed Stock - Sample No.)	Sampler's Initials	Sampler's Name	Comments	Composite Sample IDs	Date Composite Sample Prepared	Sampler's Initials	Sampler's Name
Alt Fuel	1	Kiln Feed		1			ALT-1-KF-1				ALT-1-KF-L ALT-1-KF-B			
Alt Fuel	1	Kiln Feed		2			ALT-1-KF-2							
Alt Fuel	1	Kiln Feed		3			ALT-1-KF-3							
Alt Fuel	2	Kiln Feed		1			ALT-2-KF-1				ALT-2-KF-L ALT-2-KF-B			
Alt Fuel	2	Kiln Feed		2			ALT-2-KF-2							
Alt Fuel	2	Kiln Feed		3			ALT-2-KF-3							
Alt Fuel	3	Kiln Feed		1			ALT-3-KF-1				ALT-3-KF-L ALT-3-KF-B			
Alt Fuel	3	Kiln Feed		2			ALT-3-KF-2							
Alt Fuel	3	Kiln Feed		3			ALT-3-KF-3							
Alt Fuel	1	Clinker		1			ALT-1-CL-1				ALT-1-CL-L ALT-1-CL-B			
Alt Fuel	1	Clinker		2			ALT-1-CL-2							
Alt Fuel	1	Clinker		3			ALT-1-CL-3							
Alt Fuel	2	Clinker		1			ALT-2-CL-1				ALT-2-CL-L ALT-2-CL-B			
Alt Fuel	2	Clinker		2			ALT-2-CL-2							
Alt Fuel	2	Clinker		3			ALT-2-CL-3							
Alt Fuel	3	Clinker		1			ALT-3-CL-1				ALT-3-CL-L ALT-3-CL-B			
Alt Fuel	3	Clinker		2			ALT-3-CL-2							
Alt Fuel	3	Clinker		3			ALT-3-CL-3							
Alt Fuel	1	Cement Kiln Dust		1			ALT-1-CKD-1				ALT-1-CKD-L ALT-1-CKD-B			
Alt Fuel	1	Cement Kiln Dust		2			ALT-1-CKD-2							
Alt Fuel	1	Cement Kiln Dust		3			ALT-1-CKD-3							
Alt Fuel	2	Cement Kiln Dust		1			ALT-2-CKD-1				ALT-2-CKD-L ALT-2-CKD-B			
Alt Fuel	2	Cement Kiln Dust		2			ALT-2-CKD-2							
Alt Fuel	2	Cement Kiln Dust		3			ALT-2-CKD-3							
Alt Fuel	3	Cement Kiln Dust		1			ALT-3-CKD-1				ALT-3-CKD-L ALT-3-CKD-B			
Alt Fuel	3	Cement Kiln Dust		2			ALT-3-CKD-2							
Alt Fuel	3	Cement Kiln Dust		3			ALT-3-CKD-3							
Alt Fuel	1	Conventional Fuel for Kiln		1			ALT-1-CFK-1				ALT-1-CFK-L ALT-1-CFK-B			
Alt Fuel	1	Conventional Fuel for Kiln		2			ALT-1-CFK-2							
Alt Fuel	1	Conventional Fuel for Kiln		3			ALT-1-CFK-3							
Alt Fuel	2	Conventional Fuel for Kiln		1			ALT-2-CFK-1				ALT-2-CFK-L ALT-2-CFK-B			
Alt Fuel	2	Conventional Fuel for Kiln		2			ALT-2-CFK-2							
Alt Fuel	2	Conventional Fuel for Kiln		3			ALT-2-CFK-3							
Alt Fuel	3	Conventional Fuel for Kiln		1			ALT-3-CFK-1				ALT-3-CFK-L ALT-3-CFK-B			
Alt Fuel	3	Conventional Fuel for Kiln		2			ALT-3-CFK-2							
Alt Fuel	3	Conventional Fuel for Kiln		3			ALT-3-CFK-3							
Alt Fuel	1	Conventional Fuel for Calciner		1			ALT-1-CFC-1				ALT-1-CFC-L ALT-1-CFC-B			
Alt Fuel	1	Conventional Fuel for Calciner		2			ALT-1-CFC-2							
Alt Fuel	1	Conventional Fuel for Calciner		3			ALT-1-CFC-3							
Alt Fuel	2	Conventional Fuel for Calciner		1			ALT-2-CFC-1				ALT-2-CFC-L ALT-2-CFC-B			
Alt Fuel	2	Conventional Fuel for Calciner		2			ALT-2-CFC-2							
Alt Fuel	2	Conventional Fuel for Calciner		3			ALT-2-CFC-3							
Alt Fuel	3	Conventional Fuel for Calciner		1			ALT-3-CFC-1				ALT-3-CFC-L ALT-3-CFC-B			
Alt Fuel	3	Conventional Fuel for Calciner		2			ALT-3-CFC-2							
Alt Fuel	3	Conventional Fuel for Calciner		3			ALT-3-CFC-3							
Alt Fuel	1	Cement		1			ALT-1-CM-1				ALT-1-CM-L ALT-1-CM-B			
Alt Fuel	1	Cement		2			ALT-1-CM-2							
Alt Fuel	1	Cement		3			ALT-1-CM-3							
Alt Fuel	2	Cement		1			ALT-2-CM-1				ALT-2-CM-L ALT-2-CM-B			
Alt Fuel	2	Cement		2			ALT-2-CM-2							
Alt Fuel	2	Cement		3			ALT-2-CM-3							

Table 1 - Material and Fuel Sampling Program - Sampling Summary & Chain of Custody

Company Name: _____ Site Name: ECA No. 4614-826K9W (Alt Fuel Demo ECA)

Process Condition	Source Test No.	Material/Fuel Name	Sample Location	Sample No.	Sampling Date	Sampling Time	Sample Code (Process Condition-Source Test No.- Feed Stock - Sample No.)	Sampler's Initials	Sampler's Name	Comments	Composite Sample IDs	Date Composite Sample Prepared	Sampler's Initials	Sampler's Name
Alt Fuel	3	Cement		1			ALT-3-CM-1				ALT-3-CM-L ALT-3-CM-B			
Alt Fuel	3	Cement		2			ALT-3-CM-2							
Alt Fuel	3	Cement		3			ALT-3-CM-3							

Pre-Source-Test Checklist

Company Name: St. Marys Cement
Site Name: Bowmanville Plant
ECA No. 4614-826K9W
Project: Alt Fuel Demo

Test Date:
Test Start Time:
Test End Time:

Test Description: Alt Fuel
Inspector Name:

1 **Has the following equipment been turned on prior to source test?**

		Yes/No	Consistent Rate?
1.1	Raw mill		n/a
1.2	Fuel mill		n/a
1.3	By pass		
1.4	Ammonia injection		
1.5	Lime injection		

2	**Has clinker production reached near maximum capacity (5700 - 6300 tonnes/day)?**	
3	**Is the same typical raw material blend (for primary cement product) used?**	
4	**NO use of LCF/alt fuels at ANY TIME during baseline testing.**	
5	**NO use of LCF/alt fuels during start-up, shut down or upset conditions during LCF/Alt Fuel testing.**	

6 **Are the following parameters being recorded by the CEMS properly? (Yes/No)**

	Parameter	SMC PI Tags	Daily Maximum	Daily Minimum	Daily Average	Percent Availability
6.1	NOx	NO: \\bowcntpi\K1_AI2_63_3652.PNT, NO2:K1_AI5_63_3652.PNT				
6.2	SO2	\\bowcntpi\K1_AI1_63_3652.PNT				
6.3	Opacity	\\bowcntpi\K1_AI1_63_365.PNT				
6.4	Temperature of gases leaving the kiln	\\bowcntpi\K1_TI1_63_410.PNT				
6.5	Temperature of gases leaving the calciner	\\bowcntpi\K1_TI8_63_2203.PNT				
6.6	Residual Oxygen at back end of the kiln	\\bowcntpi\K1_AI3_63_265.PNT				
6.7	Residual Oxygen at calciner down comer duct	\\bowcntpi\K1_AI1_63_203.PNT				
6.8	CO at back end of the kiln?	\\bowcntpi\K1_AI1_63_265.PNT				
6.9	CO at calciner down comer duct	\\bowcntpi\K1_AI2_63_203.PNT				
6.10	THC (as CH4) in kiln stack gas	\\bowcntpi\K1_AI7_63_3652.PNT				

7 **Is the following equipment operating under negative pressure?**

	Equipment	SMC PI Tags	Yes/No
7.1	Kiln	\\bowcntpi\K1_PI2_63_410.PNT	
7.2	Calciner	\\bowcntpi\K1_PI1_63_252.PNT	
7.3	Preheater tower	\\bowcntpi\K1_PI1_63_210.PNT	
7.4	Raw mill	\\bowcntpi\RM1_PI2_53_201.PNT	

8 **Are the following parameters being recorded by PI properly?**

	Parameter	SMC PI Tags	Yes/No
8.1	Raw material feed rate	\\bowcntpi\RM1_PIC_53_201.MEAS	
8.2	Conventional fuel feed rate - kiln	\\bowcntpi\K1_FI1_63_696.PNT	
8.3	Conventional fuel feed rate - calciner	\\bowcntpi\K1_FI1_63_693.PNT	
8.4	LCF/Alt fuel feed rate - kiln		
8.5	LCF/Alt fuel feed rate - calciner	\\bowcntpi\K1_FI1_63_935.PNT	
8.6	Clinker hourly production rate	\\bowcntpi\K1_FI1_63_410, daily, divide by 24	
8.7	Calciner feed	\\bowcntpi\K1_FI1_63_124.PNT	
8.8	Kiln feed	\\bowcntpi\K1_FI1_63_125.PNT	

Initial below

9 **If Yes to all of the above questions, notify the source testing crew to start sampling.**

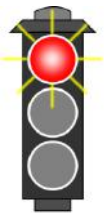
Comments:

Appendix Q

Alternative fuel docking procedure

DOCKING PROCEDURE

1. Make sure that you are using all PPE to start this procedure



2. IDENTIFY the empty trailer (RED traffic light)

3. PRESS the Stop button in front of the hydraulic System to disengage the trailer

4. DISCONNECT the two hydraulic lines from the empty trailer

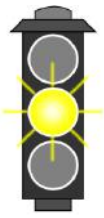
5. TOW away the empty trailer

6. Before you park the new trailer, OPEN Ecodock door

7. OPEN trailer door

8. SET the SAMPLE on yellow box
   (write date and bill number)

9. PARK the full trailer in position (traffic light will be YELLOW)

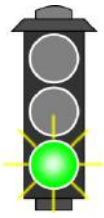


10. DISCONNECT truck from the trailer

11. CONNECT the two hydraulic lines to the full trailer

12. Make sure you are setting the trailer to unload the material

13. PRESS the ENABLE button in front of the hydraulic system (traffic light will be GREEN)



Process is complete!

Questions call <u>239</u>

Appendix D. Summary of Alternative Fuel Laboratory Test Results

Sample Information					Laboratory Results																										
Date	Sample Source	Sample Type	Sample Description		Calorific Value		Moisture Content	Total Halogen Content	Total Chlorine	Sulfur	Carbon	Ash Content		Antimony (Sb)	Arsenic (As)	Barium (Ba)	Beryllium (Be)	Cadmium (Cd)	Chromium (Cr)	Cobalt (Co)	Iron (Fe)	Lead (Pb)	Manganese (Mn)	Nickel (Ni)	Selenium (Se)	Silver (Ag)	Tin (Sn)	Vanadium (V)	Mercury (Hg)		
					BTU/lb	MJ/kg	% wt.	% wt.	% wt.	% wt.	% wt.	% wt.		ug/g	ug/g	ug/g	ug/g	ug/g	ug/g	ug/g	ug/g	ug/g	ug/g	ug/g	ug/g	ug/g	ug/g	ug/g			
				SMC Proposed Operational Parameters		>10	<25	<1																								
9/25/2018	Durham Disposal	Trial 1 Blend	Blend 1A Blend Residue		8263	19.219	14.21	0.03	0.02	0.09	48.46	4.94		0.1	0.1	8.6	<0.1	<0.1	5.8	0.1	255.7	0.1	24.3	0.1	<0.1	<0.1	0.1	<0.1	<0.001		
10/1/2018	Durham Disposal	Trial 1 Blend	2B		8990	20.91	7.49	0.38	0.37	0.01	43.85	5.04		0.1	0.1	51.5	<0.1	<0.1	14.4	0.1	495.7	0.1	23.7	14.7	<0.1	<0.1	0.1	<0.1	<0.001		
10/5/2018	Durham Disposal	Trial 1 Blend	4A		8766	20.39	18.04	0.18	0.17	0.22	46.06	5.56		0.1	0.1	90.8	<0.1	<0.1	9	0.1	3484.4	0.1	48.5	7.7	<0.1	<0.1	0.1	<0.1	<0.001		
10/5/2018	Durham Disposal	Trial 1 Blend	5B		7219	16.791	13.37	0.61	0.59	0.19	40.23	5.44		0.1	0.1	81.5	<0.1	<0.1	6.9	0.1	2943.4	15.1	47.4	5.6	<0.1	<0.1	0.1	<0.1	<0.001		
10/10/2018	Durham Disposal	Trial 1 Blend	Blend 2 - 2A Oct 10, 2018 Alt Fuel		7042	16.379	21.79	0.13	0.12	0.12	40.23	2.21		0.1	168.2	10.7	<0.1	<0.1	210.7	0.1	412.7	0.1	25.1	0.1	<0.1	<0.1	0.1	<0.1	<0.001		
10/10/2018	Durham Disposal	Trial 1 Blend	Blend 2 - 4A Oct 10, 2018 Alt Fuel		6623	15.405	25.44	0.18	0.16	0.27	36.59	3.53		0.1	0.1	18	<0.1	<0.1	6.3	0.1	574.6	8.7	37.1	3.5	<0.1	<0.1	0.1	<0.1	<0.001		
10/11/2018	Durham Disposal	Trial 1 Blend	Blend 3 - 1A Oct 11/18 Alt Fuel		7520	17.491	13.26	0.24	0.22	0.13	42.82	6.44		0.1	0.1	57.6	<0.1	<0.1	19.2	0.1	952.6	0.1	33.8	5.3	<0.1	<0.1	0.1	<0.1	<0.001		
10/12/2018	Durham Disposal	Trial 1 Blend	Blend 3 - 2A Oct 12/18 Alt Fuel		7448	17.324	20.74	0.12	0.11	0.14	41.05	6.5		0.1	0.1	25.9	<0.1	<0.1	7	0.1	821	0.1	34.7	4.8	<0.1	<0.1	0.1	<0.1	<0.001		
10/15/2018	Durham Disposal	Trial 1 Blend	Blend 3 - 4A Oct 15/18 Alt Fuel		7882	18.333	19.07	0.16	0.14	0.22	41.74	3.55		0.1	0.1	17.9	<0.1	<0.1	13.6	0.1	581.6	0.1	29	3.2	<0.1	<0.1	0.1	<0.1	<0.001		
11/30/2018	U-Pak	Trial 2 Blend	11115 SMC Blended 1A Wood/plastic		6078	14.137	24.23	0.48	0.47	0.12	38.01	4.29		0.1	15.9	23.1	<0.1	<0.1	21.8	1.1	801.6	0.1	52	2.8	<0.1	<0.1	0.1	<0.1	<0.001		
11/30/2018	U-Pak	Trial 2 Blend	11115 SMC Blend 3A, Wood/Plastic		7055	16.411	23.95	0.56	0.55	0.2	38.29	2.92		0.1	6.1	36.9	<0.1	<0.1	19.2	2	779.9	0.1	65.6	6.3	<0.1	<0.1	0.1	<0.1	<0.001		
12/3/2018	U-Pak	Trial 2 Blend	11130 Wood/Plastic Blend #4A		7167	16.669	20.06	0.94	0.91	0.37	38.05	3.85		22.1	0.1	51.9	<0.1	<0.1	13.7	0.1	1029.7	0.1	65.1	19.4	<0.1	<0.1	0.1	<0.1	<0.001		
12/3/2018	U-Pak	Trial 2 Blend	11130 Wood/plastic Blend #5A		7132	16.589	20.92	0.38	0.36	0.1	38.32	3.06		28.4	0.1	31.3	<0.1	<0.1	11.8	0.1	854.2	0.1	64.5	4.9	<0.1	<0.1	0.1	<0.1	<0.001		
12/5/2018	U-Pak	Trial 2 Blend	11170 Wood/plastic Blend #6A		7037	16.367	20.35	1.37	1.35	0.4	45.82	15.65		0.1	0.1	55	<0.1	<0.1	15.1	2	5789.9	0.1	98.4	9.4	<0.1	<0.1	0.1	<0.1	<0.001		
12/5/2018	U-Pak	Trial 2 Blend	11170 Wood/plastic Blend #7A		6719	15.629	19.38	1.78	1.75	0.16	40.08	11.39		133.6	0.1	52	<0.1	<0.1	9.8	1.6	709.1	0.1	59	3.9	<0.1	<0.1	0.1	<0.1	<0.001		
12/5/2018	U-Pak	Trial 2 Blend	11170 Wood/plastic Blend #8A		8686	20.203	17.63	2.34	2.31	0.17	44.69	4.41		29.6	0.1	39.1	<0.1	<0.1	14.3	1.9	1965.1	0.1	91.8	5.6	<0.1	<0.1	0.1	<0.1	<0.001		
11/30/2018	U-Pak	Trial 2 Blend	11297 Fuel Blend 2A, Nov 30 ,2018		7440	17.304	23.46	2.99	2.91	0.51	39.32	4.43		29.6	0.1	22.2	<0.1	<0.1	13.2	0.1	630.2	0.1	57.4	0.1	<0.1	<0.1	19.8	<0.1	<0.001		
12/5/2018	U-Pak	Trial 2 Blend	11297 Fuel Blend 6B, Dec 5,2018		6732	15.568	19.4	2.19	2.12	0.01	37.33	11.39		0.1	0.1	59.6	<0.1	<0.1	10	0.1	1502.2	0.1	77.4	1.2	<0.1	<0.1	0.1	<0.1	<0.001		
12/5/2018	U-Pak	Trial 2 Blend	11297 Fuel Blend 7B, Dec 5,2018		6681	15.539	17.65	1.99	1.93	0.16	41.6	5.33		0.1	0.1	37.6	<0.1	<0.1	17	0.1	2447.3	0.1	122.8	5.2	<0.1	<0.1	17.7	<0.1	<0.001		
12/5/2018	U-Pak	Trial 2 Blend	11297 Fuel Blend 8B, Dec 5,2018		7722	17.962	16.79	3.42	3.31	0.19	43.03	6.5		0.1	0.1	38	<0.1	<0.1	8.6	1.4	1446.7	0.1	87.6	0.1	<0.1	<0.1	13.3	<0.1	<0.001		
																														kcal/kg	
			Trial 1 MEAN		7750.33	18.03	17.05	0.23	0.21	0.15	42.34	4.80		0.10	18.78	40.28	<0.1	<0.1	32.54	0.10	1169.08	2.72	33.73	5.00	<0.1	<0.1	0.10	<0.1	<0.001		
			Trial 1 MEDIAN		7520	17.49	18.04	0.18	0.16	0.14	41.74	5.04		0.1	0.1	25.9	<0.1	<0.1	9	0.1	581.6	0.1	33.8	4.8	<0.1	<0.1	0.1	<0.1	<0.001		4180.454
			Trial 2 MEAN		7,082.6	16.47	21.0	1.49	1.45	0.23	39.78	5.7		20.3	2.8	38.3	<0.1	<0.1	14.6	0.9	1,378.2	0.1	71.6	5.8	<0.1	<0.1	4.5	<0.1	<0.001		
			Trial 2 MEDIAN		7,093.5	16.50	20.5	1.36	1.32	0.19	38.82	4.4		18.5	0.1	37.7	<0.1	<0.1	13.3	1.0	942.0	0.1	65.4	4.7	<0.1	<0.1	0.1	<0.1	<0.001		3943.599

Appendix E. Design and Operations Manual

Design and Operations Report (includes project description, plans, zoning map)

HDR Engineering

Bowmanville Cement Plant
Design and Operations Report
Environmental Compliance Approval for Regular Use of Low Carbon Alternative Fuel (Woody Biomass)

May 2014

HDR

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TABLES

FIGURES

EXECUTIVE SUMMARY

St. Marys Cement Inc. (Canada) (SMC) is submitting an application to the Ministry of the Environment for an Environmental Compliance Approval for a Thermal Treatment Facility, in order to regularly use low carbon alternative fuel (woody biomass) at its cement plant located in Bowmanville, Ontario.

The Bowmanville Cement Plant would be a Thermal Treatment Site as defined under Section 23 (4) of O. Reg. 101/07 as:

- this is an industrial facility;
- the primary purpose of the facility is not waste management;
- not more than 100 tonnes per day (tpd) of alternative fuel would be received at the facility;
- energy from waste (EFW) is produced at the site; and,
- all of the EFW produced will be used at the facility.

This Design and Operations Report is provided as part of the supporting documents for the Environmental Compliance Approval (ECA) application package. It provides background information concerning the Bowmanville Cement Plant's current operations that are relevant to the management of low carbon alternative fuel and a detailed description of the proposed design and operating methods for the alternative fuel handling system.

The following summarizes the information provided in this submission:

- The site location maps, land-use maps and site plans are provided in Appendices A through C respectively.
- General arrangements for the proposed low carbon alternative fuel (woody biomass) handling system are provided in **Appendix H**. SMC will provide to the Director and District Manager copies of final layout drawings bearing the stamp of a Professional Engineer prior to the commencement of construction.
- The proposed low carbon alternative fuel would consist of woody biomass derived from industrial and post-consumer sources.
- SMC also proposes to use clean wood as defined by O.Reg. 347 as a fuel (Section 3.2);
- Operational and environmental specifications for the proposed low carbon alternative fuel are provided in Section 3.3;
- The service area for the receipt of low carbon alternative fuel would be the Province of Ontario, and only alternative fuel generated in the Province of Ontario shall be accepted at the site (Section 3.4);
- It is proposed that the site be approved to utilize alternative fuel at a maximum rate of up to100 tonnes per day (Section 3.5);
- It is proposed that no more than 100 tonnes per day of alternative fuel would be received at the site (Section 3.5);
- It is proposed that the maximum amount of alternative fuel that may be present at the Site at any one time would not exceed 500 tonnes (Section 6.1.6);

- The hours of operation of the plant and for regular use of alternative fuel would be up to 24 hours a day, seven days a week, 365 days a year (Section 4.1);
- Truck traffic (volumes and access routes) as well as potential impacts are addressed in Section 4.2. No impacts from truck traffic associated with the trucks hauling alternative fuel are expected given that the potential increase in truck traffic with the use of alternative fuel will be in the order of 1.1 to 1.2% of the overall truck traffic accessing the Bowmanville Facility;
- Provisions for the inspection and testing of the alternative fuel by trained personnel are included in Sections 6.1.4 and 6.1.5;
- The handling of the alternative fuel will be undertaken by trained personnel, trained in accordance with SMC's current training protocols (Section 7.2);
- The low carbon alternative fuel handling building and equipment will be inspected each day to ensure that it is secure and that the operation of the low carbon alternative fuel handling system is not causing any nuisances or adverse effects on the environment(Section 8.8);
- Existing complaint response procedures applicable during regular operations using low carbon alternative fuel are described in Section 8.7;
- SMC has existing Emergency Response and Contingency plans. These plans and any adjustments related to the regular use of alternative fuel are addressed in Section 8;
- The potential for odour, litter, dust and noise are addressed in Section 9. It is not expected that there will be any odour, litter, dust or noise impacts from the regular use of alternative fuel, given the characteristics of the alternative fuel and as it will be contained either on the transfer trailers, within the Fuel Building or within the closed fuel supply system;
- The reporting methodology that would apply during the regular use of alternative fuel including a description of how data will be collected is provided in Section 10.
- The decommissioning plan, which consists of the removal of any remaining low carbon alternative fuel should the alternative fuel system be decommissioned is described in Section 11.
- Information is also included in order to provide a clear description of the Bowmanville Cement Plant, including the physical layout of the site, a description of the cement making process and the current emissions control systems (Section 5 and 7).
- Information on the current operation of the plant is included in Section 7.3 which provides detail on the design and operation of the cement plant and Section 9.6, which includes a description of the emissions controls for the facility.

Based on the facility specific emissions analysis presented in the ECA (Air) application package, it is anticipated that the use of low carbon alternative fuel comprised of woody residuals, will prove to be a sustainable, feasible and environmentally responsible method of managing these materials.

SMC believes there are several potential environmental benefits to using low carbon alternative fuel (woody biomass). These benefits include:

- Reducing St. Marys reliance on non-renewable fossil fuels, and therefore reducing the environmental impacts associated with the extraction/mining and refining of these fossil fuels;

- Potentially reducing certain emissions such as sulphur dioxide (SO_2), as the alternative fuel has a much lower sulphur content compared to the fossil fuels currently used at the plant; and,
- Reducing greenhouse gas emissions. Studies of greenhouse gas emissions indicate that using woody biomass residuals in a cement kiln will reduce GHG emissions. The use of alternative fuel by cement plants in other jurisdictions is an accepted practice that is recognized as contributing to efforts to reduce GHG emissions and to address climate change.

Outside of these benefits, it is also anticipated that the use of the proposed materials as alternative fuel will direct materials to beneficial use as fuel and away from landfill disposal, in accordance with the waste value chain within Ontario's Provincial Policy Statement on Waste Management Planning (2007).

Section 1: INTRODUCTION

St. Marys Cement Inc. (SMC) has been manufacturing cement and related construction products for over 100 years and has become a leading manufacturer of these products in Canada and around the world. SMC strives to operate its facilities in an environmentally responsible manner, and has been recognized for its efforts in increasing plant efficiency.

Low carbon alternative fuels are non-fossil derived fuels that yield energy and environmental benefits including GHG emission reductions. Since the 1970s, traditional fuels used in the cement making process have been successfully supplemented with low carbon alternative fuel in numerous countries (including areas in Western Europe, the United States, Canada, Australia, South America and Japan).

SMC has identified solid residual materials from industrial or post consumer sources, including woody biomass, as sustainable, feasible and environmentally responsible alternative fuel. SMC believes there are several potential environmental benefits to using alternative fuel. These benefits include:

- Reducing SMC's reliance on non-renewable fossil fuels, and therefore reducing the environmental impacts associated with the extraction/mining and refining of these fossil fuels;
- Potentially reducing certain emissions such as sulphur dioxide (SO_2), as the alternative fuel has a much lower sulphur content compared to the current fossil fuels used at the plant; and,
- Reducing greenhouse gas emissions (GHG). Studies of greenhouse gas emissions indicate that using woody biomass residuals in a cement kiln will reduce GHG emissions. The use of alternative fuel by cement plants in other jurisdictions is an accepted practice that is recognized as contributing to efforts to reduce GHG emissions and to address climate change.

The application and supporting documentation for the ECA (Air and Noise) assumes a maximum emission scenario using the highest contaminant emission rate from conventional fuel, a portion of conventional fuel substituted with clean wood, or a portion of conventional fuel substituted with low carbon alternative fuel. The results of this assessment show that:

- Particulate, combustion gases, HCl, ammonia, trace metals and organic compounds including dioxins and furans will remain below, and for the most part, very well below the Ministry of the Environment's (MOE) Point Of Impingement (POI)
- With respect to trace metals, the predicted change in air quality when up to 100 tpd of low carbon alternative fuel (woody biomass) is substituted for conventional fuel is insignificant (i.e. the increase or decrease in the maximum POI concentration is less than 0.0016 $\mu g/m^3$ or less than 0.5% of the POI limit.
- With respect to organic compounds including dioxins and furans, no appreciable change in organic emissions are expected. Unlike metals, organic compounds entering the combustion systems will be entirely destroyed by the high system temperatures. While there is a potential for the formation of new organic compounds as the kiln gases cool (regardless of the type of fuel used), the current system design controls and limits organic formation by rapidly reducing the gas temperature over the temperature range that new organic compounds can form.

These predicted air quality impacts are expected as: fuel makes about 10% of the total mass of material entering the kiln; at the proposed fuel substitution rate the low carbon alternative fuel (woody biomass) will make up less than 1 % of the total mass of material entering the kiln; and the raw materials themselves contain both trace metals and chlorine. As such Point-Of-Impingement concentrations are dominated by the raw materials rather than the fuel.

These estimates are very consistent with the results of the successful alternative fuel demonstration using post-composting residual material as an alternative fuel at the St. Marys cement plant in St. Marys, Ontario.

This demonstration confirmed that:

- The fuel feeding system selected by SMC (with minor adjustments) can successfully supply alternative fuel to the cement kiln at a rate that maintains internal flame temperature within the expected limits; and,
- The St Marys Cement Plant complied with the Ministry of the Environment (MOE) requirements for air quality, odour, dust and litter at all times when alternative fuels were managed at the Facility.

The design of the fuel feeding system for the Bowmanville will be very similar to that used in the St Marys Ontario demonstration.

This Design and Operations Report has been prepared to support an application to the MOE for SMC to be granted approval to use low carbon alternative fuel (woody biomass) on a permanent basis at its Bowmanville, Ontario Cement Plant.

This Design and Operations Report (Report) has been prepared in accordance with the MOE's Guide to Applying for an Environmental Compliance Approval (December 2012). In accordance with the MOE Guidelines, this Report will be maintained current at all times through the routine review of the Report by facility staff so that it continues to reflect the current practices and conditions at the facility.

Section 2: SITE PLAN AND LOCATION – BOWMANVILLE CEMENT PLANT

2.1 Site Location

The facility is located on the north shore of Lake Ontario, south of Highway 401 at the south west corner of the South Service Road and Waverly Road in Bowmanville, Ontario. The total size of the property owned by St. Marys Cement at its Bowmanville location is approximately 331 hectares (including lands used by Cargo Dockers under lease to St. Marys Cement).

The property occupied by the OPG, Darlington Nuclear Generating Plant is located immediately to the west of the St. Marys property. Lake Ontario is located to the south of the facility. On the east side of the St. Marys property, is an environmental protection area occupied by the Westside Marsh and Westside Creek. To the north of the St. Marys property, is the CN rail line, a hydro corridor, a narrow strip of land zoned for light industrial use around 350 metres north of the plant that includes some commercial/residential (legal non-conforming) land use and Hwy 401.

A Site Location Map (Figure 1) and Topographic map (Figure 2) are located in **Appendix A**.

2.2 Official Plan Designation and Zoning

The area occupied by the Bowmanville cement plant is designated as General Industrial Area (subject to a deferral by the Region of Durham) and Special Policy Area C (Aggregate Extraction Area) under the Regional Municipality of Durham, Official Plan. This area is designated as M3-1, Extractive Industrial under the Town of Clarington Zoning By-law 84-63. Official Plan and Zoning By-law maps are provided in **Appendix B**.

In a decision rendered by the Court of Appeal for Ontario, it was determined that the use of alternative fuel does not constitute a new land use and would be permissible for the purposes of Zoning By-law 84-63.

2.3 Adjacent Land Use

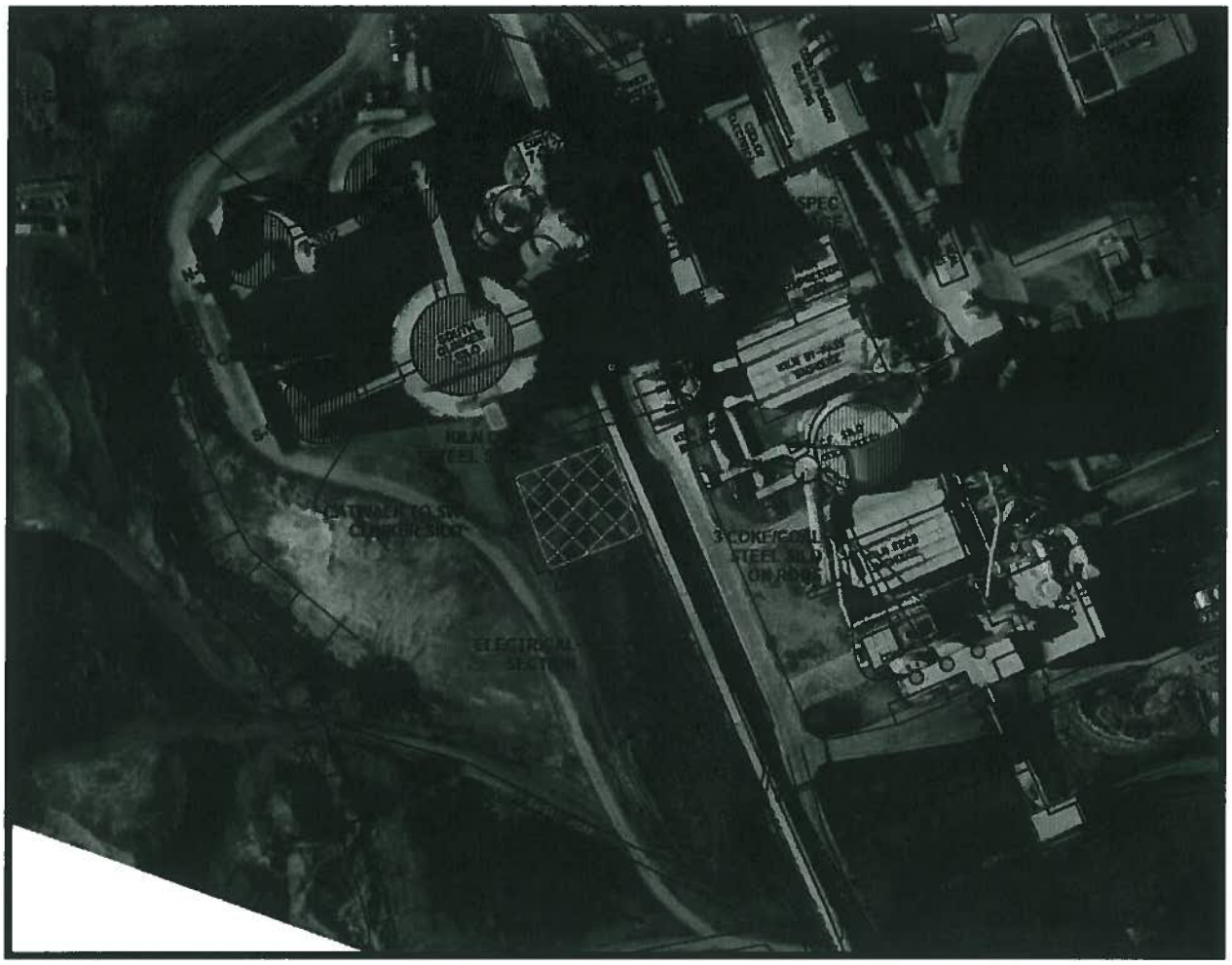
Under the Official Plan, the areas surrounding the Bowmanville cement plant property to the north and the east are designated variously as waterfront greenway; environmental protection area and light industrial (see **Appendix B**). Under the Town of Clarington Zoning By-law, the areas surrounding the St. Marys Bowmanville cement plant property to the north and the east are designated variously as: environmental protection, agricultural, residential shoreline, service station commercial and dry light industrial (see **Appendix B**). There is one residential receptor located approximately 350 m to the north of the plant close to Highway 401; the next closest residences are located approximately 1,500 meters to the southeast of the plant along the lakeshore.

2.4 Site Plan and Cement Plant Layout

2.4.1 Site Plan

Appendix C includes a copy of the Site Plan, including the access roads and buildings located on the Site. Figure 1 presents an overview of the layout of the principle features of the cement plant. On this drawing, the proposed location of the Alternative Fuel Building that would be used to receive, store and manage the low carbon alternative fuel and the fuel feed system is indicated.

Figure 1: Principle Features of the Bowmanville Cement Plant



Section 3: LOW CARBON ALTERNATIVE FUEL

3.1 Alternative Fuel Sources and Characteristics

St. Marys has identified solid residual materials from industrial or post consumer sources, consisting primarily of woody residuals as sustainable, feasible and environmentally responsible alternative fuels for regular use at the Bowmanville cement plant. These materials are consistent with those that are in common use as alternative fuel in other jurisdictions around the globe.

The proposed low carbon alternative fuel:

- has a reasonable heat of combustion;
- will meet the requirements of the alternative fuel feed system;
- will not introduce parameters into the kiln system in quantities that would impact the quality of the cement product or emissions from the Facility to a statistically significant extent; and,
- is available in a form that can be managed effectively at the site such that it does not increase the potential for emissions of dust, odour or litter from the Facility.

St. Marys intends to use these alternate fuels in both the kiln main burner and in the calciner. The materials are produced as a result of processing construction and demolition materials by facilities located in the province of Ontario.

The sources of the alternative fuel will be construction and demolition material processing facilities which will be responsible for preparing a woody biomass material stream suitable for use by St Marys. Processing activities undertaken by the construction and demolition processing facilities will include: screening of incoming material and removal of unacceptable materials (copper or arsenic treated wood, asbestos, hazardous materials), removal of non-combustible materials (metals, stone etc.), size reduction (1 metre or less particle sizes).

Table 1 provides a summary of the physical and chemical characteristics of the alternative fuel proposed for regular use at the Bowmanville cement plant. This analytical data was acquired by obtaining multiple samples of materials generated by two construction and demolition wood processing facilities in Ontario. The sampled materials represent different grades of woody biomass generated at different points in their operation. A detailed table presenting the analytical results for each sample is provided in **Appendix F**.

Table 1: Characteristics of the Low Carbon Alternative Fuel, Compared to Conventional Fuel

Parameter	Units	Alternative Fuel (1)	Conventional Fuel – (2,3)
Gross Calorific Value	MJ/kg	17.79	-
Sulphur	%	0.49	5.00
Chlorine	%	0.06	0.00
Antimony	ug/g	8.18	0.6
Arsenic	ug/g	24.20	3
Barium	ug/g	41.75	15
Beryllium	ug/g	0.04	0.4
Cadmium	ug/g	0.25	0.1
Chromium	ug/g	44.34	7
Cobalt	ug/g	1.56	2
Copper	ug/g	27.25	7
Iron	ug/g	1,145.38	2935
Lead	ug/g	48.59	5
Manganese	ug/g	67.87	80
Mercury	ug/g	NA	0.1
Nickel	ug/g	17.73	101
Selenium	ug/g	NA	3
Silver	ug/g	NA	0.6
Vanadium	ug/g	11.83	236

ND – Not Detected
NA – Not Available

(1) Average value for alternative fuel of various grades as provided by two different Construction and Demolition material processors.

(2) Average heavy metal concentrations taken from St Marys Cement Inc. Bowmanville Plant, QA/QC lab analyses for the past 5 years.

(3) Maximum sulphur and chlorine content for petroleum coke from the St Marys Cement Inc. Bowmanville Plant 2007 Stack Test.

The low-carbon woody biomass materials consist mainly of wood chips, with some fragments of plastic, shingles and other materials present in the construction and demolition material stream. The woody biomass materials include materials with laminate or surface coatings, glue etc. and thus are not defined as 'clean wood' under O. Reg. 347 under the EPA. This material does not include materials containing asbestos or hazardous waste which must be identified and managed according to provincial regulations in a secure manner.

The cement manufacturing process is capable of processing creosote and PCP treated wood, and restricted amounts of other pressure treated wood (CCA, AZCA, ACQ and CA).[1] The C&D material will be

[1] Environment Canada, Industrial Treated Wood Users Guidance Document, September 2004

screened to remove pressure treated wood materials containing copper or arsenic (CCA, AZCA, ACQ and CA wood treatments), less than 5% of the total woody biomass materials would consist of treated wood.

3.2 Fuel Specifications

St. Marys has established specifications for the alternative fuel in order to meet both operational and environmental objectives. The following tables present an overview of these specifications.

Table 2: Alternative Fuel Specifications – Operating Parameters

Operational Specification	Parameter	Rationale
Moisture	≤ 25% by weight	▪ Fuel quality ▪ Prevention of run-off ▪ Consistent heating value
Total Halogen Content	≤ 1% by weight	▪ Fuel quality ▪ Similar to regulatory guideline in other jurisdictions for similar wood waste materials (as well as other materials including plastic, paper, and textiles) ▪ Testing undertaken in accordance with CSA C22.2 No. 0.3 or MIL-DTL-24643
Calorific Value	≥ 10 MJ/kg	▪ Similar to guidance provided by US EPA under CFR 241.3 (d)(1) for non-waste fuels ▪ Ease of operation

Table 3: Alternative Fuel Specifications – Environmental Parameters

Environmental Specification	Parameter	Rationale
Metals and Metal Hydrides	Testing for the following metals in accordance with current adjunct fuel requirements in the St. Marys Plant ECA (Air): ▪ Antimony ▪ Arsenic ▪ Barium ▪ Beryllium ▪ Cadmium ▪ Chromium ▪ Cobalt ▪ Iron ▪ Lead ▪ Manganese ▪ Mercury ▪ Nickel ▪ Selenium ▪ Silver ▪ Tin ▪ Vanadium	▪ Quarterly testing of the alternative fuel for metals currently listed on Schedule of D of the ECA (Air) Number 3779-9BMQW4 ▪ Results of POI concentration modeling based on determination of the proportion of the contribution of the alternative fuel to the mass of the material to the cement plant, should indicate that the POI would not be exceeded. ▪ Applies the current approach for testing of Fuel Adjunct Materials in the Bowmanville Plant ECA (Air) Condition 4. (1) (a)

3.3 Service Area

The proposed service area from within which St. Marys would receive low carbon alternative fuel (woody biomass) is the Province of Ontario.

3.4 Low Carbon Alternative Fuel Quantity

As discussed in Section 7.3.1, fuels would be supplied to the main burner assembly of the cement kiln and/or the calciner. The main burner nozzle of the cement kiln has multiple fuel ports designed for the various types of fuels that can be fed to the process including pet-coke, coal or other pneumatically conveyed solid fuels. The main kiln burner assembly has a fuel supply rate of 10 to 15 tonnes per hour with two main fuel channels for pet coke or coal, and one channel for solid low carbon alternative fuel capable of a fuel supply rate of 0 to 5 tonnes per hour (with an average alternative fuel feed rate of 4 tonnes per hour). Additional channels are used for the preheat gas flame for kiln start-up. The calciner burner assembly is dedicated to petcoke and/or coal or alternative fuels and is capable of consuming approximately 20 to 30 tonnes of pet coke and/or C=coal per hour and up to 5 tonnes per hour of alternative fuels (average alternative fuel feed rate of 4 tonnes per hour per day). Section 7.4 provides details regarding the low carbon alternative fuel feed system.

The Alternative Fuel feed rate to either the kiln or calciner burner would average 4 tonnes per hour.

Assuming a 24 hour per day operation at this maximum rate, the total quantity of low carbon alternative fuel consumed per day would be in the order of:

4 tonnes/hour x 24 hours/day = approximately 100 tonnes per day

For the purpose of this application the maximum quantity of low carbon alternative fuel used would be 100 tonnes per day.

Low carbon alternative fuel would be used 7 days per week under normal operations however; there could be periods of time such as long weekends or delays from the material suppliers, in which no fuels may be received at the site. In order to ensure that there is sufficient fuel in hand to sustain regular low carbon alternative fuel substitution, low carbon alternative fuel that is not utilized in a given operating day, would be stored. St. Marys will require around five (5) days of low carbon alternative fuel supply on-site in storage, to sustain operations over periods in which fuels would not be received at the site. A week's material supply would be in the order of 500 tonnes.

For the purpose of this application, the maximum quantity of low carbon alternative fuel materials that would be received/accepted at the site would be 100 tonnes per day.

In order to ensure the availability of low carbon alternative fuel on a 24/7 basis, a maximum quantity of 500 tonnes of material would be stored inside the Alternative Fuel Building at any one time.

Section 4: LOW CARBON ALTERNATIVE FUEL OPERATIONAL DETAILS

4.1 Hours and Days of Operation

Alternative fuel will be accepted at the Site up to 24 hours per day, 7 days per week. The cement plant operates 12 months per year typically on a 24 hours per day, 7 days per week schedule, with a maximum production capacity of 6,500 tonnes of clinker per day. The hours and days of operation are subject to change depending on market demand as well as plant maintenance.

Alternative fuel will be used at the Site up to 24 hours per day, 7 days per week, subject to fuel availability and in accordance with the scheduled hours and days of operation.

4.2 Traffic & Site Access

Currently, truck traffic entering/leaving the site comes from four main sources.

- Reception of raw materials (including conventional fuel, limestone etc.);
- Raw salt shipments (this material is handled under a separate ECA (Air) by another company (Cargo Dockers) under agreement with St Marys Cement);
- Shipments of cement; and,
- Aggregate shipments.

Conventional fuels are delivered to the site primarily by ship, and are moved and stockpiled at the Facility by truck. A small portion of the conventional fuels are delivered by truck.

If approval is granted for SMC to utilize low carbon alternative fuel, some additional truck traffic will be associated with the reception of low carbon alternative fuel. The low carbon alternative fuel will be transported to the site in enclosed trailers. The nominal volumetric capacity of each trailer is approximately 30 cubic meters or about 20 to 25 tonnes depending upon the bulk density of the material. It is estimated that in the order of 4 to 5 trucks per day would deliver low carbon alternative fuel material to the plant.

Table 4 presents an overview of the truck traffic associated with current plant operations and identifies the potential increase in truck traffic associated with the regular use of alternative fuel.

The low carbon alternative fuel will offset the requirements for conventional fuel at approximately a 3:1 basis (i.e. the heat value of three loads of alternative fuel being equivalent to one load of pet coke), depending on the energy content of the fuel. Conservatively, the potential estimated change in traffic has been calculated assuming no change in the delivery of loads of conventional fuel by truck or the movement of conventional fuels from the dock to the cement plant for loads arriving by ship.

The truck route used to access the Bowmanville cement plant would be Hwy 401 (eastbound), exiting onto Waverly Road south to the main access road to the cement plant. At all times the trucks will be travelling on routes that are designed for higher traffic volumes and/or heavy truck traffic. The on-site route that would be used by the low carbon alternative fuel delivery trucks is identified in **Appendix H**.

Table 4: Estimated Existing and Potential Truck Traffic

		Existing Daily Truck Traffic	
Material	**Timeframe**	**Minimum**	**Maximum**
Cement and Raw Materials	April 1 to November 30	50	142
Raw Salt	November 1 to March 31	175	250
Aggregate	April 1 to December 31	100	300
Clean Wood* **	January 1 to December 31	4	5
Total		**319**	**445**
		Additional Daily Truck Traffic	
	Timeframe	**Minimum***	**Maximum****
Woody Biomass	Year Round, steady state	4	5
	Estimated Change in Truck Traffic	1.2%	0.007%

*Assuming an average of 25 tonnes of fuel per load.
** Assuming an average of 20 tonnes of fuel per load.
*** St Marys Cement is also seeking to use up to 100 tonnes per day of clean wood (as defined in O. Reg. 347), for which an ECA (Air) is required. In the order of 4 to 5 trucks per day would deliver clean wood materials. The ECA (Air) application addresses the air approvals for this material.

Given the small potential increase in truck traffic and that the routes to the site are heavily travelled routes used for existing heavy truck traffic no potential impact from the trucks associated with the delivery of low carbon alternative fuel is anticipated. No impact is anticipated to local traffic and infrastructure.

4.3 Site Security

The Site will be operated and maintained in a secure manner to prevent unauthorized persons from entering the Site. The majority of the Site boundary by is fenced. The primary point of access runs west of Waverley Road to the south of the C.N.R. and is the point of access to the cement plant for truck traffic hauling materials to and from the facility as well as plant staff. The site can be accessed the majority of the time, given that the plant is operated 24/7 for the majority of the year. Closed circuit cameras are used to monitor the facility.

A sign will be posted and maintained at the primary entrance to the Site, This sign will display the following information in a manner that is clear and legible at a distance of twenty-five metres from the public roadway bordering the Site:

- The name of the Site, the Owner and the Operator
- The number of the Environmental Compliance Approval
- The normal hours of operation
- A telephone number to which complaints could be directed;
- A twenty-four (24) hour emergency telephone number (if different from above); and
- A warning against dumping outside the Site.

4.4 Management of Plant/Site Residual Waste

Operation of the Bowmanville Cement Plant generates wastes of types and quantities consistent with any large industrial process.

A partial listing of the types of wastes generated by the plant on a routine basis includes:

- recyclable liquid industrial wastes (oils, coolants, grease, solvents)
- filters
- grinding media
- fluorescent lamp bulbs
- batteries (both motor vehicle type lead acid storage cells and consumer electronics type alkaline cells and rechargeables)
- laboratory waste chemicals
- aerosol cans
- rubber products (conveyor belts and tires)
- used personal protective equipment
- office waste (recyclable paper products, beverage containers, etcetera); and
- maintenance materials (wood, packaging, metal)
- Obsolete /scrap equipment and parts
- General waste generated by staff such as food residuals.

The Bowmanville Cement Plant has a Standard Operating Procedure (SOP) (**Appendix D**) in place for the management of routine wastes generated at the cement plant. This SOP specifies the manner in which routine wastes are to be identified, segregated and managed by waste type. It also includes provisions for ensuring compliance with the appropriate Regulations made under the Provincial Environmental Protection Act (such as generator registration, retention of records and manifests, etcetera). An internal waste audit is conducted annually in an ongoing effort to minimize waste generation while simultaneously identifying opportunities to maximize by product re-use or recycling.

Management of low carbon alternative fuel is not anticipated to result in any impacts on waste management at the facility, as use of low carbon alternative fuel would not result in generation of any

residual wastes. Only rarely, in the event that there is potential for low carbon alternative fuel to be on-site during an extended shut down, would alternative fuel be managed as a waste. In that event, the low carbon alternative fuel would be loaded onto enclosed trailers and shipped using a licensed hauler to an approved disposal facility.

4.5 Storm Water Management

There is minimal opportunity for any impacts to storm water due to the reception and use of low carbon alternative fuel at the Site. Low carbon alternative fuel will not be exposed to the elements and will at all times be contained either within closed trailers (delivery), the Alternative Fuel Building or the closed fuel delivery system. No changes to the existing Site are required to address storm water management.

4.6 Air Discharges

St. Marys currently holds an Environmental Compliance Approval (Air) Number 3779-9BMQW4 issued on December 5, 2013 (**Appendix E**). The existing ECA (Air) addresses the following:

- Noise emissions;
- Operations and maintenance of current equipment;
- Start-up, shut-down and upset procedures;
- Material analysis and criteria for acceptance, addressing acceptance of industrial by-product materials or fuel adjunct materials,
- Fugitive dust control;
- Record retention; and
- Notification of complaints.

A separate ECA application has been developed to amend the current ECA (Air) to:

- Request limited operational flexibility (LOF);
- Allow for the regular substitution of a portion of conventional fuel with up to 100 tonnes per day of clean wood; and
- Allow for the regular substitution of a portion of conventional fuel with up to 100 tonnes per day of low carbon alternative fuel defined as woody biomass from industrial and post-consumer sources as defined in this Design and Operation report.

Section 9.6 discusses air emission controls and the potential effects of low carbon alternative fuel on air emissions.

Section 5: GENERAL DESCRIPTION OF THE CEMENT PLANT DESIGN AND OPERATIONS

5.1 Overview of the Bowmanville Plant Operations

The Bowmanville Cement Plant operates 24 hours per day, 7 days per week and 12 months per year, with the exception of plant shut-downs. The maximum production rate at the plant is 6,500 tonnes/day of clinker, equivalent to 2.37 million tonnes of clinker per year.

The following provides a general overview of the operations of the Bowmanville cement plant, from the raw material supply to generation of the final product.

The main raw material (limestone) is supplied from the on-site quarry. The limestone is crushed and processed limestone is fed via enclosed conveyors to limestone storage silos. Other raw materials (sand, iron, overburden and ash) are delivered by truck. Most raw materials are stored at the plant in storage silos or storage buildings. Conventional solid fuels are primarily delivered by ship with some delivered by truck via the main plant road. Conventional solid fuels received at the dock are deposited into the fuel underground hopper from where they are transferred into the fuel storage silos.

Limestone and other raw materials are fed in controlled proportions from the raw material storage silos and storage building via an enclosed conveyor belt system to a raw mill. In the raw mill, the raw materials are ground and mixed to control particle size distribution and are dried using the hot exhaust gases from the pre-heater tower/kiln system. Emissions from the raw mill are controlled by the main kiln feed baghouse which vents through the main kiln stack.

The ground, mixed and dried raw materials known as raw meal is stored in the kiln feed silos. Raw meal from the silos is fed, via air slides and bucket elevators, up to a dual string pre-heater tower consisting of a series of cyclones. As the raw meal progressively passes through the pre-heater string and its cyclones, it is preheated using the hot gases from the kiln. These gases are the same gases that subsequently pass through the raw mill and exhaust via the main kiln stack.

Prior to being directed into the kiln, the pre-heated material is fed into a pre-calciner where the material temperature is raised to 840 °C. In the kiln, the raw meal temperature is raised to over 1,500°C. The chemical reactions and physical processes within the kiln transform the raw meal into clinker.

The clinker product is initially cooled by passing ambient air across the product. This pre-heated air is directed into the kiln for use as combustion air. The clinker is then further cooled in a clinker cooler, which achieves a lower clinker discharge temperature by passing an additional quantity of air through the clinker. The majority of this additional air passes through the clinker cooler baghouse prior to being exhausted to the atmosphere through the cooler stack, while the rest enters the kiln gas stream.

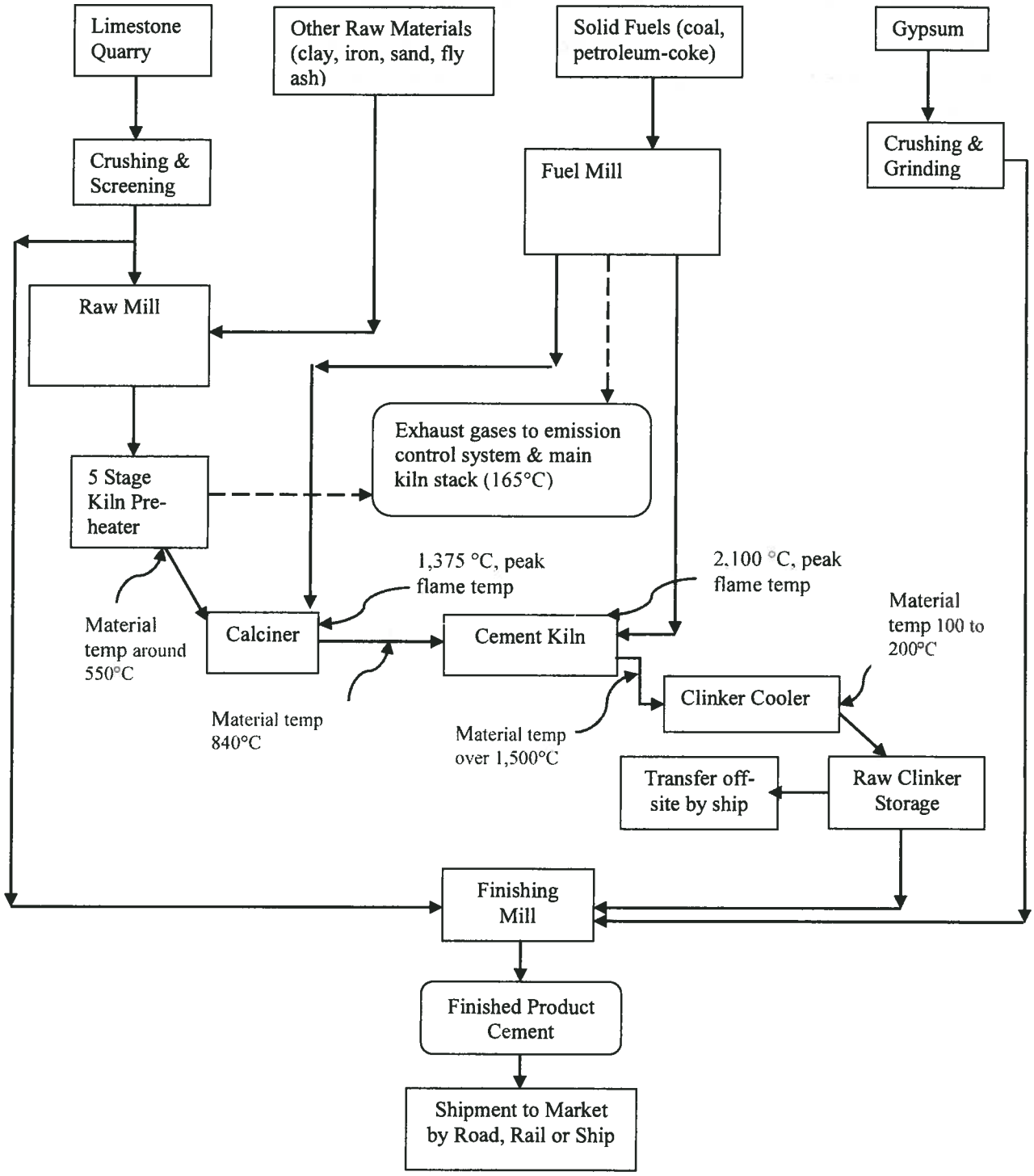
Clinker exits the clinker cooler at an average temperature of 100 to 200°C onto an enclosed conveyor system which feeds one of four clinker storage silos. The clinker can then be transferred to the roller press where it is pre-ground. Pre-ground clinker is then transferred into the cement finis mill feed silos.

Cement finishing is accomplished in three individual ball grinding mills. Clinker, limestone and gypsum are milled together to produce cement. Emissions from the three finish mills are controlled by individual baghouses venting through two finish mill stacks.

The finished cement product is transferred into product storage silos. Product is either dispatched via tanker truck or by ship. In addition to finished cement product, the plant also ships clinker. Cement and clinker are transported to the dock using an enclosed conveyor system.

Figure 2 presents a general overview of the process flow through the St. Marys cement plant. Additional information describing the cement manufacturing process at the St. Marys cement plant is presented in **Section 5**.

Figure 2: Process Flow – Bowmanville Cement Plant



5.2 Raw Materials

The main raw material (limestone) is supplied from the on-site quarry located to the east of the plant. Other raw materials (sand, iron, overburden and ash) are delivered by truck.

Table 5 provides an overview of the characteristics of the current raw materials that are typically used by the Bowmanville cement plant. In total, the raw materials make up approximately 90% of the total mass of materials used in the cement making process.

Table 5: Bowmanville Cement Plant – Raw Material Characteristics

Contaminants	Average Concentration (ppm) (1)				
	Limestone	Overburden/ Shale	Sand	Iron Source	Ash
Antimony	0.6	0.6	0.5	6	15
Chromium	8	13	81	265	184
Cobalt	3	4	3	9	7
Copper	5	6	39	214	1290
Manganese	272	331	714	6165	636
Nickel	9	8	64	70	74
Phosphorous	391	510	299	351	80143
Silver	0.5	0.5	0.5	1.1	16
Vanadium	7	7	7	63	33
Zinc	30	23	106	2489	1103
Selenium	7	4	17	51	120
Mercury	0.03	0.03	0.04	0.06	0.5
Cadmium	0.2	0.5	0.3	3	6
Arsenic	2	3	2	18	10
Lead	6	9	9	171	65
Iron	41400	22500	37150	402000	170000
Barium	39	54	29	73	1115
Beryllium	16	0.3	0.1	0.3	0.3

(1) Heavy metal concentrations taken from St Marys Cement Inc. Bowmanville Plant, QA/QC lab analyses, based on the most recent 5 years of analysis.

5.3 Conventional Fuels

The thermal requirements of the cement manufacturing process can be satisfied by the combustion of fuels which can be introduced at either the main burner assembly or in the calciner. The fuels historically used by the plant are:

- Diesel fuel (for pre-heating);
- coal; and,
- petroleum coke (sponge petroleum coke, fluid petroleum coke and shot-petroleum coke).

Diesel oil is supplied to the facility by tanker truck and is mainly used during start-up to pre-heat the kiln system. Coal and pet-coke are primarily supplied by ship, with some supplied by truck.

Fuel feed to the main kiln burner ranges from 10 to 15 tonnes/hour and to the calciner burner from 20 to 30 tonnes/hour for a total system heat release equivalent to about 875,000 mega joules per hour (MJ/hr). Depending upon a number of operational and economic factors, coal and pet-coke may be mixed

together in the milling system for simultaneous feed to the burners. Table 1 provided an overview of the characteristics of the conventional fuel used by the Bowmanville cement plant.

Section 6: FACILITY OPERATIONS – LOW CARBON ALTERNATIVE FUEL SUBSTITUTION

6.1 Alternative Fuel Reception & Storage

6.1.1 Low carbon Alternative Fuel Reception

The alternative fuels will be transported to the site in enclosed trailers (conventionally known as "walking floor" trailers). The nominal capacity of each trailer is approximately 20 to 25 tonnes of woody biomass.

In order to minimize the potential for fugitive emissions from the unloading of the alternative fuels once received at the Bowmanville Plant, material will be unloaded directly from the truck into the Alternative Fuel Building.

Because the fuel is not a subject waste as defined under the Generator Registration Regulation, the material will be accompanied by a straight bill of lading. Each truck will be weighed upon arrival at the site at the SMC scale located within the Bowmanville site, and directed to the Alternative Fuel Building for unloading. Under the direct supervision of a St. Marys Cement Ltd. operator (or other designated person) trailer unloading will proceed as follows:

a) The operator will review the information on the bill of lading to ensure that the correct material is being received.

b) The door to building will be opened. The Alternative Fuel Building will be equipped with a high speed door, which will only be opened for materials receipt. Appropriate sensors/alarms will be installed to notify the operator of the door being opened, and protocols will be in effect so that the door is opened only when required.

c) The truck will back into a designated area within the Alternative Fuel Building. Only appropriate transfer trailers would be received, that can be accommodated within the height and footprint restrictions of the receiving area in order to effectively receive low carbon alternative fuel materials.

d) The doors to the transfer trailer will be opened.

e) The truck will back in to position such that the opening of the transfer trailer aligns with the designated low carbon alternative fuel storage area, and the material will be unloaded.

f) The unloading process will be visually inspected by the operator in the building. As back-up, the receiving area, processing equipment and fuel feed system will be equipped with video surveillance / monitoring.

Upon completion of unloading, the driver will sweep out any residue remaining in the back of the trailer (especially the tail gate, doors and closure devices) so as to minimize material track out or generation of litter. The driver will close and secure the trailer doors and drive out of the receiving building. The driver will return to the weigh scale where the truck will be re-weighed and a copy of the bill of lading will be retained.

6.1.2 *Incoming and Outgoing Records*

Each truck will be weighed upon arrival at the site and directed to the alternative fuel building for unloading. After the trailer is unloaded the driver will return to the weigh scale where the truck will be reweighed and a copy of the bill of lading will be retained as part of the record of the delivery. This information will be tracked in the logs retained for the low carbon alternative fuel handling.

6.1.3 *Low carbon alternative fuel Screening*

St Marys Cement intends to enter into formal agreements for low carbon alternative fuel (woody biomass) supply. It is anticipated that the woody biomass suppliers will be construction and demolition material processing facilities which generate a stream of woody biomass materials that cannot be marketed as 'clean' wood material. In addition, St Marys Cement will also be sourcing clean wood materials for use as fuel.

The terms of agreement will reflect the requirement of the alternative fuel supplier to screen for and remove materials that would be unacceptable for St Marys Cement, from both the perspective of regulatory compliance and in regards to the suitability of the fuel for the cement making process. Screening would be required to ensure that materials containing asbestos, hazardous waste (as defined by O. Reg. 347) are excluded from the woody biomass, and that pressure treated wood containing arsenic and copper (including wood treated with CCA, AZCA, ACQ and CA) are removed (less than 5% of the materials by mass would include pressure treated wood). Inert materials including rock, concrete, dirt and metals would also be excluded.

Upon securing agreements with low carbon alternative fuel suppliers, St. Marys will implement an initial fuel testing protocol over a six month 'acceptance period' in which random samples will be taken of the size reduced fuels through a port/outlet in the fuel preparation and delivery system, and tested in the order of once per month. This approach will allow for St. Marys to determine if the material quality specifications are being met and will minimize the potential for disruption to stable operations. The low carbon alternative fuel suppliers will also be required to take random samples and test materials on a bi-weekly basis over the acceptance period, in order to establish consistency of the material supply and thereafter would be required to randomly sample and test materials on a quarterly basis.

During the six month acceptance period, St. Marys will undertake random inspections at the point of supply performed by a trained operator who is familiar with the desired composition of the alternative fuel. The inspector will be in position so as to safely observe the material as it is being loaded to the transport trailers. If the inspector observes any material in the load which is deemed to be unsuitable for use as a low carbon alternate fuel, loading will cease immediately. Unacceptable materials or conditions could include:

- excessively wet material
- oversized material
- non-combustible materials
- hazardous materials; and,
- highly odorous materials.

Once the initial acceptance period is complete and if the low carbon alternative fuel supplier has established that they can consistently meet St. Marys Cement's alternative fuel specifications, the frequency of sampling by St Marys Cement of the size reduced woody biomass fuel will be reduced to a quarterly sampling frequency similar to the sampling protocol for fuel adjunct materials as set out in condition 4. (1) (a) of ECA Number 3779-9BMQW4.

Upon receipt and unloading of low carbon alternative fuel at the St. Marys plant, a visual inspection will be undertaken by the trained operator in the fuel building. The operator will be in position so as to safely observe the material as it is being unloaded. If the inspector observes any material in the load which is deemed to be unsuitable for use as an alternative fuel, unloading will cease immediately and the material will be re-loaded onto the truck and returned to the fuel supplier.

In addition, St Marys Cement will install a video surveillance and monitoring system within the alternative fuel building, to observe and record the alternative fuel unloading, fuel preparation and the fuel feed system.

6.1.4 Alternative Fuel Sampling and Testing

SMC has established specifications for the alternative fuel in order to meet both operational and environmental objectives as outlined in Section 3.3. Operationally, the plant must ensure that the materials meet specifications related to particle size and moisture content so that the materials are suitable for injection into the main kiln burner. From an environmental standpoint, the metals/metal hydrides scan will be completed in accordance with current adjunct fuel requirements in the Bowmanville Plant ECA (Air).

The alternative fuel feed will be sampled as outlined in the Standard Operating Procedure for Fuel Sampling (**Appendix G**). Once the initial acceptance period is complete, SMC will obtain a metals/metal hydrides scan, including at a minimum the compounds listed in Table 3 on a quarterly basis.

6.1.5 Alternative Fuel Storage

SMC intends to construct a dedicated Alternative Fuel Building on the site as the location for the reception, unloading, storage, fuel preparation and feeding of the low carbon alternative fuel to the kiln. This building will also be used to store and manage clean wood materials, also destined as fuel for the cement making process. The bulk unloading and conveying equipment for managing the alternative fuel (and clean wood) will be installed within this building.

The Alternative Fuel Building will be approximately 30 metres by 30 metres. It will be a clear-span metal structure, equipped with one high-speed roll-up door at the south end of the structure for alternative fuel receipt. The structure will be located just south of the south clinker silo and west of the kiln by-pass bag house.

In order to ensure the availability of alternative fuel on a 24/7 basis, a maximum quantity of 500 tonnes of material would be stored in the building at any one time.

It is expected that each load of alternative fuel will be used within no more than one month of receipt.

Appendix H provides general arrangements for the Alternative Fuel Building.

6.2 Fuel Preparation and Handling

The alternative fuel system will be designed to manage woody biomass with particle sizes in the range of 1 metre minus in dimension that has been processed by construction and demolition material processors. The woody biomass materials would require further size reduction in order to be fed as a fuel and blending to ensure consistency in the fuel feed. This will be accomplished through loading the material into a low speed rotary cutter. Materials would then be fed via conveyor to the alternative fuel feed hopper of the fuel delivery system.

The fuel preparation and handling system will include the following:

(1) An in-feed conveyor to a low speed rotary cutter to ensure appropriate particle sizes are achieved and to blend materials. **Appendix H** includes a drawing of the proposed equipment.

(2) A drum or belt magnetic separator.

(3) An enclosed conveyor to transfer materials to the hopper for the alternative fuel feeding system.

(4) An alternative fuel feeding system, consisting of a live bottom feed hopper, elevation drag chain, dust collector, weigh hopper, and rotary valve for pneumatic transport. The system design will feed 1 to 10 tonnes per hour depending on the bulk density of the materials. The system is electronically controlled and specifically designed to handle light and low bulk density materials. Further details are provided below.

(5) A pneumatic transport system consisting of 15PSI high volume blower, and continuous pipeline to the calciner or the main kiln burner.

Appendix H provides the general arrangements for the proposed alternative fuel handing equipment and storage.

Section 7: CEMENT PLANT PROCESS AND CONTROLS

There are three critical process control factors for the cement plant operation which can have a significant impact on its performance both from an operational and environmental point of view. These are:

- Management Systems (sometimes also referred to as "administrative controls")
- Operator Training (development & application of personnel controls)
- Process Equipment

In the subsequent sections of this report each of these types of controls will be discussed with a view as to how the application of each impacts the management of alternative fuel at the facility.

7.1 Management Systems

The Bowmanville Cement Plant operation is a large, complex facility with a wide range of diverse operations being undertaken at varying schedules.

In order to facilitate control of all aspects of the operation, the facility employs a hierarchical management structure. This hierarchical control structure ensures that personnel in each area are highly trained and proficient in the performance of their respective job functions. It also facilitates the rapid exchange of information between the various work areas and ensures the coordination of efforts towards the productive management of the facility.

The overall site is under the management and control of the Plant Manager. Reporting to this position are Production Supervisors that are on-site 24 hours per day 365 days/year whose individual responsibilities cover the following areas:

- raw materials and fuel delivery, storage and preparation & product shipping
- kiln operations; and,
- facilitating maintenance activities that affect plant operations [there are also maintenance supervisors that oversee those tasks specifically].

Reporting to the Production Supervisors are workers and operators assigned to their respective areas. All workers and operators within a specific area are trained in the Standard Operating Procedures specific to their work area. In addition, operators are provided with training which is of a more general nature and would apply to workplace activities covered across the plant site. Examples of such general training would include the use of personal protective equipment, spill response and reporting, industrial hygiene practices and emergency response procedures.

In addition to the preceding, there are various non-operational support functions in place which include:

- laboratory
- engineering
- procurement; and,
- training & compliance.

The laboratory operates under the supervision of the plant chemist and is responsible for the routine analysis of all materials received at or shipped from the plant site. In addition, the on-site laboratory performs regular analyses of intermediate production materials (such as raw meal fed to the kiln) to assist in the ongoing plant operations.

Engineering, procurement and training & compliance functions report to corporate management but are continually available to plant management for assistance in the operation, safety and compliance of the site.

The regular use of low carbon alternative fuel will involve several different areas of the plant. Senior facility (and corporate) management are responsible for addressing compliance and permitting issues, physical plant and personnel resources and operator training. Engineering and procurement are tasked with equipment specification, design and installation such that the fuel can be received, processed and controlled as required for a successful continued use. These and other functions can all be managed effectively within the existing plant management structure.

SMC is one of only a few companies that have implemented an ISO 14000 compliant Environmental Management System (EMS) for all of its Canadian operations. This ISO 14000 system applies to the Bowmanville cement plant and would apply to all activities on the site including the use of low carbon alternative fuel.

The Bowmanville cement plant is ISO 9000 certified. ISO 9000 certification means that this plant conforms to an international standard primarily concerned with "quality management". The Bowmanville plant adheres to these high standards with regard to fulfilling its customers' quality requirements, following applicable regulatory requirements, while aiming to enhance customer satisfaction and achieve continual improvement of its performance in pursuit of these objectives.

7.2 Operator Training

The various operations and processes performed within the cement manufacturing facility have varying degrees of complexity. SMC recognizes that an important component of an overall strategy to maximize plant productivity while simultaneously minimizing the potential for adverse effects is to have a work force that is properly trained in the requirements of their various job functions.

Towards that objective the corporation has established a comprehensive training program that includes the following major elements:

A. Definition of Responsibility

The role and responsibility of each manager, operator or other employee in the preparation, record keeping, administration or execution of the training program is defined so that it is clearly understood what is expected of each and how their ongoing performance will be measured.

The definition of responsibility extends from the general Standard Operating Procedure (SOP) which sets forth the corporate standard to each task specific SOP within the various unit operations at the plant level.

B. Training Definitions

Within each training module, three specific areas of proficiency are identified and dealt with in varying levels of detail and importance. These are:

- Task Training: Job specific skills related to the productive performance of a particular task or general job function
- Safety Training: Focuses on the development of a sense of safety awareness and the ability to recognize (and avoid) hazards which are inherent to a specific task performed by an individual worker. In more general terms it is part of a plant wide safety awareness program which is intended to train personnel in the recognition of the potential hazards associated with their own job function and those associated with their general working environment.
- Environmental Training: This training typically comprises three main elements.
    - the development of a sense of good environmental stewardship in the employee
    - education in the environmental laws and regulations which may be applicable to the specific task at hand
    - the ability to demonstrate compliance with the training requirement of any environmental regulatory authority

C. Training Protocols, Record Keeping & Measurement of Proficiency

A program of training has been defined for each job function performed at the site. It is the responsibility of the supervisor and/or department manager to ensure that the training program is assessed annually and that the needs of the training program are being met.

Typically a specific job function will have a documented work instruction or similar form (such as a Standard Operating Procedure) which forms the basis of the training activity. A trainee will be expected to study this documentation and to become familiar with any equipment, terminology, calculations, check lists or reports similarly associated with the job function.

Upon completion of the familiarization and study phase outlined above, a qualified employee will observe the trainee executing the task. When the trainee has successfully demonstrated proficiency in the task, this will be documented.

Within one month of successful completion of the job specific training, the trainee's supervisor (or manager) undertakes a formal evaluation of the employee's proficiency at executing all elements of the defined task. The results of this assessment are documented, any deficiencies are identified and corrective actions are undertaken as may be required.

For more complex tasks, or job functions which require a trainee/employee to actively interact with several different functions or processes on the site, the training program may also include a period of time where the trainee is assigned to work alongside a trained employee. This "on-the-job" training is an effective means of learning complex tasks and provides immediate feedback and/or corrective actions for the trainee.

For the purposes of the regular use of low carbon alternative fuel the standard operating procedures) will be revised and updated and employees will be trained in their requirements These new training requirements will predominantly focus on the reception of the fuel, fuel storage and handling and on the minor control equipment additions being made to accommodate the additional fuel feed source.

SMC can provide a copy of the Environmental Management System and Training Manual as necessary to the District Office of the MOE.

7.3 Process Equipment

The main pieces of process equipment used in the operation of the cement plant relevant to the use of the low carbon alternative fuel include the:

- main burner assembly;
- cement kiln;
- calciner;
- pre-heater; and,
- emission control system.

The subsequent sub-sections of this document describe the equipment in more detail (including physical dimensions and operating parameters) so as to afford an understanding of how the processing of alternative fuel may affect operations or environmental performance.

7.3.1 Main Burner Assembly

Approximately 34% of the total thermal energy needs of the cement pyroprocess are generated by the main burner assembly. At a nominal production rate of 6,500 tonnes per day, this equates to a heat release of about 379,000 mega joules per hour.

The main burner assembly is mounted on the clinker discharge end of the cement kiln. The burner nozzle consists of multiple fuel ports designed for the various types of fuels that can be fed to the kiln including, pet-coke, coal or other pneumatically conveyed solid fuels. Each fuel is fed to the burner face through its own nozzle port.

Surrounding the fuel feed nozzles is an annular space which feeds combustion air into the fuel firing zone. The design of the burner assembly is such that the combustion air has both an adjustable axial and longitudinal component to its flow. The effect of being able to adjust both the degree of swirl (axial flow component) and the momentum (longitudinal flow component) of the combustion air allows for optimum control of the shape and intensity of the main burner flame.

In order to optimize the chemical and mineralogical characteristics of the clinker, minimize flame impingement on the kiln refractory and product (clinker) it is highly desirable to be able to produce a main burner flame which is relatively short, compact and exhibits a high luminosity (i.e. uniform heat transfer that promotes the formation of larger crystals resulting in a high quality clinker).

The low carbon alternative fuel (woody biomass) should not adversely affect the performance of the main burner assembly as:

- the fuel has a heat of combustion that is a reasonable percentage (30 to 40%) of the conventional fuels currently in use;
- the alternative fuel has a carbon to hydrogen ratio (similar to the conventional fuels) which will allow for the continued creation of a highly luminous flame; and,
- the alternative fuel can be pneumatically conveyed in the same fashion as conventional fuels.

Note: the burner pipe for the main kiln burner has been designed with an additional channel to fire alternative fuels.

7.3.2 Cement Kiln

The cement kiln is a cylindrical, steel reaction vessel mounted horizontally with a slight tilt of about 2 degrees from the horizontal. The external dimensions of the reactor are 5.0 meters diameter by 80.0 meters long. The kiln is supported in 3 places on series of rollers, some of which are fitted with hydraulically adjustable thrust bearings to keep the kiln in both horizontal and longitudinal alignment. The outside perimeter of the kiln is equipped with a toothed gear ring connected to a 1,250 horsepower drive assembly. The kiln is lined with firebrick approximately 22 centimeters thick.

The main burner assembly (as well as the discharge duct from the kiln to the clinker cooler) is located at the lower end of the kiln. Solid, pre-heated reagents exiting the calciner are introduced by gravity at the higher end of the kiln.

At the lower end of the kiln fuel and combustion air are introduced and ignited to produce a luminous flame having a peak flame temperature in the order of 2,100 °C. Approximately 8 to 12% of the combustion air required is injected as primary air via the main burner assembly. The balance of the combustion air is pre-heated air derived from the clinker cooler which is fed into the kiln via a shroud surrounding the elongated fuel nozzle of the main burner assembly. Excess air within the kiln is adjusted continually so as to provide a residual oxygen concentration.

At the upper end of the kiln, pre-heated, de-carbonized meal flows by gravity from the calciner into the kiln.

The use of alternative fuels should not adversely impact the operation of the cement kiln because the fuel selected is chemically very similar to the conventional fuels already being used. The thermodynamic properties of the kiln will therefore not be changed.

Similar to conventional fuels, most (over 99.8%) of the inorganic elements and metals present in the alternative fuel will be incorporated into the crystalline matrix of the clinker product . It is of critical commercial importance to St. Marys Cement that the chemistry of their product is not adversely affected by the use of low carbon alternative fuels. SMC will continue to regularly sample the clinker product in accordance with normal QA/QC protocols.

7.3.3 Calciner

The calciner is a vertically oriented, insulated steel vessel which is used to complete the de-carbonization reaction of the raw materials prior to their introduction to the kiln. The vessel is 6.9 meters in diameter by 18.5 meters long.

Fuels are injected into the calciner using a multi-port burner assembly similar to that used for the kiln main burner assembly. Pre-heated combustion air at a temperature ranging from 800 to 1,000°C is drawn from the clinker cooler. As with the kiln's main burner assembly, this allows for control of flame shape, operating temperature and residual oxygen concentrations.

Raw materials flow downward (under gravity) from the last cyclone stage of the pre-heater string and pass into the calciner chamber. Here the material contacts the hot combustion gases produced by the calciner burner and are heated from an initial temperature of about 550°C to temperatures in the range of about 840°C.

Since the calcination (de-carbonization) reaction temperature is considerably lower than that required for the final stage of clinker production, the calciner can operate with a lower flame temperature (about1,250 to 1,375°C).

Although the low carbon alternative fuel does have a lower heat of combustion than the conventional fuels (30 to 40% of the heat value of conventional fuel), the rate of its introduction into the calciner can be controlled so as to minimize the impact on the flame temperature. The ash content of the low carbon alternative fuel should not adversely affect the calciner operation due to the vertical orientation of the calciner vessel and the high degree of turbulence achieved by the burner nozzles.

It is expected that the ash content of the low carbon alternative fuel will uniformly blend in with the very much higher mass flow of the conventional raw materials passing down through the pre-heater tower into the calciner.

7.3.4 Pre-Heater

The solid raw materials fed to the cement kiln (referred to as "raw meal") are heated from ambient temperature to approximately 550°C in a pre-heater. The pre-heater consists of two parallel series of cyclones (5 cyclones per series) that mix the raw-meal with hot combustion gases produced by the kiln and the calciner. As raw meal falls by gravity through a cyclone, it is intimately mixed with rapidly swirling combustion gases and heat exchange between the solids and gases is rapidly achieved.

There are two parallel strings of cyclones that make up the pre-heater system. In the string feeding material to the calciner, the raw meal passes through a series of 5 identical cyclones each measuring approximately 6.6 meters in diameter by 6.9 meters high. In the string bypassing the calciner, the cyclones are significantly smaller being 3.7 meters in diameter by 4.0 meters high. The principal reason for the difference in size of the cyclones is that the cyclone string feeding the calciner has to handle the larger volume of exhaust gases produced by the combustion of secondary fuels in the calciner. By increasing the size (hence increasing the volume) of each cyclone, the velocity of the gases swirling around the circumference of the cyclone can be maintained at a level preventing excessive turbulence and subsequent re-entrainment of the raw meal in the exhaust gases.

The chemical and thermodynamic properties of the low carbon alternative fuel are very similar to the properties of conventional fuels and will be beneficially absorbed into the raw meal feed (while simultaneously contributing net thermal energy inputs). The performance of the pre-heater assembly will not be affected by the use of low carbon alternative fuel.

7.3.5 Instrumentation

A wide array of instruments have been installed in the plant to facilitate the control of operations within the cement production facility. Although much of this instrumentation has indicators or read outs convenient for inspection of localized equipment operating conditions, virtually all of the instrumentation has been tied into a centralized data management system. The data management system has four levels or areas of functionality as follows:

A. Data Acquisition and Recording

Parameters specific to the kiln system are monitored and logged in an electronic data collection system (referred to as OSI PI). The data is compressed and archived for historical record keeping and analysis.

B. Data Display

In the central control room, the kiln operator can simultaneously view a number of video screens displaying a wide range of pre-selected collections of kiln system data. For ease of use and interpretation, all data screens use full colour displays augmented by pictographs representing various process systems (or sub-systems). Data from individual instruments can be displayed in a full range of formats from simple (instantaneous) numerical values to streaming graphs showing trend lines and control points. In addition to viewing pre-selected collections of instrument data, the operator can "call up" specific instruments for more detailed inspection as system performance warrants it.

C. Computer Control

A high level supervisory Expert Optimizer system takes a range of instrumental inputs and performs repetitive calculations to monitor and model the kiln system performance. From these calculations, and based on historical kiln performance, this variable controller system makes fine adjustments to numerous controlled variables (flow of fuel, raw meal, combustion air, etcetera) designed to optimize overall system performance. The kiln operator can simultaneously view the computer control systems actions and can override changes based on his experience and knowledge of the prevailing plant conditions.

D. Interlocks & Alarms

Many of the operating sub-systems within the overall kiln system are equipped with protection devices designed to preclude select operations from occurring unless certain specified conditions are met. In general these protection devices are referred to as interlocks. An example would be that fuel flow cannot be initiated to a burner assembly until a specific instrument signals that sufficient combustion air flow (and pressure) is present.

In addition to interlocks, most of the systems are equipped with instruments and/or controllers that can generate an alarm if certain conditions are met. In some cases there are multiple alarm points set for a single process variable. An example would be that an alarm is triggered if the temperature of the exhaust gases reaches a certain value. The response to that alarm might be that the computer attempts to reduce the temperature by reducing the fuel flow. If the temperature continues to rise and a second alarm set point is triggered, the computer may make further (more aggressive) changes to one or more process parameters. If the temperature alarm persists beyond some pre-established duration, or rises to a third alarm set point, the computer may then initiate a very conservative action such as to trigger a complete system shut down. As outlined under the previous section of this report (Computer Control), the kiln operator may intervene at some point and override the computer systems intended actions.

The overall system of instrumentation, data acquisition and process controls (both automatic and human controlled) has been designed and refined over decades of cement manufacturing to provide a high level of protection for the employees, the environment, the plant's capital equipment and the quality of product. The low carbon alternative fuel feed system will be interlocked with the existing operating systems at the Bowmanville Plant.

7.4 Alternative Fuel Feed System

St. Marys Cement will install a solid feed system from a manufacturer who specializes in the design and manufacture of bulk solid conveying systems. **Appendix H** includes drawings of this equipment. A brief description of this solid feed system and its normal operation are as follows:

a) Material is loaded into a receiving hopper by front end loader;
b) At the base of the feed hopper is an in-feed conveyor which moves material to a low speed rotary cutter to ensure appropriate particle sizes are achieved and to blend materials;
c) A covered conveyor would transfer materials over a drum or belt magnetic separator, to the feed hopper for the alternative fuel feeding system;
d) At the base of the feed hopper is a slowly rotating scraper assembly which moves material from the hopper into a discharge chute;
e) From the discharge chute the material flows by gravity onto a horizontal conveyor;
f) From the horizontal discharge conveyor the material is transferred onto an inclined conveyor;
g) The material discharges from the inclined conveyor onto a horizontal belt conveyor which is equipped with loss in weight load cells so as to permit continuous indication and recording of the weight of material being transferred from the feed hopper into the pneumatic conveying system. [This assumes a consistent material heat value, which is the reason for the activities specified in sections 6.1.4 and 6.1.5.];
h) Material from the weigh conveyor drops down into a rotary air lock feeder. The rotary air lock mechanism consists of a compartmentalized, horizontally oriented chamber mounted on a central drive axle. As the chamber rotates, each compartment in turn is opened up to receive material from the weigh conveyor; and,
i) As the filled compartment rotates around, it encounters a point where compressed air enters the chamber. The compressed air, supplied by a blower integral to the equipment, fluidizes the material in the connected compartment and conveys it out of the feed device into the pneumatic transfer piping.

The rate of feed of the low carbon alternative fuel to the burner nozzle will be controlled by the control room operator through the system interlocks. An operator will be on-site in the Fuel Building and/or the kiln control room 24/7 in order to oversee the operation of the alternative fuel feed mechanism.

Control of the feed rate of the alternative fuel to the kiln will be adjusted by the control room operator according to a control strategy similar to that used for feeding conventional fuels. Specifically, the alternative fuel feed rate will be adjusted in concert with combustion air and clinker production so as to maintain the desired temperature profile and heat balance throughout the system while simultaneously ensuring that adequate residual oxygen is present for efficient combustion.

The system will be interlocked with the plant control systems, so that it will start/stop with the current fuel system, take feed-rate set-points and operating commands from the control room operator and the expert optimizer systems. The system will also have local emergency stop and test controls for clearing any blockages.

Section 8: EMERGENCY & CONTINGENCY PLANS

8.1 Emergency Response Plan

St. Marys has an existing Emergency Response Plan (ERP) for the Bowmanville Facility. It is reviewed annually and maintained current at all times. The ERP includes, but is not necessarily limited to:

- Emergency Response Procedures to be undertaken in the event of a spill or process upset, including specific cleanup methods for each different type of alternative fuel or other materials the Site is approved to accept;
- A list of equipment and spill cleanup materials available in case of an emergency; and,
- Notification protocol with names and telephone numbers of persons to be contacted, including persons responsible for the Site, the Ministry's District Office and Spills Action Centre, the local Fire Department, the local Municipality, the local Medical Officer of Health, and the Ministry of Labour, and the names and telephone numbers of waste management companies available for emergency response.

The ERP is retained in a central location at the Bowmanville Facility, and is accessible for all staff at all times. St. Marys ensures that the District Manager, the local Municipality and the Fire Department are notified of any changes to the ERP.

The equipment, materials, and personnel requirements outlined in the ERP are immediately available on the Site at all times. The equipment is kept in a good state of repair and in a fully operational condition.

All staff that operate the Site are fully trained in the use of the ERP and in the procedures to be employed in the event of an emergency.

St. Marys takes appropriate measures to contain and clean up spills or leaks which may result from the operation of the Site and immediately implements the ERP if required.

A copy of the ERP is available for review in **Appendix I**.

8.2 Start Up & Shut Down Procedures

Before initiating the feed of alternative fuel, the plant will determine that the cement kiln and all associated equipment and systems are in good working order and are performing stably within their design specifications and operating ranges. When stable kiln conditions and the appropriate pre-heater temperatures are achieved, it will be confirmed that:

- the alternative fuel feed mechanism has been energized and tested according to the manufacturer's specifications;
- all interlocks and safeties are energized and operational; and,
- the feed hopper of the feeder contains sufficient alternative fuel

Upon receiving confirmation of all of the preceding, the control room operator will open the control valve admitting flow of alternative fuel into the selected burner assembly. As alternative fuel begins to flow into the burner, the control room operator will trim back the flow of conventional solid fuel while at the same

time monitoring critical process and emission parameters for any significant changes. It is anticipated that the computer control system will be capable of adjusting most process flows and conditions in the usual fashion.

To terminate the use of alternative fuel, the control room operator will essentially follow a procedure which is the reverse of the start-up procedure. That is to say, the flow of alternative fuel will be progressively decreased and the flow of conventional solid fuels increased.

8.3 Emergency Measures

Based on decades of operating experience, the plant has a well-established emergency response protocol covering a range of potential unusual circumstances that may arise during the cement manufacturing process. Many of these procedures have been "hardwired" into networks of interlocks and automated control functions. However, for the purpose of the use of alternative fuel, it is appropriate to highlight some of the major emergency measures and the expected responses (both automated and human initiated) in the following sections of this report.

8.4 Termination of Alternative Fuel Processing

If the use of low carbon alternative fuel is determined to be adversely affecting operability of the kiln or causing unacceptable environmental emissions, the control room operator has the ability to stop the flow of alternative fuel to the burner assembly by the activation of a single control switch. This switch is interlocked to the controls of the alternative fuel feed system (including the pneumatic blower, rotary valve and conveyors) so that when activated the feed system will be de-energized and alternative fuel flow will terminate. It is expected that the expert system will then make the necessary adjustments (such as increasing the flow of conventional solid fuel, decreasing the flow of raw meal, decreasing the flow of combustion air, etcetera) to compensate for the termination of alternative fuel flow.

When the feed system is de-energized, a local alarm will alert the alternative fuel operator. They will then render the system inoperable by closing a manual isolation valve between the alternative fuel feeder and the pneumatic transfer line. They will also cease loading alternative fuel into the feed hopper and contact the control room operator to confirm shut down of the feed system and await further instructions.

8.5 Shut Down of Cement Kiln

The cement kiln system has an extensive array of interlocks and safety protocols which are designed to automatically engage should a situation arise necessitating a complete kiln shut down. By electing to have the alternative fuel feed system and storage in a separate building (but tied into the interlock system), any emergency which requires the rapid shut down of the cement kiln will not be affected by the alternative fuel system.

8.6 Contingency Plans

The existing cement plant has a comprehensive emergency response plan. Revisions to the ERP (**Appendix I**) will be made to include appropriate measures for the use of alternative fuel.

Plant personnel will be advised as to the procedures to be employed specific to the operation of the alternative fuel building and feed equipment and training records will be amended to reflect these changes.

The alternative fuel building is located within 90 meters of a fire hydrant. Dry chemical fire extinguishers will be provided within this building and will be available on any vehicles operating within the building.

8.7 Complaint Response Procedure

SMC has a Standard Operating Procedure for the documentation and response to contacts from the community. The regular use of low carbon alternative fuel will not require any significant changes to be made to this procedure. If a complaint is received at any time including during the use of alternative fuel, the complaint will be responded to according to the following procedure:

- The contact number for complaints is (905) 623-3341; this number is also linked to the plant voicemail.
- The complaint will be recorded and numbered either electronically or in a separate log book along with the following information:
    - The nature of the complaint;
    - If the complaint is odour or nuisance related, the weather conditions and wind direction at the time of the complaint;
    - The name, address and telephone number of the complainant (if provided); and
    - The time and date of the complaint.
- The District MOE office is notified within two days that the complaint is received.
- Appropriate steps to determine the possible cause of the complaint and to eliminate the cause of the complaint will be undertaken; and,
- A report is written, listing the actions taken to resolve the complaint and any recommendations for remedial measures and operational changes to reasonably avoid the recurrence of similar incidents.

Any complaints received at any time including during the use of alternative fuel will be recorded and investigated and will be included in the annual report. This record will note the circumstances of the complaint and an explanation as to whether the complaint could be related to the use of alternative fuel.

8.8 Site Inspection

A Trained Person will inspect the entire Alternative Fuel Building each day of operation to ensure that: it is secure; that the operation is not causing any nuisances; that the operation is not causing any adverse effects on the environment and that the low carbon alternative fuel system is being operated in compliance with the ECA. On each operating day, a visual inspection of the following areas associated with the use of the low carbon alternative fuel will be carried out:

- Loading/unloading area;
- Storage area; and,
- Fuel Delivery system.

A daily log will be kept that will include the name and signature of the person that completed each inspection, the date and time of each inspection, a list of any deficiencies discovered, any recommendations for action, and the date, time and description of actions taken.

Section 9: ENVIRONMENTAL MONITORING AND CONTROL

9.1 Noise Control

No discernible change in noise is anticipated from regular use of low carbon alternative fuel. The large majority of all alternative fuel operations will take place indoors within the alternative fuel building, which itself is shielded from the closest noise sensitive receptors by the existing cement plant buildings. Measures such as the use of high speed doors to the alternative fuel building are also proposed to further limit the potential for off-site noise from the fuel handing equipment. As a result it is not expected that the noise associated with alternative fuel operations will have a significant impact on the neighbouring environment.

A detailed Acoustic Assessment Report (AAR) was previously prepared and submitted to the MOE as supporting documentation for SMC's existing approval. This AAR has been updated to include the proposed changes to the Bowmanville Plant associated with the regular use of low carbon alternative fuel. The updated report presented within the ECA (Air) submission concludes that sound emissions from the Facility are currently within the applicable sound limits as set out in MOE publication NPC-300 and will remain so with the addition of the alternative fuel processing and feed system.

9.2 Dust Control

In accordance with Condition 6 of the existing ECA (Air) for the Bowmanville Cement Plant, SMC has developed and implemented a best management practice plan for fugitive particulate (**Appendix J**) that will be adhered to at all times including while utilizing low carbon alternative fuel. This plan includes control measures to mitigate fugitive dust emissions in order to minimize the impact on the environment, minimize potential nuisance to the community and ensure compliance with environmental requirements.

Receipt and management of low carbon alternative fuel is not anticipated to have any impact on dust at the site, as the alternative fuel will be fully enclosed on the transfer trailers received at the cement plant, and within the Alternative Fuels Building. Features such as the high speed door to the Alternative Fuel Building will assist in controlling dust emissions from the building. The fuel preparation and fuel delivery system, including conveyors to move the fuel will be fully enclosed.

The low speed rotary cutter will be equipped with dust collection, to collect fine particulate that could result from the size reduction of the woody biomass. This dust collector will vent inside the fuel building. Air entrained within the fuel preparation and fuel delivery system will be used to pneumatically convey the low carbon alternative fuel to the burners as fuel, maintaining a slight negative air pressure within the system. The combination of these features is intended to minimize the potential for fugitive particulate emissions from the Facility and to minimize the potential for particulate concentrations in the air within the alternative fuel building itself.

9.3 Odour Control

The potential for odours to be generated / emitted from the use of low carbon alternative fuel will be addressed through the material quality specifications and design of the system. Alternative fuel must meet the moisture requirements set out in the specifications. At the specified moisture levels (<25%) the potential for microbial action and odour generation from the materials is reduced. The alternative fuel will

be inspected during unloading to screen for unacceptable material, including material that is excessively wet or odorous.

Alternative fuel will not be exposed to the elements and will at all times be contained within closed trailers (delivery), the enclosed Alternative Fuel Building, or the closed fuel delivery system. Except for receipt of the transfer trailers, the doors to the Alternative Fuel Building will remain closed.

The pneumatic conveyor used for the fuel delivery system will draw in air from inside the alternative fuel preparation system that will then form part of the combustion air at the main kiln or calciner burners. This system will result in a slight negative air pressure inside the Alternative Fuel Building.

No discernible change in odour is anticipated from regular use of low carbon alternative fuel based on the above measures.

9.4 Litter Control

Low carbon alternative fuel will not be exposed to the elements and will at all times be contained within either closed trailers (delivery), the Alternative Fuel Building (fuel storage and preparation), or the closed fuel delivery system. The low carbon alternative fuel will be hauled to the site via an enclosed transfer trailer. Except for receipt of the transfer trailers, the doors to the fuel building will remain closed. The alternative fuel will not be exposed to the elements at any time during the storage or feed to the plant.

In the event that circumstances result in the accidental release of litter outside of the Alternative Fuel Building, plant staff will be instructed to immediately inform the Plant's Environmental Manager, who will direct the appropriate resources to remove and secure any litter for disposal.

9.5 Bird & Non-Bird Vector Control

It is not expected that any measures will be required to control bird and non-bird vectors. The low carbon alternative fuel materials will not contain any putrescible organic materials. Furthermore, the low carbon alternative fuel will not be exposed to the elements at any time during the storage or feed to the plant.

9.6 Air Emissions Control

SMC has made a considerable effort towards identifying, characterizing, quantifying and mitigating potential air emissions.

The main kiln exhaust stack is the most significant point source for emissions of particulate matter and gaseous compounds as it pertains to the regular use of alternative fuels. Control of emissions from the stack involves the application of rigorous management practices coupled with continuous emission monitoring. The management practices entail:

- operation of the kiln system within acceptable temperature ranges;
- operation of the kiln system within design combustion gas flow rate ranges;
- routine inspection and maintenance of the bag house;
- control of the emissions of sulfur dioxide (SO2) by:
    - optimizing the excess air rate (which controls the conversion of fuel sulfur into SO2, SO3or SO4) and/or
    - using an aqueous lime slurry injection system

- control of the emissions of oxides of nitrogen (NOx)by:
    - optimizing the temperature at the burner assemblies
    - using an aqueous ammonia injection system

The continuous emission monitoring system (CEM) gives the cement plant operator, a virtually instantaneous indication of key emissions from the cement kiln stack. The operator has in the control room a video monitor which continuously displays the CEM data. In addition, the output signal is fed into the central electronic data management and recording system, which provides alarms as a monitored parameter approaches a pre-determined control point.

It is anticipated that the same control strategies employed to control emissions when processing conventional fuels in the kiln will be equally effective during the regular use of alternative low carbon fuel.

Exhaust gases from the kiln system are cooled prior to passing through a multi-compartment bag house. The discharge from the baghouse is ducted to the base of the kiln exhaust stack which is 6.0 meters in diameter and extends 105 metres above grade elevation.

The chemistry of the inorganic portion of the low carbon alternative fuel is very similar to that of the conventional fuels so it is reasonable to expect no significant change in the particulate emissions from the process. Furthermore, trace metals (including those which are generally considered of the highest concern environmentally) are already present in the raw materials fed to the kiln at similar concentrations. Therefore it is reasonable to expect that the fate of any inorganic compounds introduced into the process with the use of alternative fuel will be similar to that of the elements already being processed.

9.6.1 Current Air Modeling Results

In concert with this application, a separate ECA air application has been prepared. The supporting documentation for the ECA air application includes an up-to-date ESDM Report that assesses both:

- the substitution of a portion of conventional fuel with clean wood as defined in O.Reg. 347; and
- the regular substitution of a portion of conventional fuel with low carbon alternative fuel defined as woody biomass derived from industrial and post-consumer sources.

The ESDM report identifies that the primary emissions from the St. Marys Cement Plant are particulate, nitrogen oxides, sulphur dioxide and carbon monoxide, but that trace amounts of metals/metal oxides and organic compounds as well as ammonia and hydrogen chloride may also be generated from the use/processing of raw materials and the combustion of fuel. The ESDM report calculates maximum emissions of both primary and trace contaminants using a combination of published emission factors stack test results, mass balance, and manufacturer's performance specifications.

These maximum emissions were modeled for all contaminants using the MOE approved US EPA AERMOD system and site specific meteorological data provided by the MOE. The resulting Point-of-Impingement (POI) concentrations were compared to the Schedule 3 Standards and POI Guidelines in the *MOE Summary of Standards and Guidelines to Support Ontario Regulation 419/05 Air Pollution – Local Air Quality (April 2012)*.

The ESDM report concludes that the maximum POI concentrations for all contaminants during use of low carbon alternative fuel would be below their respective POI limits.

Section 10: REPORTING

10.1 Data Collection

A comprehensive raw material and fuel data collection program is currently employed by SMC as part of current operating practice. This program will continue to be used during the use of low carbon alternative fuel to manage the environmental and operational effect of using both conventional fuels and alternative fuel at the cement plant.

10.2 Source Testing

Source testing will be required to confirm that the plant is operating according to O.Reg 419. The source testing program will be discussed with the MOE during review of the ECA application package to amend the existing ECA (Air).

The results of any required source testing will be included in the annual report.

10.3 Low Carbon Alternative Fuel Testing Protocol

Upon securing agreements with low carbon alternative fuel suppliers, SMC will implement an initial fuel testing protocol over a six month 'acceptance period' in which random samples will be taken of the size reduced fuels through a port/outlet in the fuel preparation and delivery system, and tested in the order of once per month. This approach will allow for SMC to determine that the material quality specifications are being met and will minimize the potential for the rejection/return of loads and disruption to stable operations.

The low carbon alternative fuel suppliers will also be required to take random samples and test materials on a bi-weekly basis over the acceptance period, in order to establish consistency of the material supply and thereafter would be required to randomly sample and test materials on a quarterly basis.

Once the initial acceptance period is complete and if the low carbon alternative fuel supplier has established that they can consistently meet SMC's alternative fuel specifications, the frequency of sampling by SMC of the size reduced woody biomass fuel will be reduced to a quarterly sampling frequency similar to the sampling of fuel adjunct materials as set out in condition 4. (1) (a) of ECA Number 3779-9BMQW4.

The alternative fuel feed will be sampled as outlined in the Standard Operating Procedure for Alternative Fuel Sampling (**Appendix G**).

10.4 Daily Log

A log will be maintained at the site and will be kept by SMC for a minimum of five years. The log will include daily records of the following information:

- The date;
- The types, amounts and source of the low carbon alternative fuel received and used;
- The amount, type and location of any low carbon alternative fuel stored;

- A record of daily inspections related to the alternative fuel system;
- A record of any spills or process upsets related to the use of alternative fuel at the site, the nature of a spill or process upset and the action taken to clean up or correct the spill, the time and date of the spill or process upset and for spills the time that the Ministry and other persons were notified of the spill in fulfillment of the reporting requirements of the EPA; and,
- The signature of the trained personnel responsible for conducting the inspection and completing the report.

10.5 Annual Report

On an annual basis, SMC will submit an annual report to the Regional Director for the previous calendar year. Each report, at a minimum, will include the following information:

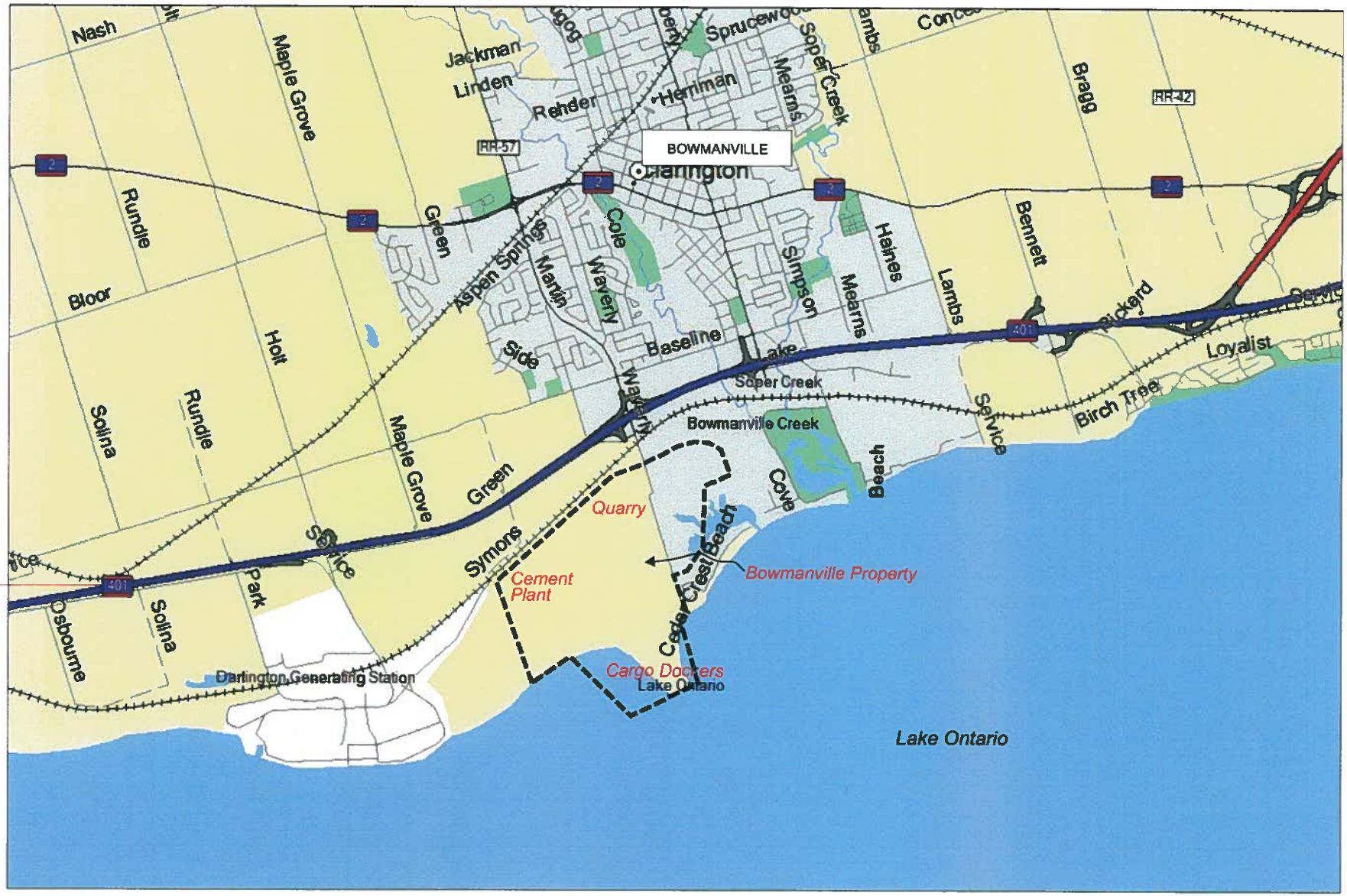
- A yearly summary of volumes of all incoming low carbon alternative fuel, transferred alternative fuel, and residual waste (e.g. rejected fuel);
- Detailed monthly summary of the type, and quantity of all low carbon alternative fuel received at site.
- Average daily amount of low carbon alternative fuel received.
- Maximum amount of low carbon alternative fuel that was received in one day in the past year.
- Amount of low carbon alternative fuel stored on-site as of date of preparation of Annual Report.
- A summary of any complaints, and actions/responses that were received regarding the facility operation related to use of alternative fuel.
- Any environmental and operational problems encountered during operations using alternative fuel and any mitigative actions taken;
- A statement as to compliance with all conditions of approval and with the inspection and reporting requirements of the conditions; and,
- Any recommendations to minimize impacts and improve operations and monitoring programs related to the use of alternative fuel.

Section 11: DECOMMISSIONING PLAN

Should it be deemed that low carbon alternative fuel will no longer be required at the site, the alternative fuel preparation and fuel handling system within the Alternative Fuel Building would be decommissioned and closed in accordance with an approved closure plan.

All unused alternative fuel would be returned to its point of origin, using a licensed hauler. The alternative fuel handling system would be dismantled and removed from the Site upon closure. SMC would notify the Director that the Site was closed and that the approved closure plan was implemented within ten (10) days after closure of the Site.

APPENDIX A: SITE LOCATION



SOURCE: NAVTEQ

0 1000m

BOWMANVILLE CEMENT PLANT
400 WAVERLY ROAD SOUTH
BOWMANVILLE, ON
L1C 3K3

N

APPROXIMATE LOCATIONS

APPENDIX B: OFFICIAL PLAN DESIGNATION AND ZONING, INCLUDING COURT OF APPEAL RULING ON THE INTERPRETATION OF THE MUNICIPAL ZONING BY-LAW

COURT OF APPEAL FOR ONTARIO

CITATION: St. Mary's Cement Inc. (Canada) v. Clarington (Municipality), 2012 ONCA 884
DATE: 20121217
DOCKET: C53545

Winkler C.J.O., Pepall J.A. and Smith J. (*ad hoc*)

BETWEEN

St. Mary's Cement Inc. (Canada)

Applicant (Appellant)

and

Municipality of Clarington

Respondent (Respondent)

Harry C. G. Underwood and Brendan Brammall, for the appellant

Ian Godfrey and Jon Smithen, for the respondent

Heard: November 20, 2012

On appeal from the judgment of Justice David G. Stinson of the Superior Court of Justice, dated March 11, 2011, with reasons reported at 2011 ONSC 1533, 81 M.P.L.R. (4th) 275.

Winkler C.J.O.:

A. Overview

[1] This is an appeal by St. Mary's Cement Inc. (Canada) ("SMC") from a decision on an application for the interpretation of a municipal zoning by-law. SMC is proposing to substitute alternative fuel for part of the conventional fossil

fuel currently used in its cement manufacturing process. The proposed fuel is recovered from post-recycling and post-composting materials. The appellant took the position that the by-law permits it to continue the manufacturing process with the new fuel. The respondent, the Municipality of Clarington ("Clarington"), disagreed.

[2] The application judge interpreted the by-law in favour of Clarington and held that the use of the alternative fuel would be an impermissible change in land use.

[3] The determinative issue in this case is whether SMC's proposed use of alternative fuel constitutes a new land use that is not permitted at the site in question. I conclude that it does not constitute a new land use. For the reasons that follow, I would allow the appeal.

B. Background

[4] SMC operates a cement manufacturing plant on the north shore of Lake Ontario in the Municipality of Clarington, within the Regional Municipality of Durham. Clarington's By-Law 84-63 permits the use of the site for a "cement manufacturing plant" as well as any accessory uses that are "customarily incidental and subordinate to, and exclusively devoted to, the main use".

[5] SMC is proposing to substitute fuel consisting of post-composting and post-recycling materials for some of the conventional fossil fuel that it currently uses.

[6] Clarington opposes SMC's proposal on the basis that it would give rise to a new land use; namely, the use of the site as a "waste disposal area," which is not permitted under the by-law. Clarington therefore maintains that an amendment to the by-law is required for SMC to use the new materials. Further, Clarington takes the position that the alternative fuels are not "customarily" used in the cement industry in Ontario and therefore do not fall within the scope of the accessory use provision of the by-law.

[7] SMC contends that its proposal does not give rise to a new land use. In the alternative, it argues that use of the alternative fuels is a permissible accessory use authorized under the by-law.

[8] Clarington's objection gave rise to the instant application. The application judge issued an order declaring that SMC's proposed use was neither a permissible use nor an acceptable accessory use under the by-law.

C. The Zoning By-Law

[9] The SMC plant comprises approximately 321 hectares and is zoned as an "Extractive Industrial (M3) Zone."

[10] Section 25.1 of the by-law lists the "Permitted Uses" of land within an M3 zone. Any use that is not permitted is prohibited. A cement manufacturing plant is not listed as one of the permitted uses in s. 25.1. However the plant is subject to a specific site exception in s. 25.4.1, which reads:

> Notwithstanding Section 25.1, those lands zoned M3-1 on the Schedules to this By-law may, in addition to the other uses permitted, be used for a cement manufacturing plant and a maximum of two (2) residential dwelling units for a manager, caretaker, watchmen, or other similar persons employed on the same lot and their families.

[11] Section 3.1(a) of the by-law permits "Accessory Buildings, Structures and Uses":

> Where this By-law provides that a lot may be used or a building or structure may be erected or used for a purpose, that purpose shall include any accessory building or structure or accessory use...

An "accessory use" is defined in s. 2 of the by-law to mean:

> [A] use established during or after the establishment of the main use which is customarily incidental and subordinate to, and exclusively devoted to, the main use of the lot, and located on the same lot as such main use.

"Use" is also defined in s. 2 of the by-law to mean:

> [T]he purpose or function for which a lot or building or structure, or any combination thereof, is designed, arranged, occupied or maintained and when used as a verb, "USE" shall have a corresponding meaning.

D. SMC's Proposal

[12] SMC currently uses petroleum coke ("petcoke"), a by-product of crude oil refining, as fuel for its cement manufacturing process. Most of the petcoke is transported to the site by lake freighter, and the rest arrives by truck. SMC has proposed to conduct a time-limited demonstration project in which three alternative fuels would be substituted for up to 30 percent of the petcoke currently used. According to the proposal, the fuels would be transported exclusively by truck and delivered on a "just-in-time" basis shortly before their use. Three alternative fuel types are proposed: post-composting residual plastic film from a composting plant, post-recycling paper bio-solids, and post-recycling residual materials from a recycled paper plant. It is hoped that this project will reduce the plant's dependency on non-renewable fossil fuels and cut costs. SMC has applied for the necessary approvals to the Ministry of the Environment under s. 27 of the *Environmental Protection Act*, R.S.O. 1990, c. E. 19 (the "*EPA*"). These approvals are pending the outcome of this appeal.

[13] Similar alternative fuels have been used by other cement manufacturers in plants in other jurisdictions including Quebec and British Columbia, as well as the United States and Europe.

[14] SMC operates another cement plant in the Town of St. Mary's in south-western Ontario. That site has proposed to use one of the same fuels proposed for use at the Clarington plant, pending approval by the Ministry of the

Environment. The Town of St. Mary's has a similar by-law but, unlike Clarington, the Town took the position that the use of alternative fuel does not constitute a change in use, that fuel storage and handling is an accessory use, and that no additional planning permission is required.

[15] Should the Clarington pilot project demonstrate that the alternative fuels can be used without any significant change in emissions or environmental impact, SMC plans to seek regulatory approval for long-term use.

[16] SMC filed expert evidence on the application to the effect that the project will not create adverse neighbourhood effects. While the substitution of fuels would result in some increased truck traffic, the system of alternative fuel delivery is enclosed and, by design, the process would not create additional litter, odour or dust nuisances. Instead, the use of post-recycled and post-compost materials is proposed to have environmental benefits and its substitution for petcoke is expected to reduce the plant's greenhouse gas and sulphur emissions.

E. Decision Below

[17] The application judge referred to the correct legal principles in interpreting the Clarington by-law. The modern principles of statutory interpretation apply equally to the interpretation of a municipal by-law and a statute: *Montréal (City) v. 2952-1366 Québec Inc.*, 2005 SCC 62, [2005] 3 S.C.R. 141, at para. 10. Thus, the interpretation of a by-law involves consideration of the text of the by-law, the

intent of municipal council, and the purpose and scheme of the by-law as a whole: *Neighbourhoods of Windfields Limited Partnerships v. Death* (2008), 48 M.P.L.R. (4th) 183 (Ont. S.C.), at para. 33, aff'd 2009 ONCA 277, leave to appeal to S.C.C. refused [2009] S.C.C.A. No. 253.

[18] The application judge decided that the proposed fuel substitution would bring the subject lands outside the expressly permitted use of the land as a "cement manufacturing plant." At para. 30 of his reasons, he concluded:

> While I agree that SMC's use of the site for the manufacturing of cement will continue to be a permitted use under the Demonstration Project ... in my view, through the introduction of a fuel that falls within the *EPA* definition of waste, SMC is introducing a new and additional use on the site, because it will be disposing of industrial waste. As such, SMC will be operating a waste disposal area on the site.

[19] The application judge also rejected the argument that use of the proposed alternative fuel was an accessory use to the main use of the site as a cement manufacturing plant, holding, at para. 33, that "[t]he evidence does not support the conclusion that the proposed use is common or customary within the Municipality of Durham or Province of Ontario."

F. Analysis

(i) The error in the decision below

[20] In my view, the application judge erred in concluding that the use of "waste" as fuel brought the plant within the definition of "waste disposal area,"

and that it therefore constituted a new and additional use. In reaching this decision he did not apply the express language used in s. 2 of the by-law to define "waste disposal area."

[21] I agree with the application judge that the proposed fuel falls within the broad definition of waste under the *EPA*. Section 2 of the *General Waste Management* Regulation, R.R.O. 1990, Reg. 347, sets out an expansive list of materials designated as wastes under the *EPA*, including post-recycling and post-composting materials regulated by *Recycling and Composting of Municipal Waste* Regulation, O. Reg. 101/94. "Waste" is not defined by the by-law; the Official Plans of Clarington and Durham define the term by reference to the EPA definition. Since by-laws are the means by which official plans are implemented, the terms of the official plans aid in the contextual interpretation of the by-law: *Aon Inc. v. Peterborough (City)* (1999), 1 M.P.L.R. (3d) 225, at para. 18.

[22] The parties agree that use of the subject lands as a "waste disposal area" is not permitted. The term "waste disposal area" is defined by s. 2 of the by-law as "a place where garbage, refuse or domestic or industrial waste is dumped, destroyed, or stored in suitable containers." Under the by-law, a "waste disposal area" is neither a generally permitted use nor a use listed under the site specific exemption for the subject lands.

[23] Under the proposal, however, SMC would not be dumping, destroying or storing waste. As a result, there is no "waste disposal area" within the meaning of the by-law. Accordingly, the sole use continues to be the use expressly permitted by s. 25.4.1 of the by-law – that is, the operation of a "cement manufacturing plant."

(ii) "Waste disposal area"

[24] The application judge concluded that because SMC would be operating a waste disposal area on the site it would be introducing a new use to the site. This conclusion is based on his finding that the proposed activity falls within the definition of "waste disposal area." In reaching this conclusion he failed to consider, and therefore analyze, the wording of the definition as it appears in the by-law. In adopting this approach to the construction of the by-law he fell into error.

[25] The site must be used for "dumping", "destroying" or "storing" waste to fall within the definition of a "waste disposal area." Clarington contends waste is "destroyed" when it is burned as fuel in a cement kiln.

[26] SMC's use of the alternative fuel would not be considered "destruction of waste", just as the use of petcoke fuel would not be characterized as the destruction of petcoke. In both cases, fuel is being used productively as part of the permitted use – the manufacturing of cement.

[27] Reading the definition of "waste disposal area" in the context of the by-law as a whole, and in the context of the official plans, the purpose of the definition is clear: the Municipality seeks to regulate land that is used for the purpose of removing, containing or managing unwanted materials. Conversely, SMC is proposing to use the materials as a resource for an existing and approved manufacturing process. The fact that the fuel materials are being diverted from the waste stream is not, on the facts of this case, determinative of the land use. In this context it is worth noting that petcoke is a "by-product" of petroleum production, and by definition, would itself be a waste product if it did not have a productive use. The use of one fuel as opposed to another does not alter the fact that the SMC plant is in essence a cement plant and not a waste disposal area.

(iii) Is the proposed use of the land a prohibited additional use?

[28] Clarington submits that even if the proposal does not fall within the definition of "waste disposal area", the proposed substitution of fuels is a use that is still prohibited because the by-law does not permit any kind of waste processing at the SMC site. The by-laws should be interpreted in the context of the Official Plans for Durham and Clarington. Clarington argues that the provisions in the Official Plans show an intention to regulate the land use aspects of waste handling. Neither the M3 Zone, nor the M3-1 Exception Zone, explicitly lists any kind of waste processing as a permitted use. By contrast, another provision in the by-law explicitly allows for a "waste transfer station and material

recovery and recycling facility for solid non-hazardous waste." Therefore, by implication, it is Clarington's position that any kind of waste processing activity is a new use that would require explicit permission.

[29] Clarington cites the decision of this court in *1121472 Ontario Inc. v. Toronto (City)* (1998), 39 O.R. (3d) 535 (C.A), at para. 15 as authority for the proposition that land may have more than one use, and if one of the uses is prohibited, that use is not saved because the primary use is permitted. Applying this reasoning to the instant circumstance, Clarington asserts that the proposed use of alternative fuel constitutes a second use of the subject lands, namely the handing of waste, which is not permitted.

[30] I cannot accede to this submission that the use of the alternative fuel by SMC constitutes a second use. All the above arguments by Clarington are contingent on a finding that the SMC proposal would introduce an additional use of the land. In my view, there is no additional use in the present circumstances. This is a complete answer to the line of argument advanced by Clarington.

[31] The proposition that partial substitution of alternative fuels constitutes a change in use requiring new planning permission was considered and rejected by the Court of Appeal of England and Wales in *R. (ex parte Lowther) v. Durham County Council and Lafarge Redland Aggregates Limited*, [2001] EWCA Civ 781.

Although *Lowther* was decided under a different regulatory framework, the interpretive issue in that case is analogous to the present circumstance.

[32] In *Lowther*, the Lafarge company ran an operation in which kilns were used to produce dolomite. Petcoke served as the primary fuel. Lafarge proposed to substitute a fuel derived from waste solvents for some of the petcoke used and received approval from the Environment Agency. The issue was whether use of the alternative fuel constituted "a material change in use of any buildings or other land" requiring separate planning permission. The court in *Lowther* noted that waste disposal could constitute a separate and distinct use of land.

[33] In *Lowther*, the court held that the use of alternative fuel was not a "material change" in land use. At para. 45, Phillips M.R. stated:

> I have been unable to identify any principle of planning law that decrees that, simply because waste is matter which has to be disposed of, a person who makes constructive use of the waste for the purpose of some activity other than disposal of the waste, but who incidentally disposes of the waste at the same time, must be deemed to be making two uses of the land, namely waste disposal and the ulterior activity.

[34] Moreover, at para. 54, the Master of the Rolls relied on "the principle that, when one is dealing with waste, the object of the operation is of particular importance when analysing the nature of the activity for planning purposes." At para. 72, Phillips M.R. agreed that there was no waste disposal use in Lafarge's burning of the alternate fuel. He concluded that the burning of fuel is a process of

"energy recovery" that is "so entirely part of the manufacture of cement for lime that it would be wrong to characterise it as a separate use."

[35] I find the reasoning in *Lowther* to be compelling and apposite to the instant case. The burning of fuel is inherent in the production of cement, and the use of alternative fuel does not amount to a separate use of the land.

[36] There may be instances where land truly has two uses, one of which would render the entire enterprise prohibited. Examples of this could include methane recapture from a landfill site or energy generation from a garbage incinerator. These situations could fall within the restricted definition of "waste disposal area." Phillips M.R. averted to this possibility at para. 58 of *Lowther*:

> In some circumstances an operation may involve a nice balance between the objective of waste disposal and the ultimate objective of the operation. In those circumstances it may be correct to hold that the land is being subjected to two uses, waste disposal and the ultimate objective.

[37] Whether any particular activity constitutes a second use for planning purposes will depend on the facts of the case and specific language of the by-law at issue.

G. Conclusion and Disposition

[38] My conclusion that the by-law does not bar SMC's alternative fuel use is in no way an invitation to unregulated waste disposal in the municipality. The by-law is still effective against any activity captured by the definition of "waste disposal

area," as it is against any other activity where land is being used for an additional use that is not permitted.

[39] It is worth repeating that the present case is a land use case and not an environmental matter. Even though the by-law does not restrict the substitution of fuels in this case, SMC is still subject to the broad regulatory oversight of the Ministry of the Environment. At para. 10 of his reasons, the application judge emphasized that "the focus of this case is on land use, not environmental regulation." Use of the proposed fuels still requires s. 27 approval from the Ministry under the *EPA*, which is pending in this case.

[40] Moreover, it is also important to emphasize that this case is about the interpretation of a specific by-law. It does not involve an issue as to the powers of the municipality.

[41] Given my conclusion that the proposed use of alternative fuel falls within the permitted use under the by-law, it is unnecessary to address the second issue of accessory use.

[42] For the reasons above, I would allow the appeal, set aside the judgment below and the application judge's order as to costs.

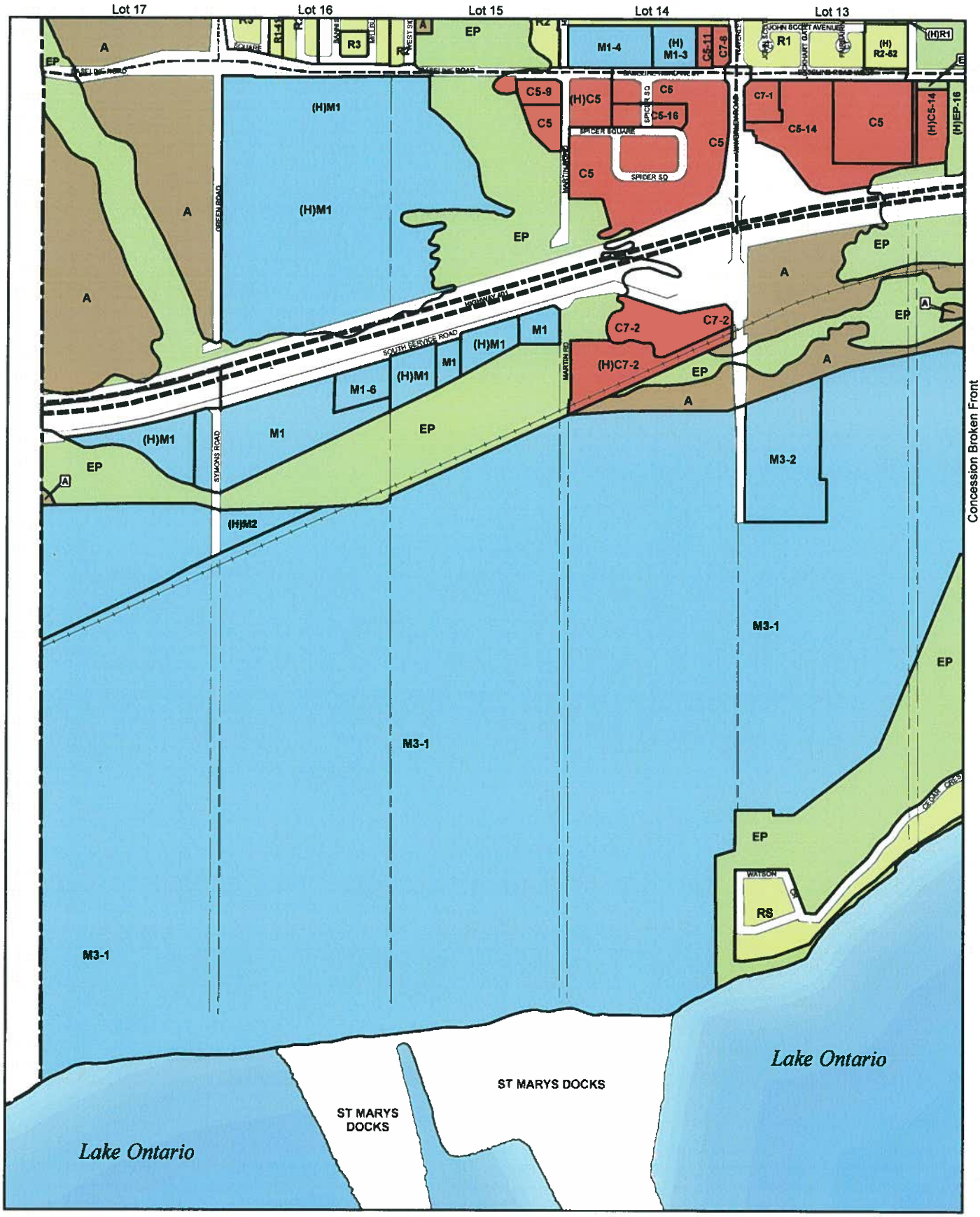
[43] An order shall issue declaring that use of the proposed alternative fuels at the SMC plant in the Municipality of Clarington does not constitute a new land use and is permissible for the purposes of Zoning By-Law 84-63.

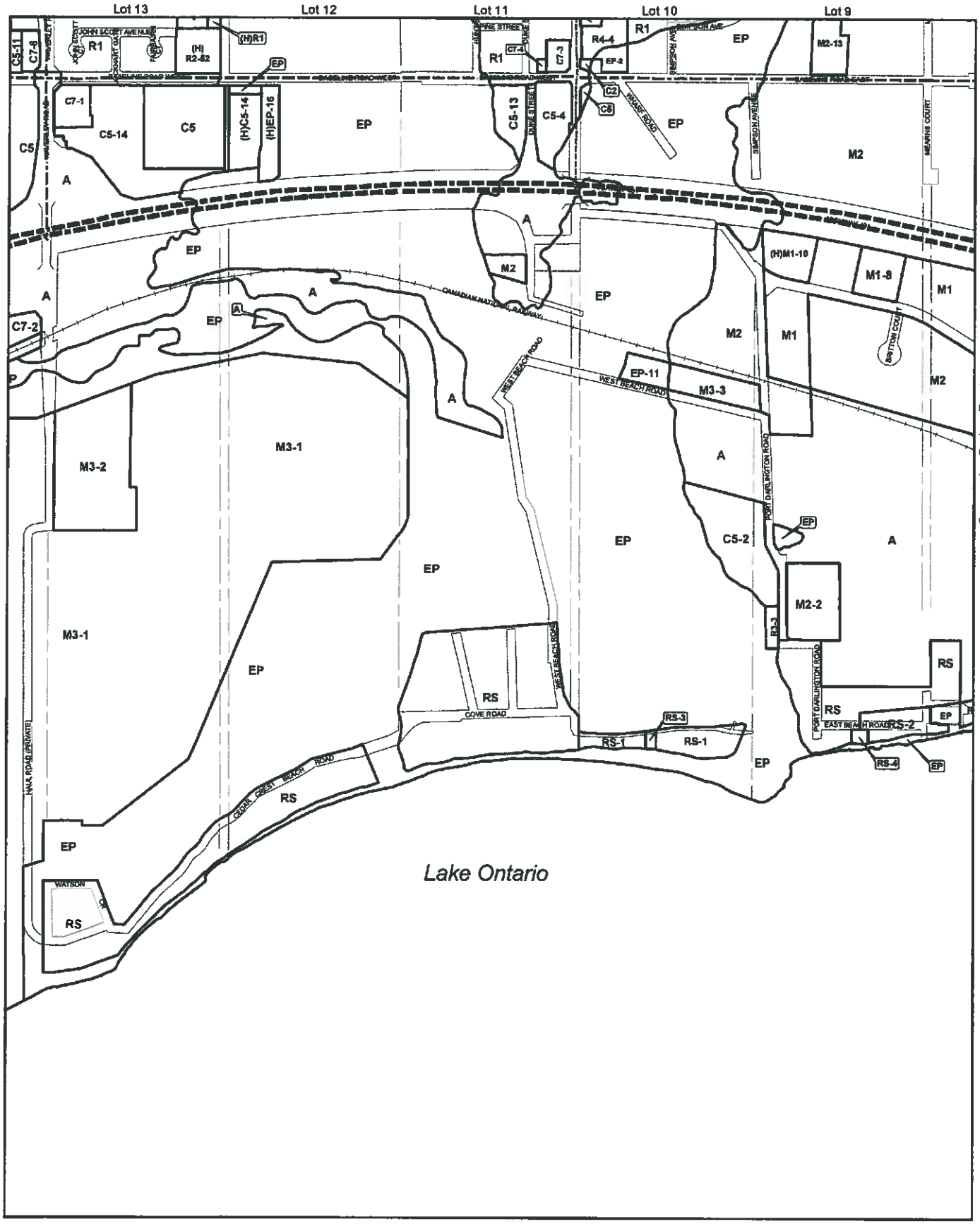
[44] SMC is entitled to its costs on the application and the appeal. The costs of the appeal are fixed at the agreed amount of $25,000, inclusive of disbursements and taxes.

Released: DEC 17 2012

I agree. St. Lipsett JA.

I agree
Patrick Smith J.
(ad hoc)


Lot 17
Lot 16
Lot 15
Lot 14
Lot 13
Concession Broken Front
BELFAIR ROAD
GREEN ROAD
SYMONS ROAD
SOUTH SERVICE ROAD
HIGHWAY 401
MARTIN RD
SPICER SQUARE
SPICER SQ
JOHN SCOTT AVENUE
WATSON
CRAIG CRES
A
EP
R3
R2
R1
M1-4
(H) M1-3
C5-11
C7-6
C5-9
C5
(H)C5
C5-16
C7-1
C5-14
(H)C5-14
(H)EP-16
(H)R1
(H) R2-52
(H)M1
M1
M1-6
C7-2
(H)C7-2
M3-2
M3-1
(H)M2
RS
Lake Ontario
ST MARYS DOCKS
Residential
Commercial
Institutional
Industrial
EP
Agricultural
N
January, 2013
ZONE BOUNDARY
ARTERIAL ROAD TYPE 'A'
ARTERIAL ROAD TYPE 'B'
Municipality of Clarington
Zoning By-Law 84-63
Schedule 3 (Bowmanville)
3D
1B
3A
3B



January 4, 2010

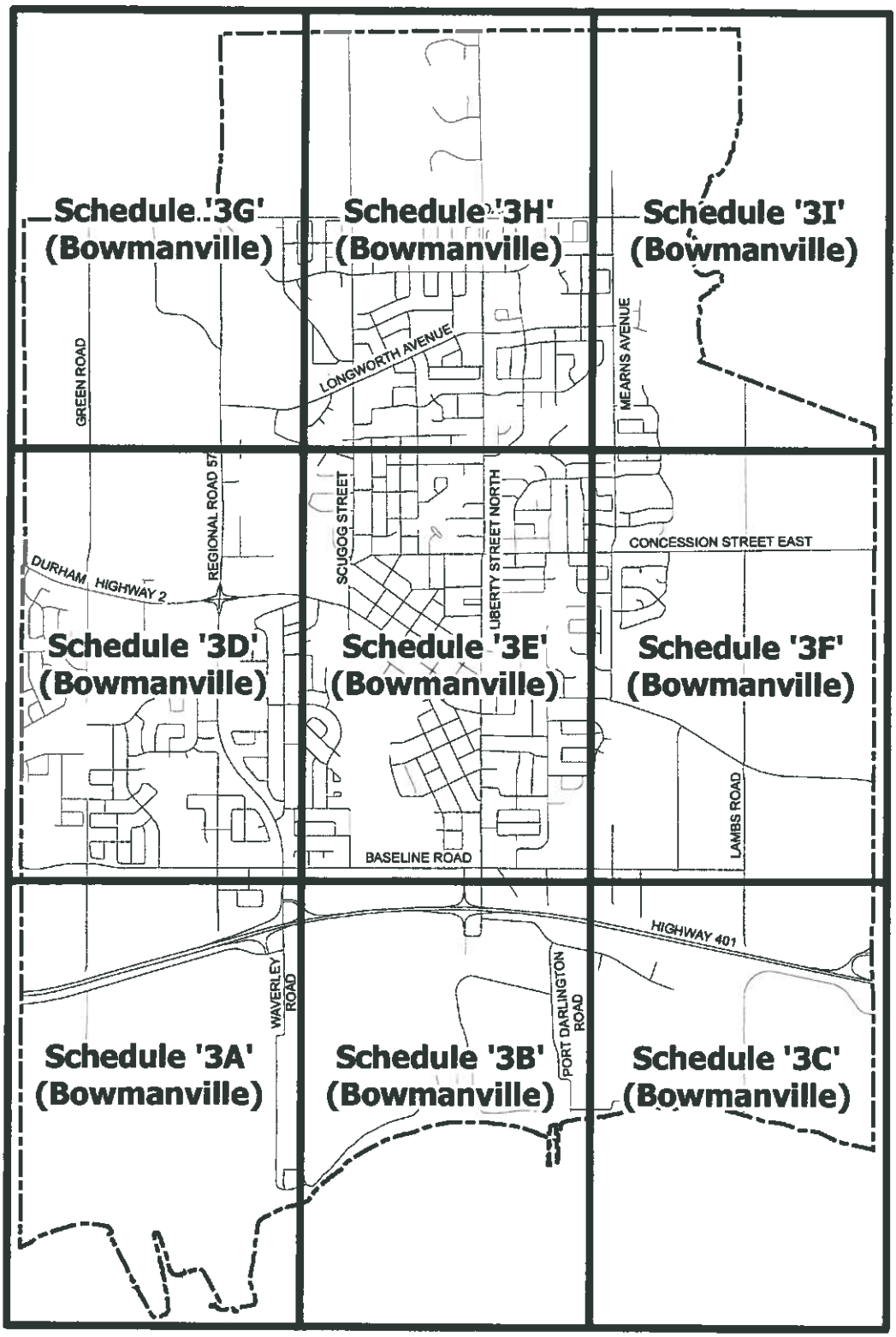
0 100 200 400 Metres

ARTERIAL ROAD TYPE 'A'

ARTERIAL ROAD TYPE 'B'

Municipality of Clarington
Zoning By-Law 84-63
Schedule 3 (Bowmanville)

3A **3B** 3C 3E



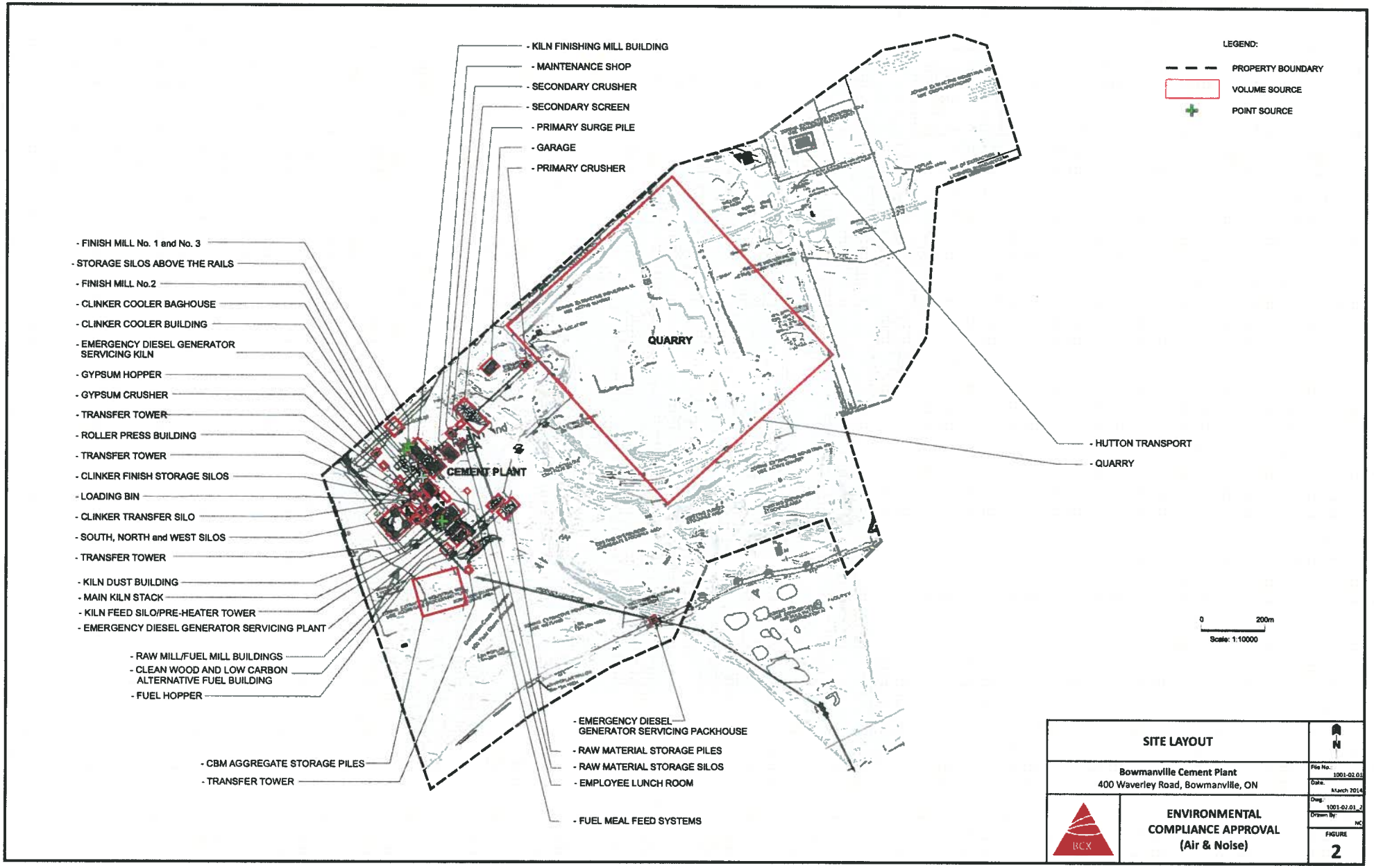
CORPORATION of the
MUNICIPALITY of CLARINGTON
(Former Town of Newcastle)
BOWMANVILLE
(FORMER TOWNSHIP OF DARLINGTON)

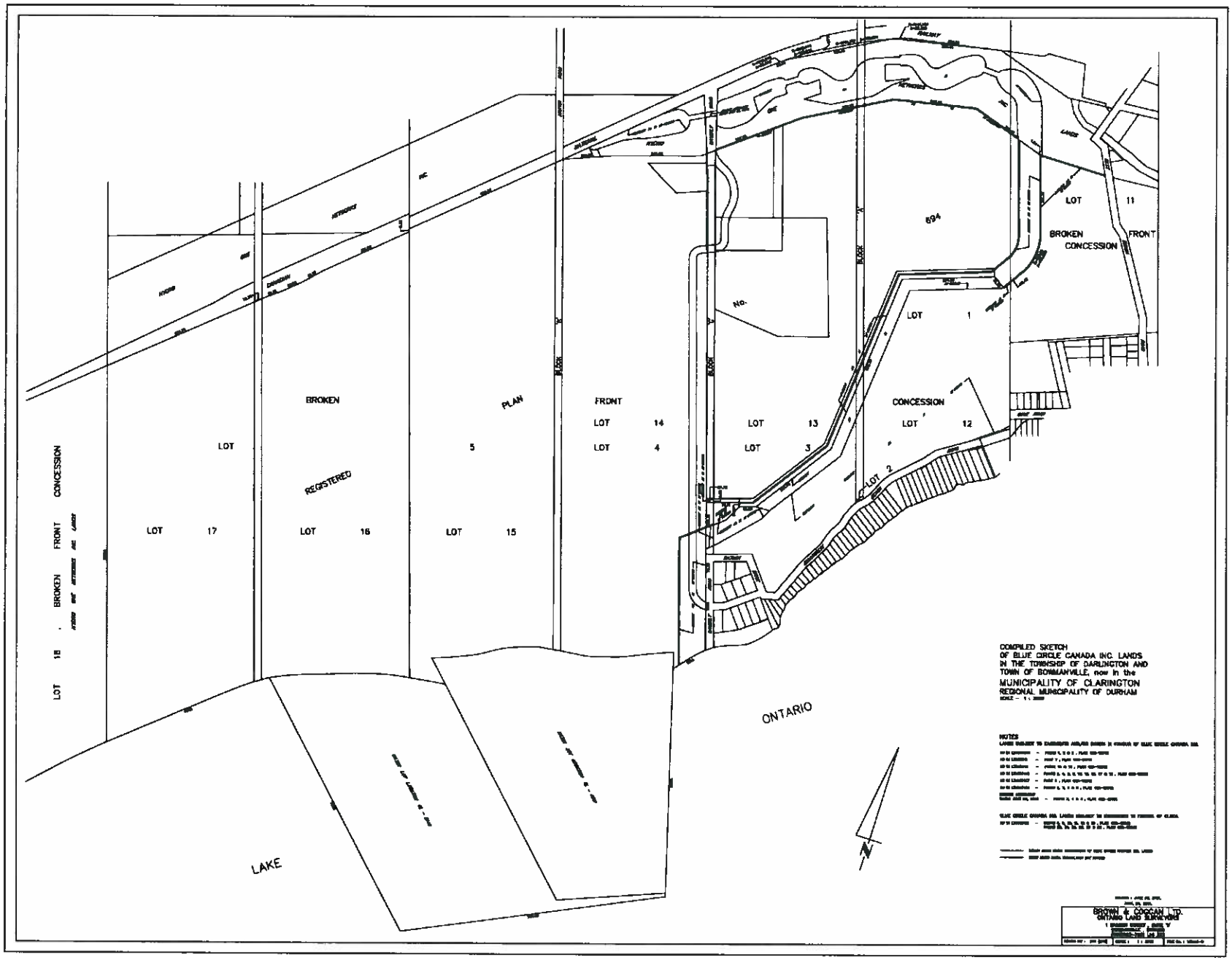
THIS IS SCHEDULE '3'
TO BY-LAW 84-63
PASSED THIS 10th DAY
OF SEPTEMBER, 1984

G B Rickard — G B. RICKARD, MAYOR
Gertrude Gray — DEPUTY CLERK

Schedule '3' (Bowmanville)

APPENDIX C: SITE PLAN


- KILN FINISHING MILL BUILDING
- MAINTENANCE SHOP
- SECONDARY CRUSHER
- SECONDARY SCREEN
- PRIMARY SURGE PILE
- GARAGE
- PRIMARY CRUSHER
- FINISH MILL No. 1 and No. 3
- STORAGE SILOS ABOVE THE RAILS
- FINISH MILL No.2
- CLINKER COOLER BAGHOUSE
- CLINKER COOLER BUILDING
- EMERGENCY DIESEL GENERATOR SERVICING KILN
- GYPSUM HOPPER
- GYPSUM CRUSHER
- TRANSFER TOWER
- ROLLER PRESS BUILDING
- TRANSFER TOWER
- CLINKER FINISH STORAGE SILOS
- LOADING BIN
- CLINKER TRANSFER SILO
- SOUTH, NORTH and WEST SILOS
- TRANSFER TOWER
- KILN DUST BUILDING
- MAIN KILN STACK
- KILN FEED SILO/PRE-HEATER TOWER
- EMERGENCY DIESEL GENERATOR SERVICING PLANT
- RAW MILL/FUEL MILL BUILDINGS
- CLEAN WOOD AND LOW CARBON ALTERNATIVE FUEL BUILDING
- FUEL HOPPER
- CBM AGGREGATE STORAGE PILES
- TRANSFER TOWER
- EMERGENCY DIESEL GENERATOR SERVICING PACKHOUSE
- RAW MATERIAL STORAGE PILES
- RAW MATERIAL STORAGE SILOS
- EMPLOYEE LUNCH ROOM
- FUEL MEAL FEED SYSTEMS
- HUTTON TRANSPORT
- QUARRY
QUARRY
CEMENT PLANT
LEGEND:
PROPERTY BOUNDARY
VOLUME SOURCE
POINT SOURCE
0
200m
Scale: 1:10000
SITE LAYOUT
N
Bowmanville Cement Plant
400 Waverley Road, Bowmanville, ON
File No.: 1001-02.01
Date: March 2014
Dwg.: 1001-02.01_2
Drawn By: NC
ENVIRONMENTAL COMPLIANCE APPROVAL (Air & Noise)
FIGURE
2


LOT 18 . BROKEN FRONT CONCESSION
LOT 17
BROKEN
REGISTERED PLAN 5
FRONT
LOT 14
LOT 4
LOT 13
LOT 3
CONCESSION
LOT 12
LOT 2
LOT 1
694
NO.
LOT 11
BROKEN CONCESSION FRONT
LOT 16
LOT 15
ONTARIO
LAKE
COMPILED SKETCH
OF BLUE CIRCLE CANADA INC. LANDS
IN THE TOWNSHIP OF DARLINGTON AND
TOWN OF BOWMANVILLE, now in the
MUNICIPALITY OF CLARINGTON
REGIONAL MUNICIPALITY OF DURHAM
NOTES
BROWN & COGGAN LTD.
ONTARIO LAND SURVEYORS

APPENDIX D: RELEVANT STANDARD OPERATING PROCEDURES (SOPS)

1.0 PURPOSE

1.1 The purpose of this procedure is to describe the proper handling and disposal of general waste and recyclable material generated by St. Marys Cement Bowmanville Plant.

2.0 SCOPE

2.1 This procedure applies to the operations and activities within ST. Marys Bowmanville Plant related to the generation, handling, disposal and recycling of waste.

3.0 RESPONSIBILITY

3.1 **Employee:**
All employees are responsible to comply and follow the requirements of this procedure.

3.2 **Dept. Supervisor/Mgr.:**
All supervisors / Managers are responsible to ensure that waste is handled and disposed according to the requirements of this procedure within their area of responsibility.

3.3 **Environmental Manager/ Safety and Health Representative:**
The Environmental Manager and the Safety and Health Representative are responsible to identify and communicate applicable regulatory legal requirements.

4.0 DEFINITIONS

4.1 **Applicable Health Safety and Environment Legal Requirements**: Requirements established by a proper Government Agency that regulates the operations of St Marys Bowmanville Plant regarding Heath Safety & Environment.

4.2 **Proper Government Agency:**
Government Agency with authority or power to issue Health, Safety and Environmental regulations. Examples of proper government agencies are the Ministry of the Environment, Environment Canada, and the Ministry of Labor.

5.0 PROCEDURE

5.1 Drummed Waste

5.1.1 Empty drums are available from stores; all drummed waste must have a waste label affixed to the outside prior to filling.

5.1.2 Labels are available from stores and must have the type of waste and the date the waste drum became full.

5.1.3 Examples of wastes that should be handled in drums are the following:

- Used oil
- Ethylene Glycol
- Used grease
- Solvents

- Contaminated fuel (diesel/gasoline)
- Grinding aid
- Absorbent material contaminated with any of the wastes listed above

5.1.4 Liquid waste should be placed in a closed top, bung type drum wherever possible.
5.1.5 Used oil should be placed in a black plastic closed top, bung type drum wherever possible.
5.1.6 Solid waste should be placed in an open top drum.
5.1.7 All bungs on closed top drums or rims on open top drums must be securely in place prior to moving the drum.
5.1.8 Full waste drums must be moved inside the waste storage compound located south of the plant lubrication building.
5.1.9 Waste drums should not be moved if the drum is not labeled and properly closed. Waste drums should be moved in a safe manner to minimize the risk of spills or leaks; caution should be taken to avoid denting or damaging the drum while is handled.
5.1.10 If the drum is leaking transfer the waste to another drum or place the drum in an overpack drum and clean up any spilled material. Use appropriate personal protective equipment.
5.1.11 If there is a doubt on how to handle a waste contact your supervisor or the Environmental Manager.
5.1.12 The Environmental Manager is responsible to contact a company as required for the pick up of drummed waste and to ensure that waste drums are not stored more than three months in the waste storage compound.

5.2 Used Oil & Oily Waste

5.2.1 Used oil should be handled in a black plastic closed top, bung type drum wherever possible. If smaller containers are required to collect used oil ensure that the container is transferred to a proper drum, to the used oil tank located at the south of the lubricant building or to the designated tote for used oil located in the quarry maintenance building. Do not mix oil with other materials.
5.2.2 Drums with oil should be transferred to the used oil tank located at the south of the lubricant building. The lift truck operator should place the filled drums with used oil on top of the used oil tank. The lift truck operator is responsible to place the drums on top of the used oil tank and the lubrication crew will be responsible to drain the drums into the used oil tank, close the empty drums and put them on the floor of the waste storage compound.
5.2.3 When 5 to 10 empty drums are generated the lift truck operator should transfer the empty drums to Stores for return or recycling.
5.2.4 Oil saturated wastes such as absorbents should be placed in open top drums, labeled and transferred to the waste storage compound.
5.2.5 Oil and oily waste should not be disposed in the dumping hoppers.
5.2.6 The Environmental Manager will contact a waste disposal company as required for the pick up of used oil and oily waste.

5.3 Used Oil Filters

5.3.1 Used oil filters should not be disposed of in the regular plant waste
5.3.2 Used oil filters should be collected in the black totes located in the waste storage compound and in the quarry maintenance building.
5.3.3 The Environmental Manager will contact a waste disposal company as required for the pick up of used oil filters.

5.4 Fluorescent tubes

5.4.1 Fluorescent tubes, high intensity discharge lamps (HID) and high pressure sodium lamps contain mercury mainly in vapor form.

5.4.2 Spent fluorescent tubes, HID lamps and high pressures sodium lamps should be repackaged in their original packaging when available or use the packaging material provided by the waste disposal company. Reasonable effort should be made to prevent breakage.

5.4.3 Spent lamps should be stored in the metallic container located inside on the west side of the main floor of the old burner building.

5.4.4 Environmental Manager will contact a waste disposal company as required for the pick up of spent lamps.

5.5 Lead Acid Batteries

5.5.1 Lead acid batteries contain hazardous and corrosive substances and should not be disposed of in the regular plant waste.

5.5.2 Spent lead acid batteries should be collected in the quarry maintenance shop or in the waste storage compound at the south of the plant lubrication building.

5.5.3 Take the necessary precautions to prevent damage or leakage of lead acid batteries. Damaged or leaking batteries should be placed in a drum and labeled. Contact the Environmental Manager for their disposal.

5.5.4 Environmental Manager will contact a recycling or waste disposal company as required for the pick up of spent lead acid batteries.

5.6 Small Batteries

5.6.1 Alkaline batteries should be collected for recycling or proper disposal

5.6.2 Used batteries should be collected by each department and placed in the waste storage compound in the container labeled "used batteries."

5.6.3 Environmental Manager will contact a recycling or waste disposal company as required for the pick up of spent batteries.

5.7 Computers / Electronic equipment

5.7.1 Computers and electronic equipment should not be placed with garbage. It should be collected for recycling or proper disposal.

5.7.2 Contact the Environmental Manager or Electrical Supervisor to arrange for recycling or disposal of computers or other electronic equipment such as televisions, monitors, printers, telephones, cellular phones, VCRs, cameras and radios.

5.8 Laboratory Waste

5.8.1 Spent chemical solutions and obsolete chemicals should be collected and labeled for disposal.

5.8.2 Spent chemical solutions and obsolete chemicals should be handled according to their MSDS and appropriate personal protective equipment should be used.

5.8.3 The Quality Control Laboratory Supervisor is responsible for the temporary storage of spent solutions and obsolete chemicals.

5.8.4 The Quality Control Laboratory Supervisor will coordinate with the Environmental Manager the pick up of spent solutions and obsolete chemicals as required.

5.9 Aerosol Cans Disposal

5.9.1 Used aerosol cans should be punctured using the equipment for can disposal located in the mechanical maintenance shop or the quarry garage in order to remove any remaining material.

5.9.2 The aerosol punctured cans should be placed in the recycling containers for metal.

5.10 Equipment Containing Refrigerant

5.10.1 Equipment containing refrigerant should not be disposed of unless the equipment is tagged by a certified technician who determines that the equipment no longer contains any refrigerant.
5.10.2 The department responsible of the equipment containing refrigerant is responsible to contact a certified technician to ensure that the equipment does not contain refrigerant before its disposal.
5.10.3 Only certified technicians should service equipment containing refrigerants to ensure proper handling of the refrigerant and to diminish the risk of possible leaks of refrigerant.

5.11 Rubber Belt Conveyors

5.11.1 Rubber belt conveyors should be sent back to the manufacturer for recycling when possible.
5.11.2 If rubber belt conveyors cannot be sent to manufacturer an alternative method for reuse should be evaluated. The last option to be considered will be disposal in a landfill.

5.12 Tires

5.12.1 Waste tires should not be placed with garbage.
5.12.2 The department that is arranging to change a tire or tires should also arrange with the company that is replacing the tires for the disposal of the waste tires.
5.12.3 Tire supplier should be contacted to collect and dispose waste tires.

5.13 Used Personal Protection Equipment

5.13.1 Used personal protection equipment can be disposed in garbage containers if it is not contaminated with hazardous materials.
5.13.2 Used personal protection equipment contaminated with hazardous materials should be disposed in the same manner as the hazardous material.

5.14 Asbestos

5.14.1 Take all precautions necessary to prevent asbestos waste from becoming airborne.
5.14.2 Project work involving asbestos removal should be co-ordinated with the environmental manager and the safety and health representative for proper disposal and handling.
5.14.3 Personnel should use proper PPE to avoid inhalation of asbestos.
5.14.4 Bags or liners should be used to dispose asbestos in order to prevent asbestos from becoming airborne.
5.14.5 Containers used for disposal of asbestos should be properly labeled.
5.14.6 Environmental Manager will contact a waste disposal company as required for the pick up of asbestos waste.

5.15 General Recycling

5.15.1 Where practicable, aluminum and plastic beverage containers, paper, cardboard, metal and wood should be recycled.
5.15.2 Recyclable material should be placed in the labeled containers located throughout the plant and office buildings.
5.15.3 Cleaning workers are responsible for emptying personal recycling material from office buildings.

5.15.4 Lift truck operators are responsible to collect the dumping hoppers throughout the plant and disposing the material in the proper central containers.

5.15.5 Used office printer cartridges should be sent back to the supplier for recycling or refilling when possible.

5.16 General Waste

5.16.1 General waste should be placed in the labeled containers located throughout the plant and office buildings.

5.16.2 Cleaning workers are responsible for emptying general waste from office buildings.

5.16.3 Lift truck operators are responsible to collect the dumping hoppers throughout the plant and dispose the general waste in the proper central container.

5.16.4 General waste will be disposed by a waste management company as required.

5.17 Signing Waste Manifest

5.17.1 Only St. Marys personnel trained in the Transportation of Dangerous Goods Act shall complete and sign waste manifests.

5.17.2 Contact the Environmental Manager to verify list of people trained in Transportation of Dangerous Goods

6.0 REFERENCE DOCUMENTS

- Waste Management Ontario Regulation 347
- St. Marys Bowmanville Plant Asbestos Survey
- PD 00617 Refrigerant and Ozone Depleting Substance Management

Votorantim Cimentos	VCNA-St. Marys - Bowmanville Plant PROCEDURE	Code	
		Revision	00
	Title: Spill Response Procedure	Area	Environment
		Pages	1 of 5

1. OBJECTIVE

The purpose of this procedure is to ensure that appropriate actions are taken to respond to any spill within the property of St Marys Cement Bowmanville Plant in order to comply with all applicable environmental regulations and minimize its potential adverse effect.

2. REFERENCES

Environmental Protection Act

Ontario Water Resources Act

Spills O.Reg 360/90

Classification and Exemption of Spills O.Reg 675/98

Spill Prevention and Contingency Plans O. Reg 224/07

Accident Incident and Environmental Non-Conformance Reporting Procedure PD00166

3. DEFINITIONS

Spill: A discharge of a pollutant into the natural environment from or out of a structure, vehicle or other container, that is abnormal in quality or quantity.

Reportable spill: A spill that **causes** or **may cause** any of the following adverse effects:

Impairment of the quality of the natural environment for any use that can be made of it;

Injury or damage to property, plant or animal life;

Harm or material discomfort to any person;

An adverse effect on the health of any person;

Impairment of the safety of any person;

Rendering any property, plant or animal life unfit for human use;

Loss of enjoyment of normal use of property;

Interference with the normal conduct of business;

If a spill enters or is likely to enter any waters

Or if it is an uncontained spill and the volume meets or exceeds the volumes in the table listed below.

Contaminant	Quantity
Diesel Fuel	100 liters
Gasoline	100 liters
Solvents	100 liters
Lubricant Oils	100 liters
Grinding Aid	100 liters
Glycol	100 liters
Refrigerant	100 Kg
Cement	If dust leaves site in quantities sufficient to cause an adverse effect.
Stone Dust	If dust leaves site in quantities sufficient to cause an adverse effect.
Yard Dust	If dust leaves site in quantities sufficient to cause an adverse effect.

Uncontained spill: A spill that is not contained by a structure such as a dike or a building that prevents the spill to enter the natural environment.

Natural environment: Means the air, land and water, or any combination or part thereof, of the Province of Ontario.

Air: Means open air not enclosed in a building, structure, machine, chimney, stack or flue.

Land: Means surface land not enclosed in a building, land covered by water and all subsoil, or any combination or part thereof.

Water: Means surface water and ground water, or either of them.

Pollutant: Means a contaminant other than heat, sound, vibration or radiation, and includes any substance from which a pollutant is derived.

Contaminant: Means any solid, liquid, gas, odour, heat, sound, vibration, radiation or combination of any of them resulting directly or indirectly from human activities that causes or may cause an adverse effect.

CAR: Corrective Action Request, form to perform root cause analysis with the purpose to avoid reoccurrence.

4. STANDARD ITEMS DESCRIPTION

4.1 General Spill Response:

Spill response, as outlined in the following, should be initiated for any spill regardless of size:

- Ensure your personal safety and the safety of those around you;
- Clear the area, where and as appropriate;
- Notify your supervisor and Shift Production Supervisor;
- The Shift Production Supervisor will notify the Environmental Manager or Safety and Health representative;
- Determine the nature of the spill, identify the substance, source and volume of the spill, and area of impact;
- If unsure about how to handle the substance refer to the MSDS for information about clean up and disposal;
- Make sure to use proper personal protective equipment;
- If possible shut off or eliminate the source;
- Contain the material in the smallest possible area;
- If there is the possibility of a oil/fuel spill entering into the natural watercourse, the installation of oil booms across the creek should be conducted immediately;
- If the spill is larger than you can handle get assistance, otherwise initiate clean up.

4.2 Spill Clean up:

Spill clean up should be initiated as soon as possible to diminish its environmental risk:

- Place absorbent material on the spill, starting from the outer edges
- If necessary build berms below the area where the spill is spreading
- Attempt to keep the spill from reaching water, sanitary and storm sewers. Cover all drains to basins, ditches and storm sewers with drain cover or diking material;
- Place saturated material in a drum or other liquid tight container;
- Label the container indicating the type of material;
- Place drum in designated waste storage area;
- Notify the Environmental Manager when the clean up has been completed.

4.3 Spill Notification:

- All employees must report a spill immediately to their supervisor and the Shift Production Supervisor.
- The Shift Production Supervisor will report the spill to the Environmental Manager and in the absence of the Environmental Manager the spill must be reported to the Safety and Health Representative.

4.3.1 Reportable Spill:

The Environmental Manager or Safety and Health representative will report immediately those spills that meet the definition of reportable spill to the **Spill Action Center of the Ministry of The Environment. (Ph. #: 1-800-268-6060) and the Municipality of Clarington (Ph. #: 905-623-3379).**

In the absence of the Environmental Manager and the Safety and Health representative; the Production Shift Supervisor will make the appropriate notifications.

Cargo Dockers is responsible for dock operations and to ensure compliance with legal requirements within their area of responsibility.

Cargo Dockers is responsible to notify immediately the Ministry of the Environment, the Municipality of Clarington and St Marys' personnel when a reportable spill occurs at the dock.

The person reporting the spill should be prepared to provide the following information:

- Type of material released;
- Time, location, and duration of the release;
- Estimate of the quantity of the spill;
- Description of the circumstances and cause of the spill;
- Description of actions taken to contain the spill and clean up efforts.

Write the name of the person of the Ministry of the Environment and the time that the spill was reported, this information should be included in the associated Corrective Action Request form (CAR).

4.3.2 In case that the spill is larger than St Marys' personnel can handle the Environmental Manager, the Safety and Health Representative, or the Shift Production Supervisor should contact immediately **DETOX emergency spill response service (Ph.#: 905-623-1367)** to handle the spill.

4.3.3 All reportable spills, are considered non-conformances and a CAR should be issued to avoid reoccurrence. The Environmental Manger will decide whether a CAR is required for spills that are not reportable.

5. APPENDICES

NA

APPENDIX E: ECA (AIR) NUMBER 3779-9BMQW4

Ontario

Ministry of the Environment
Ministère de l'Environnement

AMENDED ENVIRONMENTAL COMPLIANCE APPROVAL
NUMBER 3779-9BMQW4
Issue Date: December 5, 2013

St. Marys Cement Inc. (Canada)
55 Industrial Street
Toronto, Ontario
M4G 3W9

Site Location: Bowmanville Plant
400 Waverly Road, Bowmanville
Clarington Municipality, Regional Municipality of Durham
L1C 3K3

You have applied under section 20.2 of Part II.1 of the Environmental Protection Act, R.S.O. 1990, c. E. 19 (Environmental Protection Act) for approval of:

A cement manufacturing Facility, having a maximum clinker production of 6,500 tonnes per day, consisting of the following equipment:

- One (1) dry process cement kiln:
  - Firing bituminous coal, petroleum coke, fuel oil and/or Fuel Adjunct Materials at a maximum heat input of 26,000 Gigajoules per day;
  - Using limestone and gypsum as raw materials along with Industrial By-Product Materials as substitute raw material sources of calcium oxide, silica, iron oxide and alumina required for the cement manufacturing process; and
  - Equipped with a pulse jet type dust collector (Kiln Feed Baghouse), having 1,667 square metres of filtering bags and a filtering velocity of 7.8 centimetres per second, discharging into the air at a maximum volumetric flowrate of 130 cubic metres per second through a stack (Kiln Stack), having an exit diameter of 5.5 metres, extending 15 metres above the roof and 105 metres above grade.
- One (1) kiln by-pass system, complete with a pulse jet type dust collector (By-Pass Baghouse) having 23,750 square metres of filtering bags and a filtering velocity of 0.96 centimetres per second, discharging into the air through a stack (Kiln Stack) (as described above);

- One (1) selective non-catalytic NOx reduction system, with the total maximum ammonia injection rate of 1200 litres per hour, discharging into the air through a stack (Kiln Stack) (as described above);

- One (1) hydrated lime injection system, with the total maximum injection rate of 8 tonnes per hour, discharging into the air through a stack (Kiln Stack) (as described above);

- One (1) clinker cooler, complete with a pulse jet type dust collector (Cooler Baghouse), having 15,627 square metres of filtering bags and a filtering velocity of 2 centimetres per second, discharging into the air at a maximum volumetric flowrate of 111 cubic metres per second through a stack (Cooler Stack), having an exit diameter of 3.55 metres, extending 42 metres above grade;

- Three (3) finishing mills each processing cement at a maximum production rate of 1,680 tonnes per day, complete with:

  - Two pulse jet type dust collectors (Finish Mills 1 and 3 Baghouses) serving Finish Mills 1 and 3, having filtering bag area of 1418 square metres and 1066 square metres with a corresponding filtering velocity of 2.0 centimetres per second and 2.08 centimetres per second and a volumetric flow rate of 28.3 cubic metres per second and 22.1 cubic metres per second, respectively, discharging into the air at a combined maximum volumetric flowrate of 50.4 cubic metres per second through a stack (Finish Mills 1 and 3 Stack), having an exit diameter of 1.85 metres, extending 42.7 metres above grade; and

  - One pulse jet type dust collector (Finish Mill 2 Baghouse) servicing Finish Mill 2, having 1,411 square metres of filtering bags and a filtering velocity of 3.9 centimetres per second, discharging into the air at a maximum volumetric flowrate of 28.3 cubic metres per second through a stack (Finish Mill 2 Stack), having an exit diameter of 1.2 metres, extending 42.7 metres above grade.

- One (1) secondary crusher, having a maximum production rate of 26,400 tonnes per day, equipped with a pulse jet type dust collector (Secondary Crusher Baghouse), discharging into the air at a maximum volumetric flowrate of 5.2 cubic metres per second through a stack having exit dimensions of 0.3 metre by 0.3 metre, extending 16.5 metres above grade;

- One (1) screen, having a maximum production rate of 26,400 tonnes per day, equipped with a pulse jet type dust collector having 479 square metres of filtering bags and a filtering velocity of 3.4 centimetres per second, discharging into the air at a maximum volumetric flowrate of 5.6 cubic metres per second through a stack having exit dimensions of 0.3 metre by 0.3 metre, extending 16.5 metres above grade;

- One (1) gypsum/slag crusher, equipped with a pulse jet type dust collector (Gypsum/Slag Crusher Baghouse) having 308 square metres of filtering bags and a filtering velocity of 1.23 centimetres per second discharging into the air at a maximum volumetric flowrate of 3.8 cubic metres per second through a stack having an exit diameter of 0.5 metres, extending 5.6 metres above grade;

- One (1) fuel mill, having a maximum production rate of 1,536 tonnes per day, equipped with two identical pulse jet type dust collectors (Fuel Mill Baghouses 1 and 2) each having 2,397 square metres of filtering bags and a filtering velocity of 1.1 centimetres per second, discharging at a maximum volumetric flowrate of 3.7 cubic metres per second through the baghouses and discharging into the air through the Kiln Stack (as described above);

- Pulse jet baghouse dust collectors described in Schedule "B", to control particulate matter emissions from the various processes and material storage and handling operations;

- One (1) diesel fired emergency pump, having a maximum heat input capacity of 536,904 kilojoules per hour, discharging into the air through a stack having an exit diameter of 0.2 metre extending 0.1 metre above the roof and 5 metres above grade;

- Two (2) diesel fired emergency generators:

  - One (1) diesel fired emergency generator designated to provide electricity to the plant excluding kiln, having a maximum heat input capacity of 1,208,034 kilojoules per hour, discharging into the air through a stack having an exit diameter of 0.2 metre, extending 0.1 metre above the roof and 5 metres above grade;

  - One (1) diesel fired emergency generator designated to provide electricity to rotate the kiln, having a maximum heat input capacity of 2,010,705 kilojoules per hour, discharging into the air through a side exhaust having an exit diameter of 0.2 metre and extending 10 metres above grade.

- Five (5) fuel fired comfort heating units:

  - One (1) No. 2 oil fired boiler, having a maximum heat input capacity of 225 kilojoules per hour, discharging through a stack having an exit diameter of 0.1 metre, extending 1.5 metres above the roof and 15 metres above the grade;

  - One (1) No. 2 oil fired boiler, having a maximum heat input capacity of 71 kilojoules per hour, discharging through a stack having an exit diameter of 0.1 metre, extending 1.5 metres above the roof and 40 metres above the grade;

  - One (1) No. 2 oil fired boiler, having a maximum heat input capacity of 984 kilojoules per hour, discharging through a stack having an exit diameter of 0.1 metre, extending 0.1 metre above the roof and 5 metres above the grade;

  - One (1) No. 2 oil fired boiler, having a maximum heat input capacity of 139 kilojoules per hour, discharging through a stack having an exit diameter of 0.1 metre, extending 0.1 metre above the roof and 10 metres above the grade;

  - One (1) propane direct-fired space heater, having a maximum heat input capacity of 0.124 SCF per hour, discharging directly into maintenance garage.

- Eight (8) laboratory fume hoods, discharging into the air via one (1) stack, having exit dimensions of 1.3 metre by 0.45 metre, extending 1 metre above the roof and 11 metres above grade;

A limestone quarry, having a maximum limestone extraction rate of 100,000 tonnes per blast, including the following equipment and associated exhaust systems:

- One (1) primary crusher, having a maximum production rate of 3000 tonnes per hour, equipped with a shaker type dust collector (Primary Crusher Baghouse) having 239 square metres of filtering bags and a filtering velocity of 98 centimetres per second, discharging into the air at a maximum volumetric flowrate of 2.3 cubic metres per second through a stack having exit dimensions of 0.3 metre by 0.3 metre, extending 2 metres above grade;

Fugitive emissions from the following activities within the Facility:

- Delivery and transfer of raw materials;
- Delivery and transfer of fuels; and
- Movement of front-end loaders onsite;

all in accordance with the documents set out in Schedule "A" attached to this Approval.

For the purpose of this environmental compliance approval, the following definitions apply:

1. "Approval" means this entire Environmental Compliance Approval and any Schedules to it;

2. "Baseline Parameters" means the maintenance parameters for the air pollution control equipment set out in Schedule "C" attached to this Approval;

3. "Best Management Practices Plan" means the document titled "St. Marys Cement Inc. & CBM Aggregates - Bowmanville Site, Best Management Practices Plan for the Control of Fugitive Dust Emissions, Revision 1", dated September, 2013, as amended;

4. "Company" means St. Marys Cement Inc. (Canada) that is responsible for the construction or operation of the Facility and includes any successors and assigns in accordance with section 19 of the EPA;

5. "Director" means a person appointed by the Minister pursuant to section 5 of the EPA;

6. "District Manager" means the District Manager of the appropriate local district office of the Ministry, where the Facility is geographically located;

7. "EPA" means the Environmental Protection Act, R.S.O. 1990, c.E.19, as amended;

8. "Equipment" means equipment or processes described in the ESDM Report, this Approval and in the Schedules referred to herein and any other equipment or processes;

9. "ESDM Report" means the Emission Summary and Dispersion Modelling Report, submitted by BCX Environmental Consulting, dated March 28, 2011 and signed by Xiaoxi (Winnie) Song; Bridget Mills and Ruben Plaza;

10. "Facility" means the entire operation located on the Property where the Equipment is located;

11. "Fuel Adjunct Materials" means solid fuel, wholly used at the Facility, as supplementary fuels to coal and petroleum coke for firing the cement kiln, such as but not limited to carbon dust, metallurgical coke and carbon black;

12. "Industrial By-Product Materials" means industrial by-product materials such as but not limited to: iron slag from smelting industry, fly ash from coal fired generating plants; ash from waste water treatment plants and foundry sand used in casting processes, wholly used at the Facility site as substitute raw material sources of calcium oxide, silica, iron oxide and alumina required for the ongoing cement manufacturing process which does not involve combustion of the materials;

13. "Manual" means a document or a set of documents that provide written instructions to staff of the Company;

14. "Maximum Emissions Scenario" means maximum emissions scenario as outlined in the ESDM Report;

15. "Ministry" means the ministry of the government of Ontario responsible for the EPA and its regulations and includes all officials, employees or other persons acting on its behalf;

16. "Point of Impingement" has the same meaning as in section 2 of O. Reg. 419/05;

17. "Property" means the entire property excluding the dock area, as illustrated in Figure 2 - Site Layout of the Document " Updated air emissions and dispersion modelling data to account for the exclusion of emissions from the dock area from the rest of the facility operations" submitted by BCX Environmental Consulting on February 5, 2013 and signed by Neil Chan and Bridget Mills;

18. "Publication NPC-205" means Ministry Publication NPC-205 "Sound level Limits for Stationary Sources in Class 1 & 2 Areas (Urban)", October 1995; and

19. "Schedules" means the following schedules attached to this Approval and forming part of this Approval namely:

Schedule "A" - Supporting Documentation
Schedule "B" - List of Baghouses
Schedule "C" - Baseline Parameters for Baghouses
Schedule "D" - Materials Characterization - List of Inorganic Contaminants
Schedule "E" - Materials Characterization - List of Organic Contaminants
Schedule F - Materials Characterization - List of Polyaromatic Contaminants.

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

TERMS AND CONDITIONS

NOISE

1. The Company shall ensure that the noise emissions from the Facility comply with the limits set in Publication NPC-205.

OPERATION AND MAINTENANCE

2. The Company shall ensure that the Equipment is properly operated and maintained at all times. The Company shall, as a minimum:

   (1) update as necessary, not later than six (6) months from the date of issue of this Approval, the Manual outlining the operating procedures and a regular inspection and maintenance program for the Equipment; including as a minimum:

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

      (b) acceptable ranges of the Baseline Parameters for the Equipment;

      (c) frequency of measurement of the Baseline Parameters for the Equipment;

      (d) maintain a program to continuously monitor the pressure differential across each of the Primary Equipment Dust Collectors used to control particulate emissions; and procedures to investigate and correct the cause of any anomalous measurements of the pressure differential across any of the above baghouses;

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

(f) establish a list of management and supervisory personnel responsible for the operation and maintenance of the Equipment;

(2) procedures for recording and responding to complaints;

(3) all appropriate measures to minimize noise emissions from all potential sources; and

(4) implement the recommendations of the operating and maintenance Manual.

START-UPS, SHUTDOWN AND UPSET PROCEDURES

3. The Company shall update as necessary, not later than six (6) months from the date of issue of this Approval, operating procedures/updated procedures which address kiln start-ups, shut down and any upset conditions.

MATERIAL ANALYSIS AND CRITERIA FOR ACCEPTANCE

4. The Company shall ensure that a material analysis program to measure and record the concentration of inorganic and/or organic contaminants is implemented.

(1) For Industrial By-Product Materials or Fuel Adjunct Materials

(a) For each Material used as Fuel Adjunct Materials, the Company shall obtain a metals/metal hydrides scan, including at a minimum the compounds listed in Schedule "D"on a quarterly or Lot basis, as applicable. The Company shall ensure that the standard sampling methods outlined in ***Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario*** , Ontario Ministry of the Environment and Energy, Standards Development Branch, December, 1996 are used; and that the samples are submitted to a CAEAL certified laboratory for analysis.

(b) For each Material used as Industrial By-Product Materials, the Company shall obtain a metals/metal hydrides scan, including at a minimum the compounds listed in Schedule "D", as well as organic and polyaromatic hydrocarbon compounds as set out in Schedules "E" and "F" on a quarterly or Lot basis, as applicable. The Company shall ensure that the standard sampling methods outlined in ***Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario*** , Ontario Ministry of the Environment and Energy, Standards Development Branch, December, 1996 are used; and that the samples are submitted to a CAEAL certified laboratory for analysis.

(c) At any time, should the Company either independently or through other sources reasonably expect other inorganic or organic compounds not outlined under (a) or (b) above to be present in any Material at greater than the trace concentrations, the Company shall obtain the appropriate analysis forthwith.

(d) Upon receipt of the analysis, the Company shall ensure that the Point of Impingement concentrations of any inorganic and or organic compounds identified in (a), (b) or (c) above do not exceed the respective limit based on the Maximum Emissions Scenario. For contaminants not covered under the Maximum Emission Scenario, the Company shall develop a maximum emissions scenario for these organic and or inorganic compounds and ensure that they do not exceed their respective Point of Impingement limits.

(2) The Company shall limit the accumulation of Industrial By-Product Materials and other raw materials in exterior storage piles to amounts which may reasonably be expected to be necessary for use in the cement manufacturing processes.

5. The Company shall ensure that any Industrial By-Product Materials stored at the Facility which the Company determines cannot be utilized in ongoing cement manufacturing processes, is managed in accordance with applicable waste management regulations, and, where an Industrial By-Product Material becomes unusable, the Company shall advise the District Manager in writing, of the type and quantity of such material, the reasons why it cannot be used and the specific manner in which the material is to be managed as a waste.

FUGITIVE DUST CONTROL

6. The Company shall finalize the Best Management Practices Plan for the control of fugitive dust emissions, in consultation with the District Manager not later than three (3) months from the date of issue of this Approval. Upon acceptance of the Best Management Practices Plan by the District Manager, the Company shall immediately implement the Best Management Practices Plan.

Documentation Requirements - Best Management Practices Plan

7. The Company shall record and retain such records, each time a specific preventative and control measure described in the Best Management Practices Plan. The Company shall record, as a minimum:

(a) the date when each emission control measure is implemented, including a description of the control measure;

(b) the date when each new preventative measure or operating procedure to minimize emissions is implemented, including a description of the preventative measure or operating procedure; and

(c) the date, time of commencement, and time of completion of each periodic activity conducted to minimize emissions, including a description of the preventative measure/procedure and the name of the individual performing the periodic activity.

RECORD RETENTION

8. The Company shall retain, for a minimum of two (2) years from the date of their creation, all records and information related to or resulting from the monitoring and recording activities required by this Approval. These records shall be made available to staff of the Ministry upon request. The Company shall retain, as a minimum:

(1) all records on maintenance, repair and inspection of the Equipment, including measurements of the Baseline Parameters;

(2) all records produced by the continuous process monitoring systems relating to the pressure differential across each of the Primary Equipment baghouses used to control particulate emissions; and any corrective measures taken to correct the anomalous measurements of the pressure differential across each of the Primary Equipment baghouses;

(3) all records related to Industrial By-Product Materials and Fuel Adjunct Materials characterization including metal/metal hydride analyses, organic analyses and PAH analyses;

(4) all records associated with comparison of materials analysis to limits based on Maximum Emission Scenario;

(5) all calculations made to establish, and update as necessary, the concentration limit of contaminants not covered under Maximum Emission Scenario;

(6) the complaints recording procedure, including records related to all environmental complaints made by the public as required by Condition 10 of this Approval;

(7) records related to the preventative and control measures implemented as required by the section titled "Fugitive Emissions Control" of this Approval.

9. The Company shall, commencing from the date of issue of this Approval, prepare an annual summary report documenting the use of Industrial By-Product Materials and Fuel Adjunct Materials received at the Facility for the preceding calendar year. This summary report shall be submitted to the District Manager within sixty (60) days following the close of each calendar year and shall include a summary of the information set out in Condition No. 4(1) of this Approval.

NOTIFICATION OF COMPLAINTS

10. The Company shall notify the District Manager, in writing, of each environmental complaint within ten (10) business days of the complaint. The notification shall include all records pertaining to environmental complaints; comprising:

(1) a description, time, date and location of each complaint;

(2) wind direction and other weather conditions at the time of the complaint;

(3) the name(s) of Company personnel responsible for handling the complaint;

(4) the cause of the complaint;

(5) the Company response to the complaint; and

(6) a description of the measures taken to address the cause of the complaint and to prevent a similar occurrence in the future, and the outcome of the measures taken.

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

1. Condition No. 1 is included to provide the minimum performance requirement considered necessary to prevent an adverse effect resulting from the operation of the Facility.

2. Condition No. 2 is included to emphasize that the Equipment must be maintained and operated according to a procedure that will result in compliance with the EPA, the regulations and this Approval.

3. Condition No. 4 (1) is included to require the Company to gather accurate information on an on-going basis so that compliance with maximum Point of Impingement concentration limits and Maximum Emission Scenario can be verified.

4. Condition No. 6 is included to minimize the possibility of an adverse effect due to fugitive emissions arising from the operation of the Equipment and the Facility.

5. Condition Nos. 3, 4(2) and 5 are included to minimize the possibility of an adverse effect arising from the operation of the Equipment and the Facility.

6. Condition Nos. 7, 8 and 9 are included to require the Company to retain records and provide information to the Ministry so that the environmental impact and subsequent compliance with the EPA, the regulations and this Approval can be verified.

7. Condition No. 10 is included to require the Company to notify staff of the Ministry so that compliance with the EPA, the regulations and this Approval can be verified.

SCHEDULE "A"

Supporting Documentation

1. Application for an Approval dated March 30, 2011 signed by Ruben Plaza, Environmental Manager and submitted by the Company for amending the existing Certificate of Approval.
2. Emission Summary and Dispersion Modelling Report, submitted by BCX Environmental Consulting, dated March 28, 2011 and signed by Xiaoxi (Winnie) Song; Bridget Mills and Ruben Plaza.
3. Updated air emissions and dispersion modelling data to account for the exclusion of emissions from the dock area from the rest of the facility operations, submitted by BCX Environmental Consulting on February 5, 2013 and signed by Neil Chan and Bridget Mills.
4. Additional air emissions information and clarifications submitted by BCX Environmental Consulting on September 13, 2013 and signed by Xiaoxi (Winnie) Song.
5. Acoustic Assessment Report prepared by HGC Engineering, dated April 16, 2012 and signed by Corey Kinart, P.Eng.

SCHEDULE "B"

List of Baghouses

Stack No.	Equip. No.	Production Area	Location	Stack Gas Outlet Flow	Filtering Area	Stack Diameter	Stack Height Above Grade
				(Am^3/s)	(m^2)	(m)	(m)
BH-1	3-3-339	Finish Mill Buildings	D/C & Fan to L/S Silo (5-3-010E)	1.6	479.1	0.30	-
BH-2	7-3-304		D/C & Fan Top of Off Spec. Silo	4.2	42.0	0.56	31.3
BH-3	7-3-305		(8-103) D/C & Fan Top Clinker Feed Silo	3.3	42.2	-	-
BH-4	7-3-308		(5-106) D/C & Fan Top Clinker Feed Silo	4.2	42.2	-	-
BH-5	7-3-311		D/C & Fan Top Clinker Feed Silo	3.3	42.2	0.51	31.3
BH-6	7-3-324		D/C & Fan Top of Conv. 7-3-314	1.2	42.0	0.50	41.9
BH-7	7-3-325		(8-104) D/C & Fan Top Gyp. Feed Silo	2.4	42.0	-	-
BH-8	7-3-326		D/C & Fan Top of Conv. 7-3-316	1.2	42.0	0.50	41.9
BH-9	7-3-327		D/C & Fan Top of Conv. 7-3-317	1.2	42.0	0.50	41.9
BH-10	8-2-313		Mill Feed Stand-By D/C	4.7	586.8	-	-
BH-11	8-2-326		Mill #2 Clinker Feeders D/C & Fan	4.7	-	-	-
BH-12	8-313		Mil #1 Feed Sys. D/C & Fan	6.1	589.9	-	-
BH-13	8-3-221		(5-221) Mill #3 Feed Sys. D/C & Fan	3.8	156.0	-	-
BH-14	7-115	North Transfer Tower	D/C North Transfer Tower	0.9	88.7	-	-
BH-15	9-737	Cement Transfer Tower	South Dock Trans. House D/C & Fan	1.2	42.9	0.29	6.8
BH-16	9-3-103	Cement Silos Above Rail Tracks	D/C & Fan Shipping Silo 109	1.5	156.3	-	74.0
BH-17	9-3-104		D/C & Fan Shipping Silo 111	1.5	78.9	-	74.0
BH-18	9-3-208		D/C & Fan Scale #3 Shipping	2.3	127.8	-	2.0
BH-19	9-103		D/C & Fan Silo 107	1.7	157.0	-	-
BH-20	9-208-1		D/C & Fan North Shipping	2.7	359.3	-	-
BH-21	9-208-2		D/C & Fan South Shipping	2.7	359.3	-	-
BH-22	6-3-530	Kiln Fuel Hopper/Crusher	D/C and Coal Crusher	3.7	130.3	0.51	10.0
BH-23	3-3-320	Raw Material Silos	D/C & Fan L/S Silo (E)	1.8	108.0	0.38	44.5
BH-24	3-3-324		D/C & Fan L/S Silo (M)	3.2	105.0	0.51	44.5
BH-25	3-3-328		D/C & Fan L/S Silo (W)	1.8	91.0	0.38	44.5
BH-26	5-3-149		D/C & Fan Additive Silo	3.4	146.0	0.48	33.3
BH-27	5-3-161		D/C & Fan @ Stone Feeder	3.8	142.0	0.6	8.2
BH-28	5-3-162		D/C & Fan Additive Silo	3.4	146.0	0.47	4.4
BH-29	5-3-166		D/C & Fan @ Stone Feeder	3.9	146.0	0.59	8.2
BH-30	5-3-168		D/C & Fan @ Stone Feeder	3.9	146.0	0.59	8.2
BH-31	7-104	Storage Silos	D/C & Fan O.S. Silo	6.6	293.3	-	-
BH-32	7-147		D/C & Fan O.S. Silo Reclaim	3.8	105.8	-	-
BH-33	7-144	Loading Bin	D/C & Fan @ Loadout Bin	2.7	90.6	-	-
BH-34	9-731		North Dock Trans. House D/C & Fan	1.2	42.9	0.29	13.0

SCHEDULE "B" Continued

Stack No.	Equip. No.	Production Area	Location	Stack Gas Outlet Flow (Am^3/s)	Filtering Area (m^2)	Stack Diameter (m)	Stack Height Above Grade (m)
BH-35	7-134	South, North and West Storage Silos	D/C & Fan Clinker Storage Silo (S)	2.7	137.5	-	-
BH-36	7-423		D/C & Fan Top of Conv. 7-138	1.2	47.7	0.25x0.30	5.0
BH-37	7-3-130		D/C & Fan Top Clinker Silo (N)	2.4	92.7	0.37	65.0
BH-38	7-304		D/C & Fan Top Clinker Silo (N) - West	1.2	48.6	0.25x0.30	68.9
BH-39	7-3-132		D/C & Fan Top Clinker Silo (N)	4.7	244.9	0.53x0.86	63.5
BH-40	7-307		D/C & Fan Top of Conv. 7-305	1.2	48.6	0.25x0.30	73.0
BH-41	7-308		D/C & Fan Top of West1 Clinker Silo	4.7	190.3	0.53x0.69	69.5
BH-42	7-312		D/C & Fan Top of Conv. 7-310	1.2	48.6	0.25x0.30	73.0
BH-43	7-313		D/C & Fan Top of West3 Clinker Silo	4.7	1256.0	0.53x0.69	69.5
BH-44	7-420		D/C & Fan Top of Conv. 7-416	1.4	47.7	0.25x0.30	3.5
BH-45	7-422		D/C & Fan Top of Conv. 7-414	1.4	47.7	0.25x0.30	3.5
BH-46	5-3-430	Finish Mill Kiln Building	D/C & Fan Top CF Silo	2.4	91.0	0.70	92.4
BH-47	5-3-435		D/C & Fan Bottom A/S for Tower Elev.	2.4	91.0	0.37	13.0
BH-48	6-3-190		D/C & Fan for Kiln FeedBin	1.3	72.6	0.27	12.3
BH-49	6-3-195		D/C & Fan Top of Tower Elev.	3.4	91.0	0.70	92.4
BH-50	6-3-1201		D/C & Fan for Kiln FeedBin	0.5	15.1	0.22 x 0.19	19.0
BH-51	6-3-1202		D/C & Fan for Kiln FeedBin	0.5	15.1	0.22 x 0.20	19.0
BH-52	6-3-1203		D/C & Fan for Kiln FeedBin	0.5	15.1	0.22 x 0.21	19.0
BH-53	6-3-1955		D/C & Fan Top of Calciner Elev.	1.2	44.5	0.21 x 0.31	50.3
BH-54	7-3-135	Transfer Tower	D/C & Fan Clinker Transfer Tower	6.9	287.5	0.80	39.8
BH-55	7-3-139		D/C & Fan Clinker Transfer Tower	2.4	79.0	-	-
BH-56	7-3-227		Bucket elevator	1.4	54.0	-	-
BH-57	7-3-235		D/C & Fan for Conveyor 7-3-230	0.8	27.4	0.22 x 0.19	25.3
BH-58	7-3-268	Roller Press Building	D/C & Fan for Clinker Conveyor	1.9	65.0	0.39	12.0
BH-59	7-3-270		D/C & Fan for Roll Press Bldg.	3.3	141.0	0.59	29.0
BH-60	7-3-272		D/C & Fan for Conveyor 7-3-265	1.2	37.3	-	-
BH-61	6-3-535	Fuel Mill Building	D/C & Fan Top Coal Storage Silo	5.7	195.2	0.65	40.0
BH-62	6-3-638		D/C & Fan Coal Silo Dia: Feeders	3.3	-	0.48	15.5
BH-63	6-3-669		D/C & Fan for F/K Pump	0.1	5.0	0.22	10.3
BH-64	6-3-390	Kiln Feed Building	D/C & Fan Waste Dust Loadout	1.3	57.0	0.31	13.3
BH-65	6-3-396		D/C & Fan Top Waste Dust Bins	0.4	24.8	0.24	22.8
BH-66	6-3-671	Fuel Feed System	D/C Fuel Feed System for Kiln	1.6	49.0	0.40	25.8
BH-67	6-3-672		D/C Fuel Feed System for Pre-Calciner	1.6	49.0	0.40	25.8
BH-68	9-734	Transfer Tower	Mid Dock Trans. House D/C & Fan	1.2	42.9	0.29	7.6
BH-69	9-731		D/C & Fan for belt 9-730	1.2	42.9	0.29	13.0
BH-70	9-505	Cement Storage Silos	D/C & Fan Top Dock Trans. Silo	4.5	149.5	0.47	72.9
BH-71	9-515		D/C & Fan Bot. Dock Trans. Silo	1.4	55.3	0.41	72.9
BH-72	9-525		D/C & Fan Top of New Cement Silo	3.5	136.3	0.55	61.0
BH-73	9-535		D/C & Fan Top of New Cement Silo	1.4	54.5	0.32	5.0
BH-74	6-3-770	Clinker Cooler Building	D/C & Fan North Cooler #3	3.8	45.1	0.39x0.46	9.5

SCHEDULE "C"

Baseline Parameters for Baghouses

The value of each of the following parameters must be referenced to the value recorded during previous source testing, if available. In the absence of source testing, each parameter must be referenced to the value or normal range representing normal operation, recorded as soon as possible for the Equipment.

Primary Equipment

Dust Collector

"Baseline Parameters" means the following operating parameters for the following fabric filter dust collectors: Kiln Feed Baghouse; Bypass Baghouse, Fuel Mill Baghouse; Cooler Baghouse; Finish Mill 1 Baghouse; Finish Mill 2 Baghouse; Finish Mill 3 Baghouse

i. the condition of the dust collector filter bags, the ducts leading to and from the dust collector and connecting the components of the dust collector;

ii. the static pressure drop across the dust collector filter bag compartments;

iii. the presence or absence of clean side deposits, where safely visible;

iv. the frequency of cleaning;

v. the current of the induced draft fan(s); and

vi. the revolutions per minute of the induced draft fan(s).

Secondary Equipment

Dust Collector

"Baseline Parameters" means the following operating parameters for all other fabric filter dust collectors:

i. the condition of the dust collector filter bags, the ducts leading to and from the dust collector and connecting the components of the dust collector, where safely visible; and

ii. the static pressure drop across the dust collector filter bag compartments.

SCHEDULE "D"

Materials Characterization - List of Inorganic Contaminants

1. Antimony
2. Arsenic
3. Barium
4. Beryllium
5. Cadmium
6. Chromium
7. Cobalt
8. Iron
9. Lead
10. Manganese
11. Mercury
12. Nickel
13. Selenium
14. Silver
15. Tin
16. Vanadium

SCHEDULE "E"

Materials Characterization - List of Organic Contaminants

1. Chloromethane
2. Vinyl chloride
3. Bromomethane
4. Chloroethane
5. Trichlorofluoromethane
6. Acetone
7. 1,1-Dichloroethene
8. Dichloromethane (Methylene Chloride)
9. trans-1,2-Dichloroethene
10. Methyl-t-Butyl Ether
11. 1,1-Dichloroethane
12. Methyl Ethyl Ketone (MEK)
13. cis-1,2-Dichloroethene
14. Chloroform
15. 1,2-Dichloroethane
16. 1,1,1-Trichloroethane
17. Carbon Tetrachloride
18. Benzene
19. 1,2-Dichloropropane
20. Trichloroethene (Trichloroethylene)
21. Bromodichloromethane
22. cis-1,3-Dichloropropene
23. Methyl Isobutyl Ketone (MIBK)
24. trans-1,3-Dichloropropene
25. 1,1,2-Trichloroethane
26. Toluene
27. 2-Hexanone
28. Dibromochloromethane
29. 1,2-Dibromoethane (Ethylene dibromide)
30. Tetrachloroethene (Perchloroethylene)
31. 1,1,1,2-Tetrachloroethane
32. Chlorobenzene
33. Ethylbenzene
34. m-Xylene & p-Xylene
35. Bromoform
36. Styrene
37. 1,1,2,2-Tetrachloroethane
38. o-Xylene
39. 1,4- Dichlorobenzene
40. 1,2-Dichlorobenzene

SCHEDULE "F"

Materials Characterization - List of Polyaromatic Contaminants

1. Naphthalene
2. 2-Methylnaphthalene
3. 1-Methylnaphthalene
4. Acenaphthylene
5. Acenaphthene
6. Fluorene
7. Phenanthrene
8. Anthracene
9. Fluoranthene
10. Pyrene
11. Benzo(a)anthracene
12. Chrysene
13. Benzo(b)fluoranthene
14. Benzo(k)fluoranthene
15. Benzo(a)pyrene
16. Indeno(1,2,3-cd)pyrene
17. Dibenzo(a,h)anthracene
18. Benzo(ghi)perylene

Upon issuance of the environmental compliance approval, I hereby revoke Approval No(s). 8824-7HPPDA issued on March 13, 2009.

In accordance with Section 139 of the Environmental Protection Act, you may by written Notice served upon me, the Environmental Review Tribunal and in accordance with Section 47 of the Environmental Bill of Rights, 1993, S.O. 1993, c. 28 (Environmental Bill of Rights), 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 environmental compliance approval or each term or condition in the environmental compliance 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

Pursuant to subsection 139(3) of the Environmental Protection Act, a hearing may not be required with respect to any terms and conditions in this environmental compliance approval, if the terms and conditions are substantially the same as those contained in an approval that is amended or revoked by this environmental compliance approval.

The Notice should also include:

3. The name of the appellant;
4. The address of the appellant;
5. The environmental compliance approval number;
6. The date of the environmental compliance approval;
7. The name of the Director, and;
8. The municipality or municipalities within which the project is to be engaged in

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

This Notice must be served upon:

The Secretary* Environmental Review Tribunal 655 Bay Street, Suite 1500 Toronto, Ontario M5G 1E5	AND	The Environmental Commissioner 1075 Bay Street, Suite 605 Toronto, Ontario M5S 2B1	AND	The Director appointed for the purposes of Part II.1 of the Environmental Protection Act Ministry of the Environment 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) 212-6349, Fax: (416) 314-4506 or www.ert.gov.on.ca**

This instrument is subject to Section 38 of the Environmental Bill of Rights, 1993, 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.ebr.gov.on.ca , you can determine when the leave to appeal period ends.

The above noted activity is approved under s.20.3 of Part II.1 of the Environmental Protection Act.

DATED AT TORONTO this 5th day of December, 2013

THIS APPROVAL WAS MAILED
ON Dec. 9, 2013
9e
(Signed)

Rudolf Wan, P.Eng.
Director
appointed for the purposes of Part II.1 of the
Environmental Protection Act

SA/
c: District Manager, MOE York-Durham
Xiaoxi (Winnie) Song, P.Eng. / Bridget Mills, P.Eng., BCX Environmental Consulting

APPENDIX F: CHARACTERISTICS OF THE ALTERNATIVE FUEL STREAM

LAB NAME		SGS LABS				PETRO LABS					
SAMPLE NAME		#1 HORSMC, Toronto, Wood May 29/13	#2 HORSMC, Hamilton, Wood 1.4" Minus June 4/13	#3 HORSMC, Hamilton, Wood 2, 4" Minus June 4/13	#4 HORSMC, Hamilton, Wood 3.5" Minus June 4/13	#1 HORSSC, Toronto, Wood May 29/13	#2 HORSMC, Hamilton, Wood 1,4" Minus June 4/13	#3 HORSMC, Hamilton, Wood 2, 4" Minus June 4/13	#4 HORSMC, Hamilton, Wood 3,5" Minus June 4/13	AVERAGE	STANDARD DEVIATION
Parameter	Units										
Material Analysis		Material Analysis	Material Analysis	Material Analysis	Material Analysis	Material Analysis	Material Analysis	Material Analysis	Material Analysis	Material Analysis	Material Analysis
General Fuel Quality											
Gross Calorific Value	MJ/Kg	16.5	15.8	15.9	17.5	17.8	21.7	19.8	17.8	17.8	2.1
Total Carbon	%	41.6	38.1	37.7	43.3	42.7	42.8	35.2	42.5	40.8	2.8
Moisture Content	%	18.0	17.3	17.2	15.3	12.8	10.4	10.1	10.6	14.0	3.3
Ash	%	0.1	0.7	1.0	0.1	1.4	12.4	13.6	1.7	3.8	5.7
Sulphur	%	0.0	0.6	0.6	0.0	0.1	1.3	1.1	0.1	0.5	0.5
Chlorine	%	0.0	0.1	0.1	0.0	0.0	0.0	0.1	0.0	0.1	0.0
Heavy Metals											
Aluminum	ug/g	120	1000	1700	130	492	1493	1909	120	672	753
Antimony	ug/g	<0.8	3	5.7	1	0	23	0	0	5	8
Arsenic	ug/g	3.2	31	12	43	0	45	0	11	19	19
Barium	ug/g	10	110	53	25	18	38	17	59	42	33
Beryllium	ug/g	<0.02	0.03	0.05	<0.02	0	0	0	0	0	0
Bismuth	ug/g	<0.08	0.1	<0.08	<0.08	ND	ND	ND	ND	0	NA
Boron	ug/g	ND	ND	ND	ND	7	59	129	14	52	56
Cadmium	ug/g	0.13	0.59	0.21	0.09	0	0	0	0	0	0
Calcium	ug/g	2800	16000	24000	2100	2539	24220	18920	1795	11919	10252
Carbon	ug/g	0.1	1.8	2.4	0.1	ND	ND	ND	ND	1	1
Cesium	ug/g	0.03	0.01	0.05	<0.01	ND	ND	ND	ND	0	0
Chromium	ug/g	8.4	110	79	59	0	45	8	3	39	41
Cobalt	ug/g	0.11	2.2	3.8	0.34	ND	ND	ND	ND	2	2
Copper	ug/g	11	21	23	39	3	34	7	60	27	29
Europium	ug/g	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA
Gallium	ug/g	<0.03	0.31	0.51	<0.03	ND	ND	ND	ND	0	0
Iron	ug/g	170	1500	3400	150	188	1877	1918	152	1146	1199
Lanthanum	ug/g	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA
Lead	ug/g	0.54	210	35	11	0	20	15	0	36	71
Phosphorus	ug/g	43	110	150	50	417	112	119	49	131	122
Potassium	ug/g	1300	660	720	540	800	247	367	420	648	333
Lithium	ug/g	<2	<2	<2	<2	ND	ND	ND	ND	NA	NA
Magnesium	ug/g	310	3900	14000	380	2539	24220	18920	1795	8257	9413
Manganese	ug/g	31	77	110	52	55	59	68	72	68	20
Mercury	ug/g	ND	ND	ND	ND	0	0	0	0	0	0
Molybdenum	ug/g	0.3	2.8	2	0.3	ND	ND	ND	ND	1	1
Nickel	ug/g	1.5	34	59	1.9	0	5	5	0	13	22
Niobium	ug/g	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA
Rubidium	ug/g	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA
Scandium	ug/g	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA
Selenium	ug/g	<0.7	<0.7	<0.7	<0.7	0	0	0	0	0	0
Silver	ug/g	ND	ND	ND	ND	0	0	0	0	0	0
Strontium	ug/g	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA
Thallium	ug/g	<0.2	0.02	0.02	<0.02	ND	ND	ND	ND	0	0
Thorium	ug/g	0.16	0.27	0.35	0.01	ND	ND	ND	ND	0	0
Tin	ug/g	<0.5	2.4	3.7	<0.5	ND	ND	ND	ND	3	1
Titanium	ug/g	5.7	120	75	10	28	107	52	18	52	44
Tungsten	ug/g	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA
Uranium	ug/g	0.014	0.074	0.11	0.014	ND	ND	ND	ND	0	0
Vanadium	ug/g	1	18	25	1	0	18	10	0	9	10
Yttrium	ug/g	0.065	0.73	0.86	0.065	ND	ND	ND	ND	0	0
Zinc	ug/g	15	110	97	34	9	223	364	52	115	129
Germanium	ug/g	<0.3	<0.3	<0.3	<0.3	ND	ND	ND	ND	NA	NA
Hafnium	ug/g	<0.1	<0.1	<0.1	<0.1	ND	ND	ND	ND	NA	NA
Indium	ug/g	0.1	0.1	<0.1	<0.1	ND	ND	ND	ND	0	0
Lanthanum	ug/g	0.065	0.7	0.97	0.037	ND	ND	ND	ND	0	0
Niobium	ug/g	0.3	0.5	0.3	0.2	ND	ND	ND	ND	0	0
Rubidium	ug/g	3.3	1.8	2	1.1	ND	ND	ND	ND	2	1
Rhenium	ug/g	<0.05	<0.05	<0.05	<0.05	ND	ND	ND	ND	NA	NA
Tantalum	ug/g	<0.01	<0.01	<0.01	<0.01	ND	ND	ND	ND	NA	NA
Tellurium	ug/g	<0.1	<0.1	<0.1	<0.1	ND	ND	ND	ND	NA	NA
Thorium	ug/g	0.16	0.27	0.35	0.01	ND	ND	ND	ND	0	0
Zirconium	ug/g	1.1	2.3	2.4	0.85	ND	ND	ND	ND	1	1
Ash Analysis	Units	Ash Analysis	Ash Analysis	Ash Analysis	Ash Analysis	Ash Analysis	Ash Analysis	Ash Analysis	Ash Analysis	Ash Analysis	Ash Analysis
Aluminum (as Al2O3)	%	8.9	5.8	4.5	0.7	1.8	1.3	2.3	1.5	2.39	-1.69
Calcium (as CaO)	%	8.9	14.1	21.8	5.1	21.6	3.5	17.9	19.3	13.91	-7.25
Iron (as Fe2O3)	%	0.8	1.9	2.8	0.5	1.2	1.0	1.0	1.4	1.32	-0.80
K2O	%	0.7	1.2	0.8	0.3	9.2	0.1	0.5	1.5	1.78	-3.02
Magnesium (as MgO)	%	1.5	4.8	11.8	1.2	2.0	2.0	1.5	2.4	3.32	-3.51
Na2O	%	1.8	1.7	1.2	0.8	7.7	0.6	0.2	1.9	1.98	-2.40
Phosphate (as P2O5)	%	0.4	0.2	0.2	0.3	0.4	0.1	0.2	0.3	0.25	-0.09
Silica (SiO2)	%	4.0	28.6	29.8	3.3	0.0	0.0	0.0	0.1	6.23	-13.08
SO3	%	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA
MnO	%	ND	ND	ND	ND	0.3	0.1	0.1	0.3	0.21	-0.15
P2O5	%	0.4	0.2	0.2	0.3	ND	ND	ND	ND	0.26	-0.10
NiO	%	0.2	0.1	0.1	0.1	ND	ND	ND	ND	0.13	-0.05
Cr2O3	%	0.0	0.1	0.1	0.2	ND	ND	ND	ND	0.10	-0.06
V2O5	%	<0.01	0.0	0.0	<0.01	ND	ND	ND	ND	0.02	-0.01
TiO2	%	0.2	1.2	1.0	0.8	0.1	0.1	0.1	0.1	0.43	-0.49

ND – Not Detected
NA – Not Available

APPENDIX G: ALTERNATIVE FUEL SAMPLING METHODOLOGY

1.0 PURPOSE

1.1 The purpose of this procedure is to describe the proper fuel sampling and testing that will be performed ensuring the low-carbon alternative fuel meets established specifications for both operational and environmental objectives. Operationally, the plant must ensure that the materials meet specifications related to particle size and moisture content so that the materials are suitable for injection into the main kiln burner. Environmentally, the metals/metal hydrides scan will be completed in accordance with current adjunct fuel requirements in the Bowmanville Plant ECA (Air).

2.0 SCOPE

2.1 This procedure applies to the operations and activities within the St Marys Bowmanville Plant related to the proper fuel sampling and testing that will be performed ensuring the low-carbon alternative fuel meets established specifications for both operational and environmental objectives.

5.0 SAMPLING METHODOLOGY

Similar to the sampling protocol for fuel adjunct materials as set out in condition 4. (1) (a) of ECA Number 3779-9BMQW4, fuel sampling and testing will be performed quarterly during the regular use of the low-carbon alternative fuel. These tests will ensure that the fuel meets both operational and environmental objectives as outlined in Tables 2 and 3 below.

Operationally, the plant must ensure that the materials meet specifications related to particle size and moisture content to ensure that the materials are suitable for injection into the main kiln burner and the calciner.

Table 1: Alternative Fuel Specifications – Operating Parameters

Operational Specification	Parameter	Rationale
Moisture	≤ 25% by weight	▪ Fuel quality ▪ Prevention of run-off ▪ Consistent heating value
Total Halogen Content	≤ 1% by weight	▪ Fuel quality ▪ Similar to regulatory guideline in other jurisdictions for similar wood waste materials (as well as other materials including plastic, paper, and textiles) ▪ Testing undertaken in accordance with CSA C22.2 No. 0.3 or MIL-DTL-24643
Calorific Value	≥ 10 MJ/kg	▪ Similar to guidance provided by US EPA under CFR 241.3 (d)(1) for non-waste fuels ▪ Ease of operation

Table 2: Alternative Fuel Specifications – Environmental Parameters

Environmental Specification	Parameter	Rationale
Metals and Metal Hydrides	Testing for the following metals in accordance with current adjunct fuel requirements in the St. Marys Plant ECA (Air): ▪ Antimony ▪ Arsenic ▪ Barium ▪ Beryllium ▪ Cadmium ▪ Chromium ▪ Cobalt ▪ Iron ▪ Lead ▪ Manganese ▪ Mercury ▪ Nickel ▪ Selenium ▪ Silver ▪ Tin ▪ Vanadium	▪ Quarterly testing of the alternative fuel for metals currently listed on Schedule of D of the ECA (Air) Number 3779-9BMQW4 ▪ Results of POI concentration modeling based on determination of the proportion of the contribution of the alternative fuel to the mass of the material to the cement plant, should indicate that the POI would not be exceeded. ▪ Applies the current approach for testing of Fuel Adjunct Materials in the Bowmanville Plant ECA (Air) Condition 4. (1) (a)

A grab sample of processed alternative fuel will be taken by the St. Marys staff a minimum of three times daily for a period of one week (seven (7) consecutive days) every quarter for analysis to ensure that the products as received meet these specifications.

The methodology used to take these samples will be as follows:

a) Volume and Number of Grab Samples for Composite:

Samples of the processed alternative fuel will be collected from the fuel feeding conveyor system after alternative has been processed and blended.

Three (3) representative grab samples per day are to be collected during the seven (7) day sampling period resulting in a minimum of twenty (20) grab samples for the sampling period.

The volume of each grab sample should be equal to at least 10 litres (pail or container full).

b) Lot Consisting of One Residual Waste Pile:

The grab samples will be collected directly from the fuel feed conveyor system using a plastic shovel and a container or pail.

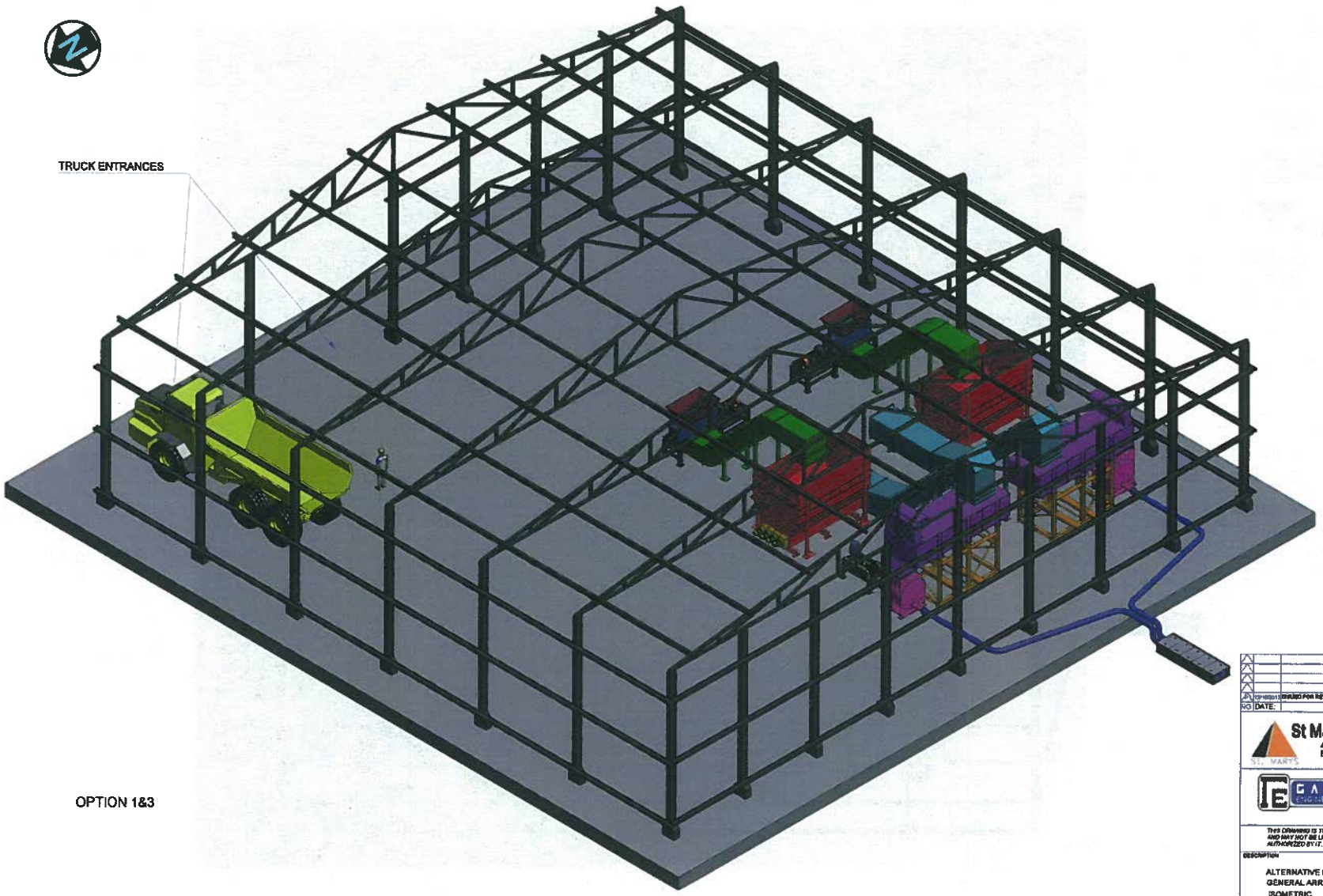
Grab samples will be collected from the fuel feeding conveyor system after alternative has been processed and blended. One grab sample will be collected during each eight (8) hour period during the facility's twenty-four (24) hour operating period for seven (7) consecutive days.

c) Preparation of Composite Sample:

All grab samples collected will be mixed thoroughly. A composite will be prepared from the mixed grab samples through quartering until a sample volume of 1 to 2 kg is obtained.

Quartering will be performed in the following manner, the residual waste sample to be reduced is formed into a conical pile, the top of the pile is flattened and divided into four piles along two diameters at right angles to each other, two of the diagonally opposite quarters are removed and discarded, the remaining quarters are mixed and the previous steps are repeated until the desired sample volume is obtained of 1 kg (minimum).

APPENDIX H: GENERAL ARRANGEMENTS FOR ALTERNATIVE FUEL BUILDING AND HANDLING EQUIPMENT



OPTION 1&3

NO	DATE:	REVISION	BY	CHK
P1	12/10/2013	ISSUED FOR REVIEW	M.W.	A.J.K

St Marys Cement Inc.
400 Waverley Road South
Bowmanville, Ontario

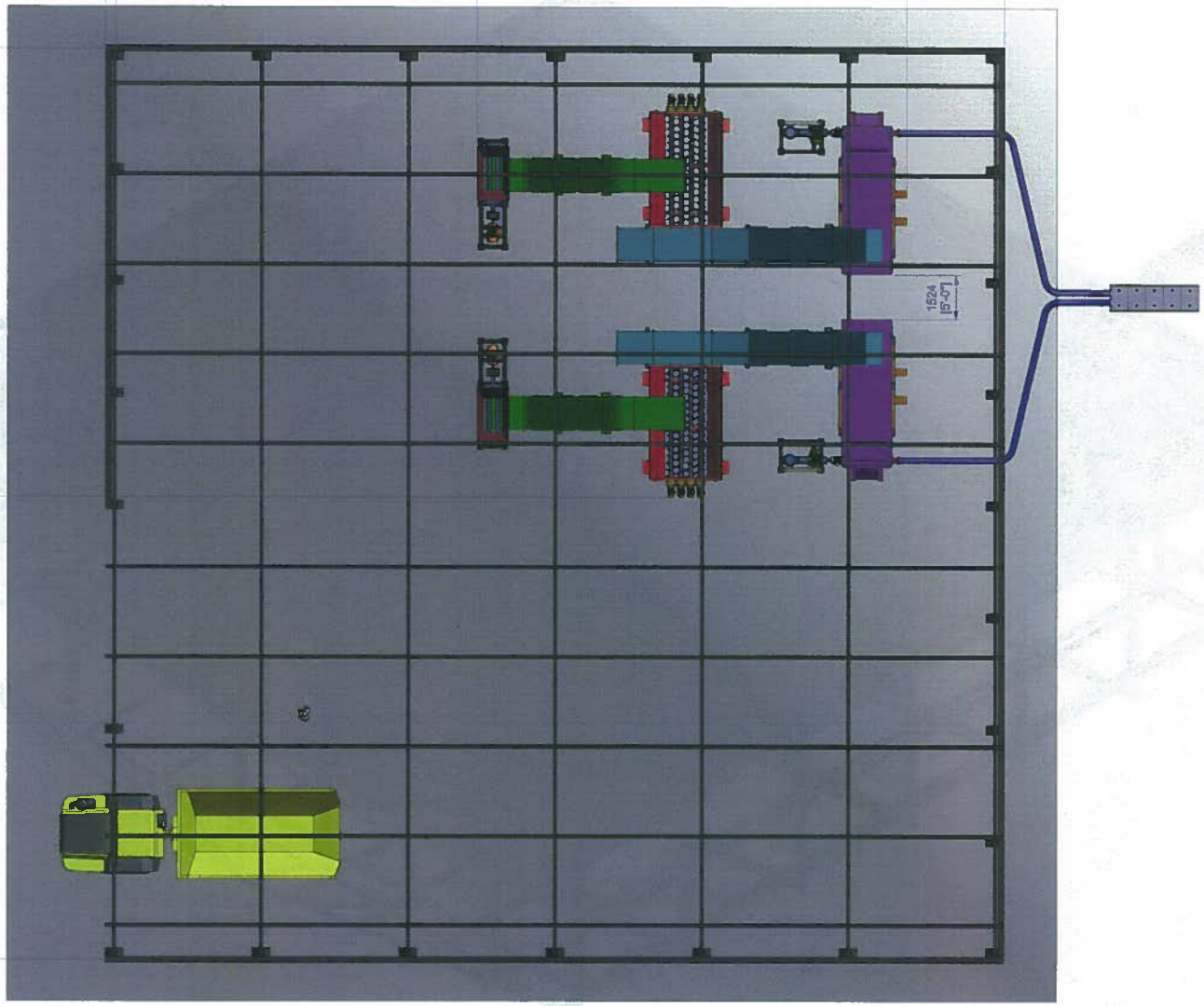
GAMMA ENGINEERING LTD
WHITBY, ONTARIO, CANADA

DESCRIPTION
ALTERNATIVE FUEL FEEDING SYSTEM
GENERAL ARRANGEMENT
ISOMETRIC

DESIGN BY:	DRAWN BY:	CHECKED BY:	DATE:
M.W.	M.W.	A.J.K	12/10/2013

DRAWING CODE:	DRAWING NUMBER:	SHEET	REV
307-009	307-009-G-04	1 of 8	P1

SCALE:	CLIENT SHEET	SHEET	REV
		of	



OPTION 1& 3

NO	DATE	REVISION	BY	CHK
0		ISSUED FOR REVIEW	M.W.	A.J.K

St Marys Cement Inc.
400 Waverley Road South
Bowmanville, Ontario

GAMMA ENGINEERING LTD
WHITBY, ONTARIO, CANADA

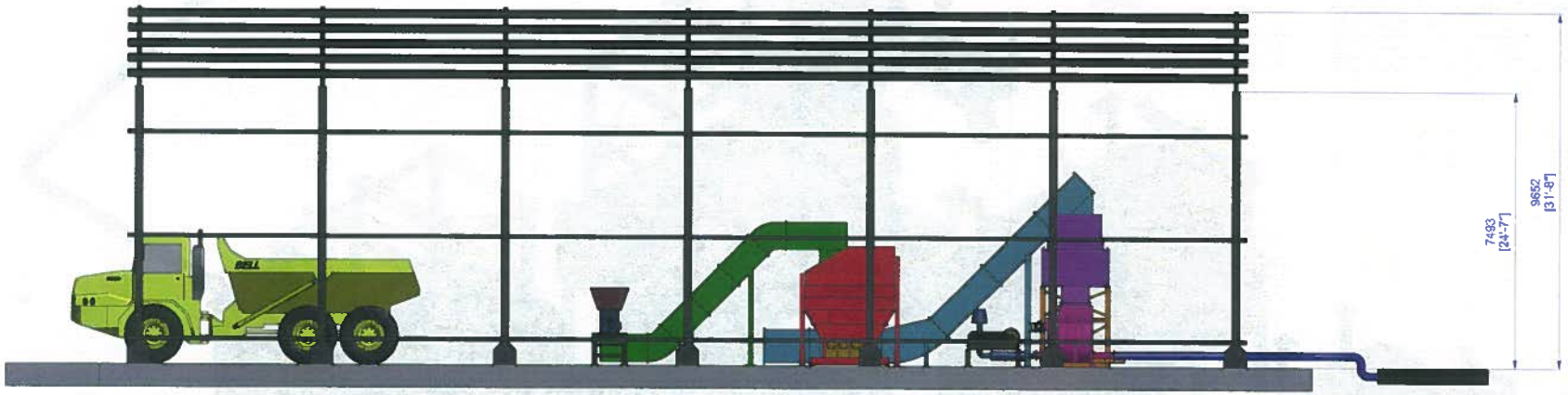
DESCRIPTION

ALTERNATIVE FUEL FEEDING SYSTEM
GENERAL ARRANGEMENT

DESIGN BY:	DRAWN BY:	CHECKED BY:	DATE:
M.W.	M.W.	A.J.K	12/10/2013

GAMMA CODE:	GAMMA GROUP:	SHEET	REV
307-009	307-009-G-04	2 of 6	

SCALE:	CLIENT GROUP:	SHEET	REV
		A1	



OPTION 1&3

NO	DATE	REVISION	BY	CHK
A	12/10/2013	ISSUED FOR REVIEW	M.W.	A.J.K

St Marys Cement Inc.
400 Waverley Road South
Bowmanville, Ontario

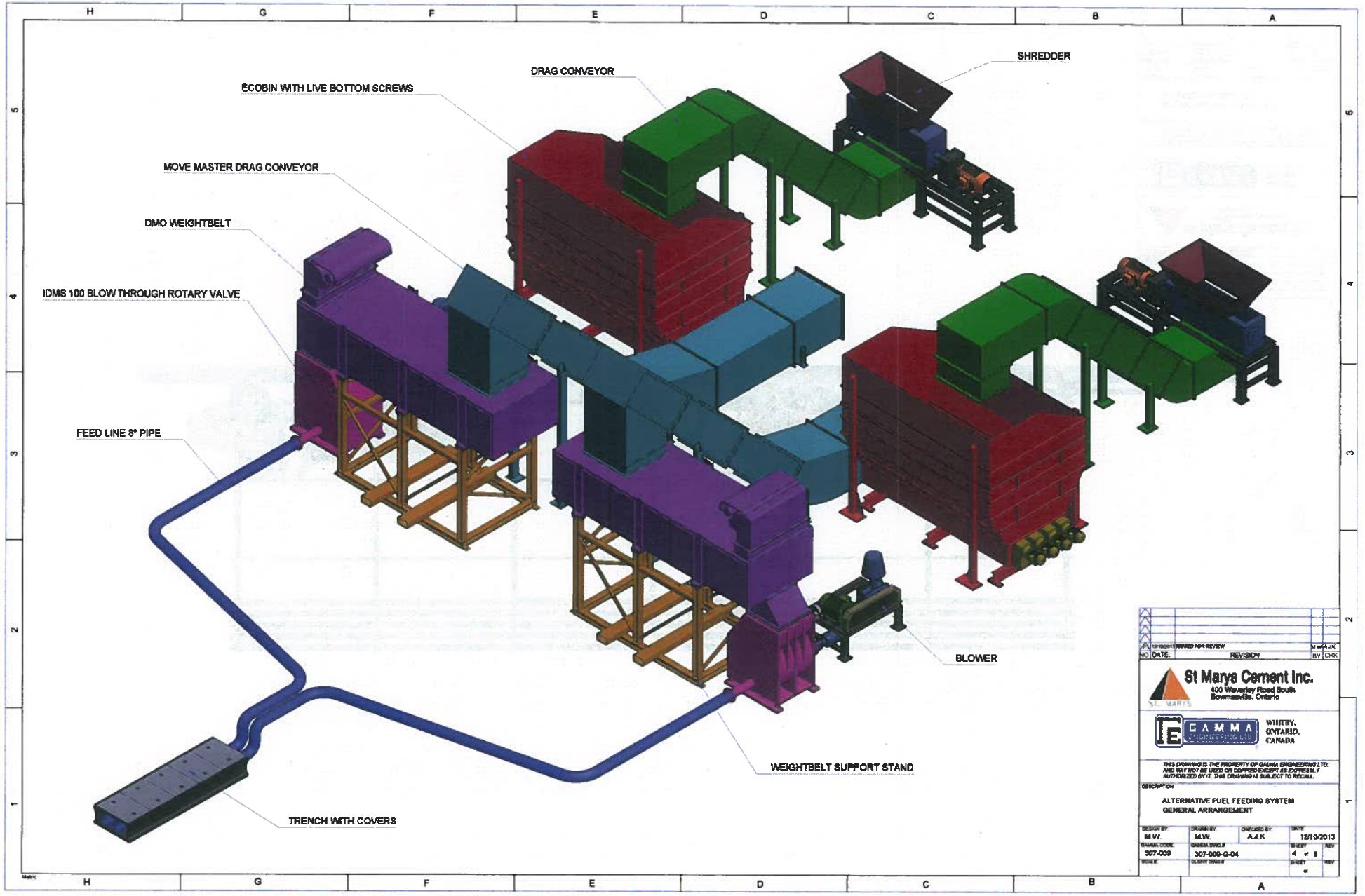
GAMMA ENGINEERING LTD
WHITBY, ONTARIO, CANADA

DESCRIPTION
ALTERNATIVE FUEL FEEDING SYSTEM
GENERAL ARRANGEMENT

DESIGN BY:	DRAWN BY:	CHECKED BY:	DATE:
M.W.	M.W.	A.J.K	12/10/2013

CLIENT CODE:	GAMMA DWG.#	SHEET	REV
307-009	307-009-G-04	3 of 6	

SCALE:	CLIENT DWG.#	SHEET	REV
		of	



NO	DATE	REVISION	BY	CHK
A	12/10/2013	ISSUED FOR REVIEW	M.W.	A.J.K

St Marys Cement Inc.
400 Waverley Road South
Bowmanville, Ontario

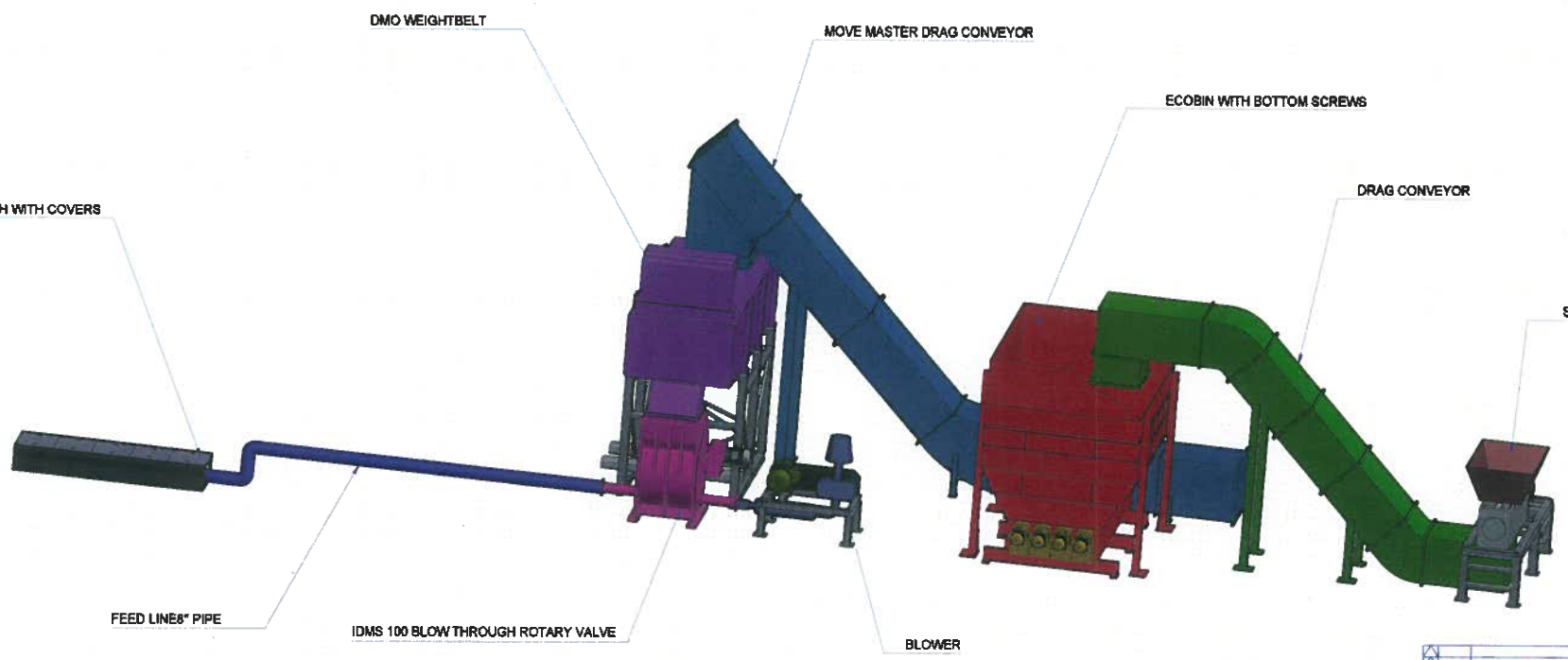
GAMMA ENGINEERING LTD
WHITBY, ONTARIO, CANADA

DESCRIPTION

ALTERNATIVE FUEL FEEDING SYSTEM
GENERAL ARRANGEMENT

DESIGN BY	DRAWN BY	CHECKED BY	DATE
M.W.	M.W.	A.J.K	12/10/2013

GAMMA CODE	GAMMA DWG #	SHEET	REV
307-009	307-009-G-04	4 of 8	
SCALE:	CLIENT DWG #	SHEET of	REV



OPTION 2

NO.	DATE	REVISION	BY	CHK
0	12/12/2013	ISSUED FOR REVIEW	M.W.	A.J.K

St Marys Cement Inc.
400 Waverley Road South
Bowmanville, Ontario

GAMMA ENGINEERING LTD.
WHITBY, ONTARIO, CANADA

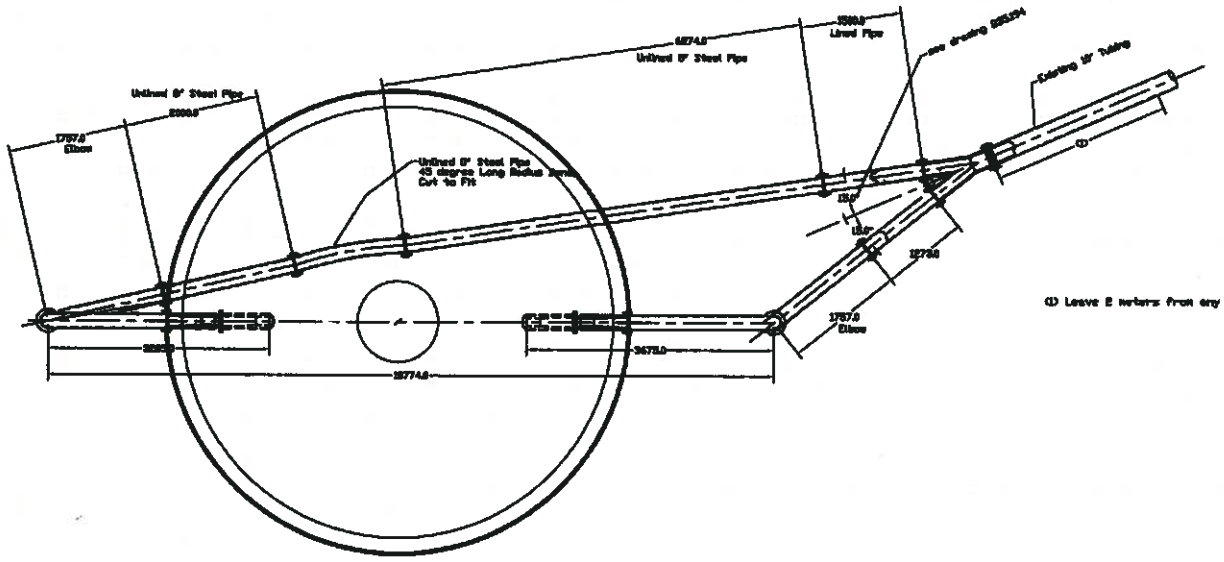
DESCRIPTION

ALTERNATIVE FUEL FEEDING SYSTEM
GENERAL ARRANGEMENT

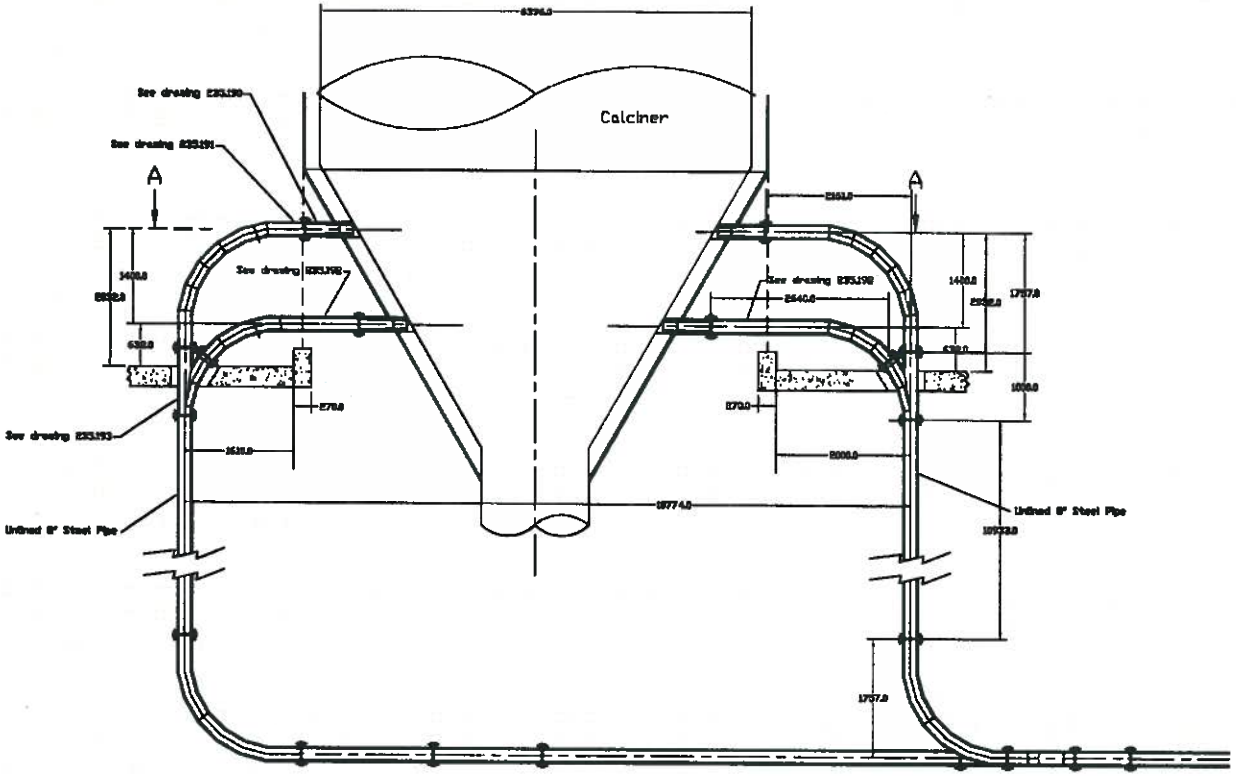
DESIGN BY:	DRAWN BY:	CHECKED BY:	DATE:
M.W.	M.W.	A.J.K	12/10/2013

GAMMA CODE	GAMMA DWG #	SHEET	REV
307-009	307-009-G-04	6 of 8	

SCALE:	CLIENT DWG #	SHEET	REV
		of	



A-A Section



NO.	BY	REVISION	DATE

St Marys Cement Co.

ST. MARYS

Bowmanville Plant, Ontario, Canada

TITLE: Fuel Feeding (Calciner)

DRAWN :

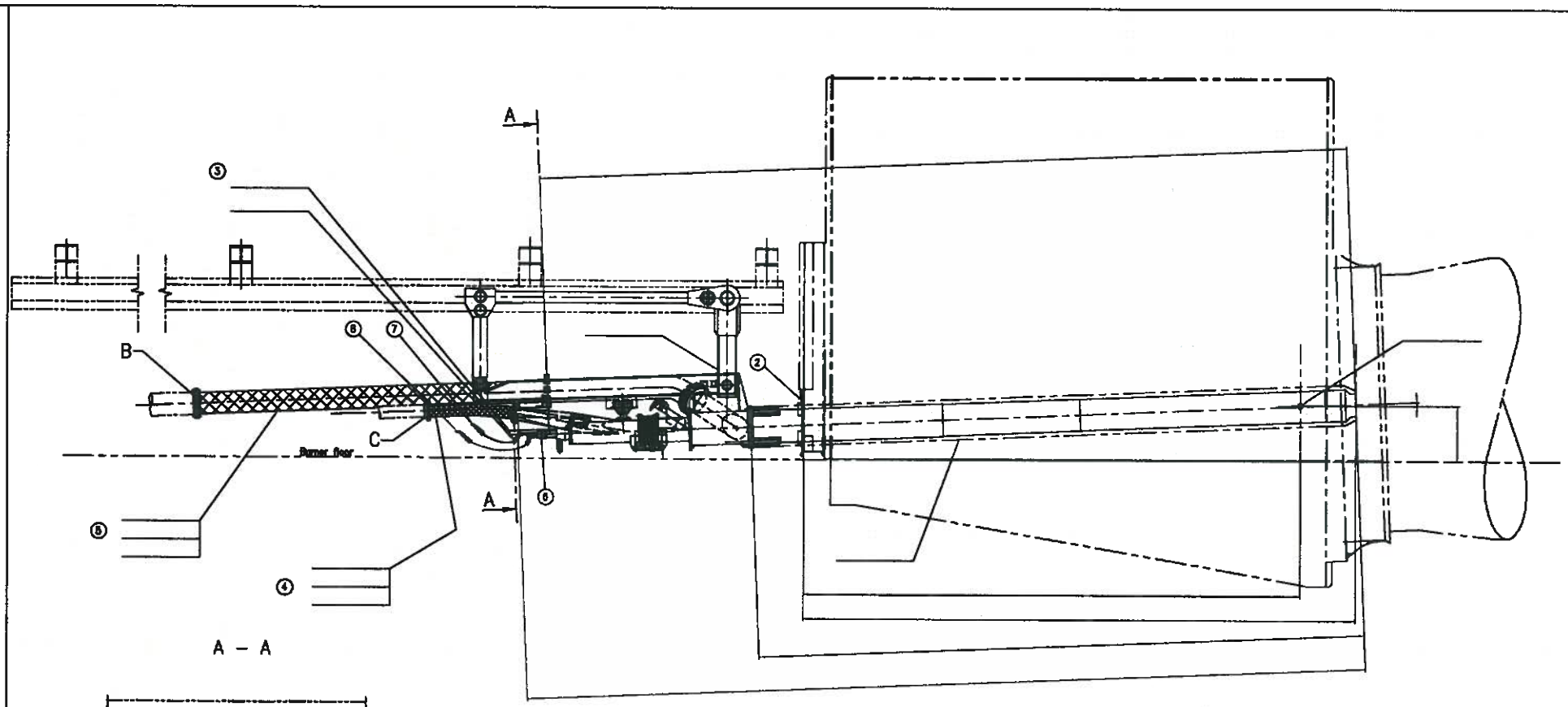
CHECKED :

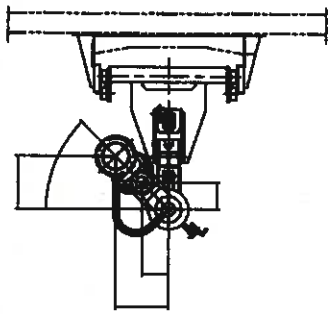
DATE :

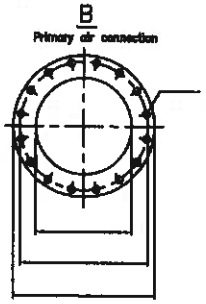
EQUIP # :

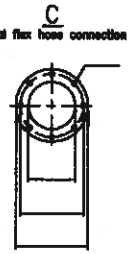
DRAWING NUMBER

REV: 0

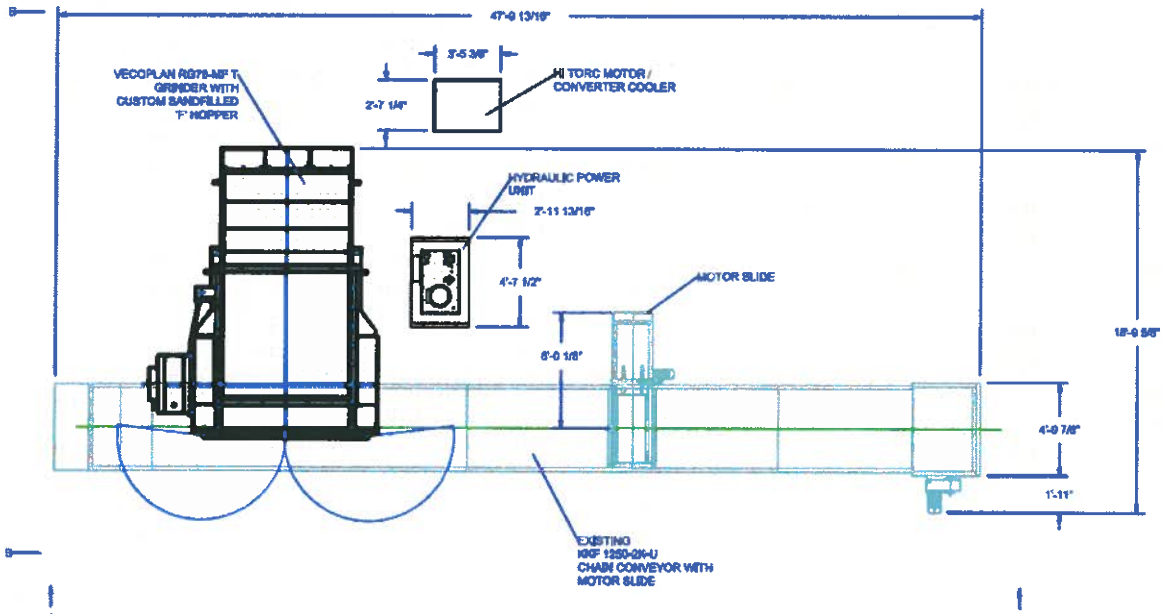


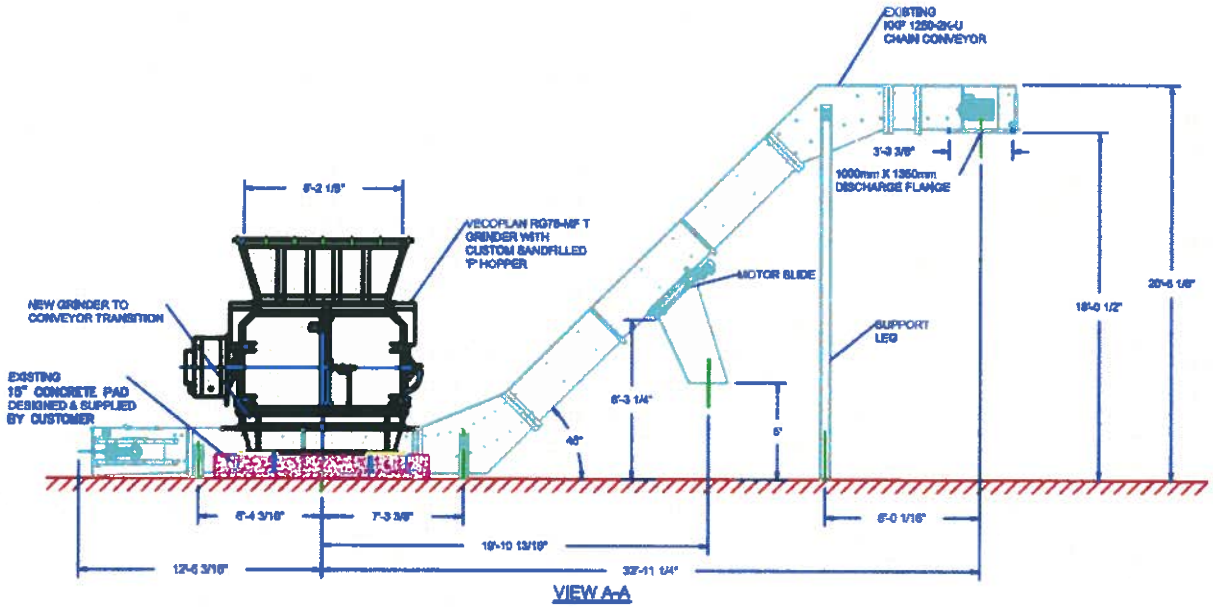






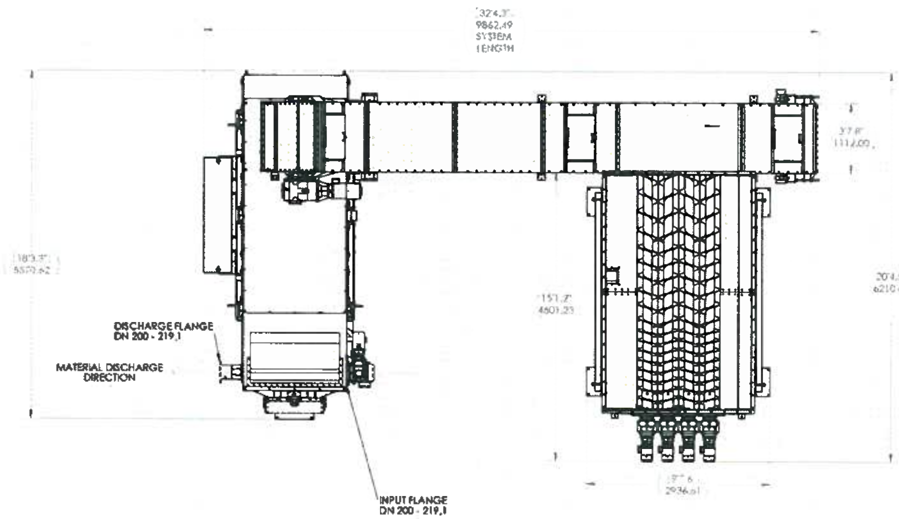
⑨ Owner to modify existing burner floor as required.
⑧ Air line 1" flex hose x 3000mm long
⑦ Oil line 1/2" flex hose x 3000mm long
⑥ JJ2 oil light-up burner
⑤ Air flex hose 4388 I.D. x 10000 long (minimum bend radius = 1500mm)
④ Coal flex hose 4204 I.D. x 3000 long (minimum bend radius = 1300mm)
③ Ignition gas burner
② Burner seal
① Element numbers shown refer to main parts list S.704879

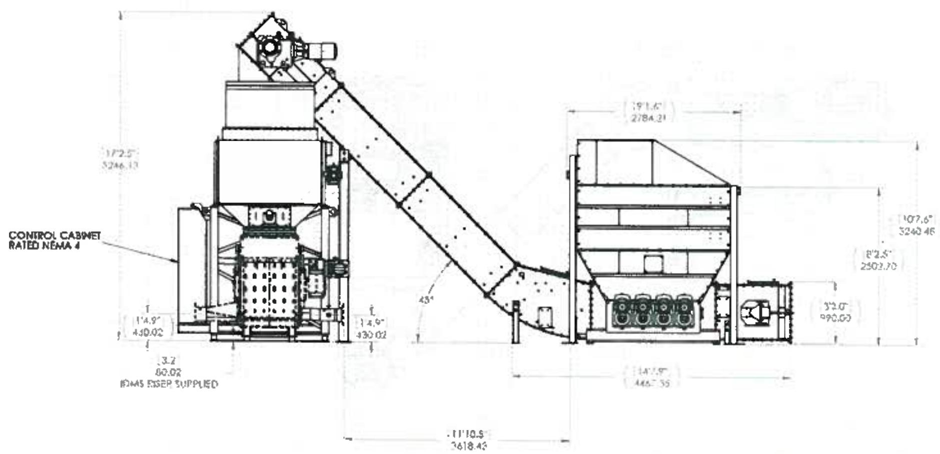

47'-0 13/16"
3'-5 3/8"
2'-7 1/4"
VECOPLAN RG78-MF T GRINDER WITH CUSTOM SANDFILLED 'F' HOPPER
HI TORC MOTOR / CONVERTER COOLER
HYDRAULIC POWER UNIT
2'-11 13/16"
4'-7 1/2"
MOTOR SLIDE
6'-0 1/8"
18'-9 5/8"
4'-9 7/8"
1'-11"
EXISTING IKF 1250-2K-U CHAIN CONVEYOR WITH MOTOR SLIDE
A
A

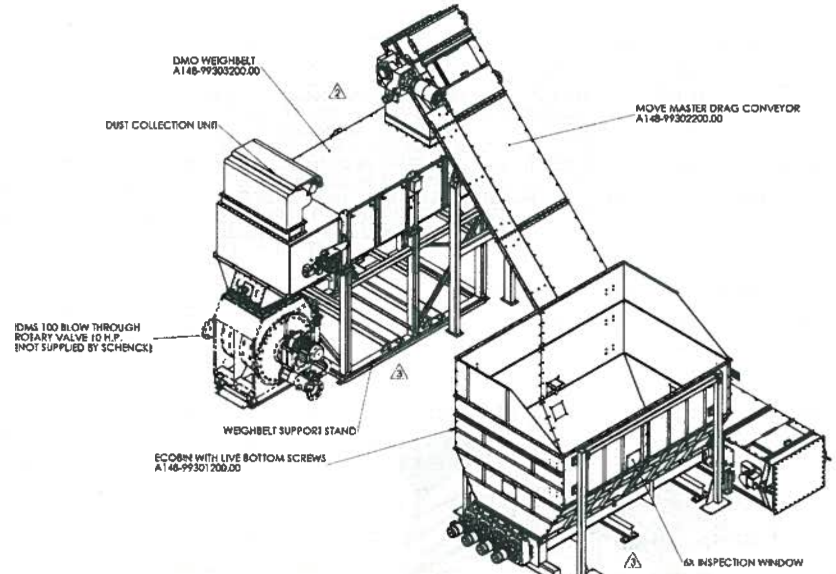

EXISTING IKF 1250-2K-U CHAIN CONVEYOR
3'-3 3/8"
1000mm X 1350mm DISCHARGE FLANGE
5'-2 1/8"
VECOPLAN RG78-MF T GRINDER WITH CUSTOM SANDFILLED 'F' HOPPER
MOTOR SLIDE
SUPPORT LEG
NEW GRINDER TO CONVEYOR TRANSITION
EXISTING 15" CONCRETE PAD DESIGNED & SUPPLIED BY CUSTOMER
18'-0 1/2"
20'-6 1/8"
6'-3 1/4"
45°
5'
5'-4 3/16"
7'-3 3/8"
5'-0 1/16"
19'-10 13/16"
12'-6 3/16"
32'-11 1/4"

VIEW A-A

REVISIONS						
REV.	ECN #	CHANGE BY	DATE	CHECK BY	DATE	DESCRIPTION
0		-	-			NEW RELEASE
1		[illegible]	[illegible]			ADDED MATERIAL NOTE
2		[illegible]	[illegible]			[illegible]
3		[illegible]	[illegible]			CHANGES MADE TO [illegible]







NOTES:
1. POWER REQUIREMENT - 460 VAC, 3 PH, 60 HZ, REFER TO P&ID FOR FULL AMP LOAD
2. COMPRESSED AIR REQUIRED - 80 PSI, 41 SCFM
3. MATERIAL:
   1 - 10 TPH AUTO FLUFF AND RECYCLE MATERIAL 10 - 25 # PER CUBIC FT
   1 - 6 TPH SHREDDED ROOF SHINGLES 50 - 55 # PER CUBIC FT
4. MODIFICATION TO SCREWS AND POSSIBLE DRIVE MAY BE REQUIRED TO FEED ROOF SHINGLES
5. MATERIAL SIZE - <2"

TOLERANCES PER ACCURATE W.I.3.2.1

D.ROOK 2/22/11

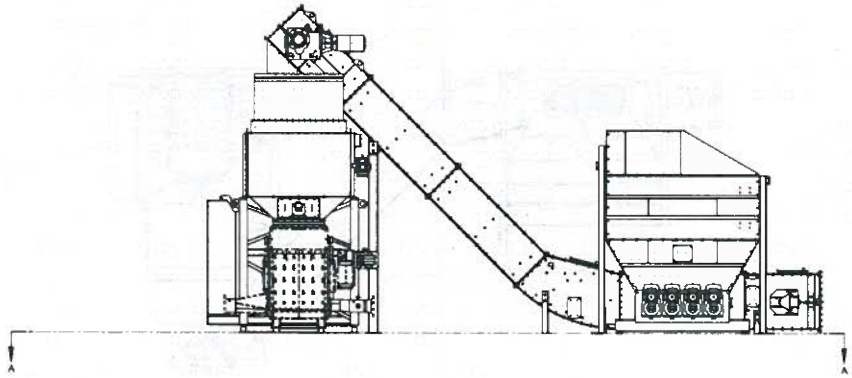
schenck process

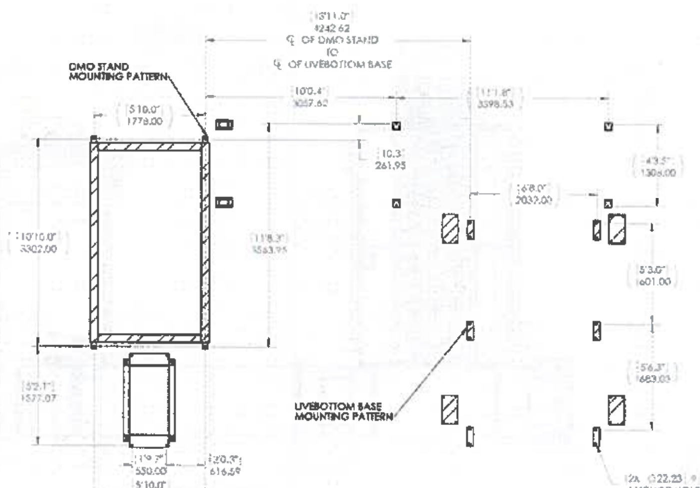
ALTERNATIVE FUEL FEEDING SYSTEM
W/ECOBIN, CONVEYOR, DMO

mm

A133-24301200.00 D 1:30 **A148-99301100.00**

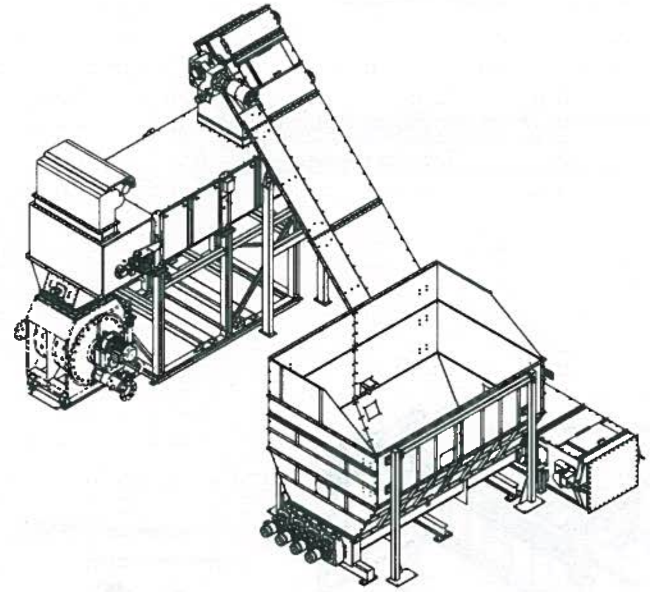
SHEET 1 OF 2





SECTION A-A

VIEW SHOWING FOOTPRINT LOCATIONS



INSTALLATION NOTES:

- REFER TO LAYOUT DIMENSIONS SHOWN ON THIS SHEET FOR PROPER EQUIPMENT LOCATIONS DURING INSTALLATION.
- LAG EQUIPMENT ONLY AFTER PROPER EQUIPMENT ALIGNMENT IS ENSURED.
- FOUNDATION TO BE 6" REINFORCED CONCRETE.
- FOUNDATION TO BE LEVEL AND FREE OF DEBRIS.
- ASSEMBLY CHECK LISTS MUST BE COMPLETED FOR ALL MODULES OF THE SYSTEM - SEE OPERATION MANUALS FOR CHECK LISTS.
- LUBRICATION SCHEDULE MUST BE FOLLOWED FOR ALL BEARINGS.
- ALL FASTENERS MUST BE TORQUED TO (59) FT-LBS MINIMUM (GRADE 8.8 BOLTS).

TOLERANCES PER ACCURATE W.I.3.2.1

D.ROOK

schenck process

ALTERNATIVE FUEL FEEDING SYSTEM W/ECOBIN, CONVEYOR, DMO

mm

A133-24301200.00 D 1:36 **A148-99301100.00**

SHEET 2 OF 2

One Source

Design and Operations Appendix H - Information on DUOFLEX Burner

DUOFLEX™ burner

FLSmidth

Flexible and robust design

Key benefits

- **Robust design**
- **Low primary air consumption**
- **Adjustable swirl**
- **Adjustable air nozzle area**
- **Central fuel injection**

Application
The DUOFLEX™ burner fires rotary kilns with pulverised coal or coke, oil, natural gas or any mixture of these fuels. The burner may be fitted with extra ducts for secondary fuels such as plastic chips, wood chips, sewage sludge, etc. Standard types are available for any fuel combination and a maximum capacity ranging from 20 to 250 MW, catering for even the largest of rotary cement kilns.

Design
The burner is based on a novel concept featuring a central duct for gaseous and liquid fuels placed inside an annular coal duct which is surrounded by two concentric ducts that form two primary air channels, one for radial air and one for axial air.

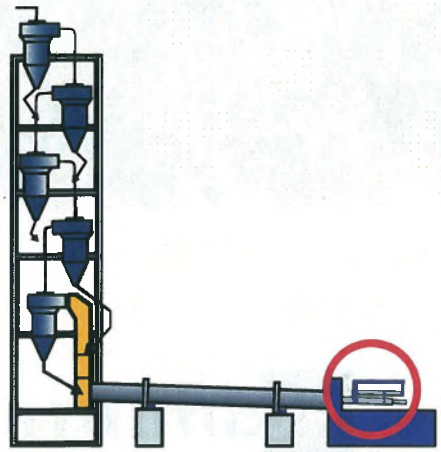
The two air flows are mixed before being injected via the conical air nozzle. The two outer ducts form a very rigid supporting structure, minimising deflection of the burner pipe and ensuring long refractory life.

The primary air is supplied by a high pressure fan that yields a maximum pressure of 250 mbar as standard, but on request pressures up to 400 mbar can be delivered.

The air nozzle area can be adjusted within the range 1:2. The axial/radial air ratio – and consequently the degree of swirl – is also adjustable.

These adjustments offer wide scope of shaping the flame.

Process and function
From a process point of view, a burner used for heating the burning zone of a rotary cement kiln must fulfil the following requirements:

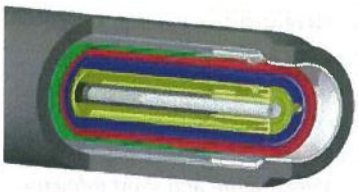


- The burner must be able to fire coal, coke, fuel oil and natural gas or any mixture thereof, ensuring complete combustion, low excess air and minimum formation of carbon monoxide (CO) and nitrogen oxides (NO_x). If relevant, the burner must be able to handle alternative fuels without requiring change of its original design. In this way, only minor modifications to meet the special requirements must be necessary.
- The burner must produce a short, narrow, strongly radiant flame, as this is a condition for good heat transfer from the flame to the material in the sintering zone of the kiln.
- Flame formation must be conducive to a dense, stable coating on the refractory in the burning zone of the kiln as well as a nodular clinker with low dust content and correctly developed clinker phases.
- The burner must use as little primary air as possible without compromising stability during normal or upset operating conditions. Primary air is basically false air, in other words air that has not been used for clinker heat recuperation while passing through the clinker cooler. The primary air is usually expressed as a percentage of the stoichiometric combustion air needed to burn the amount of fuel fired through the burner.

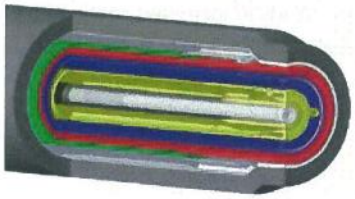
Multi-channel burners

Compared to a simple single-tube burner modern multi-channel burners offer much better possibilities for flame shape control because of their separate primary air channels, allowing for adjustment of primary air amount and injection velocity independently of the coal meal injection.

The most important flame control parameters are primary air momentum (primary air amount multiplied by discharge velocity) and amount of swirl (tangentially air discharge). A high momentum will give a short, hard flame whereas a low momentum will make the flame longer and lazier. Swirl will help creating recirculation in the central part of the flame. This will stabilise the flame and give a short ignition distance. Too much swirl however can cause high kiln shell temperatures due to flame impingement on the burning zone refractory. A good swirl control system is therefore important. The best solution would be a system where swirl could be adjusted independent of the momentum.

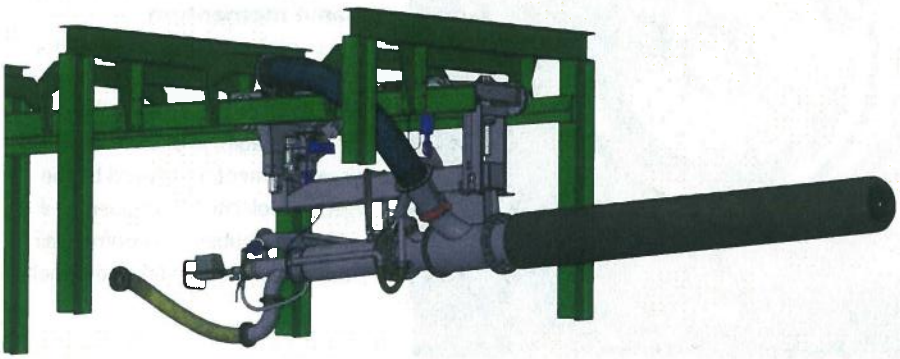


Nozzleopen



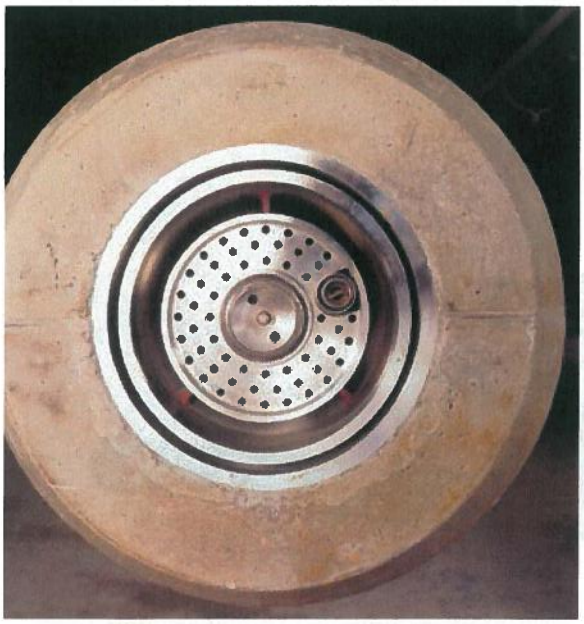
Nozzelclosed

The burner nozzle is adjustable both vertical and horizontally.



Traditional multi-channel burners normally have two air nozzles, one for axial air discharge and one with vanes or tangential slots for swirl air. Swirl is controlled by adjusting the swirl air amount (or the ratio between axial air and swirl air). This can be done in two ways, by dampers installed in the ducts upstream of the burner or – more effective - by adjusting the air nozzle areas. Most modern multi-channel burners therefore have adjustable air nozzles.

If all the primary air is supplied by one primary air fan, momentum and swirl cannot be adjusted independently. Adjusting the swirl air nozzle will also change the pressure at the axial air nozzle and vice versa. To overcome this problem many multi-channel burners have separate fans for axial air and swirl air. This however does not solve the problem completely because the momentum will still change if swirl air amount is changed.



A constant momentum can only be maintained by adjusting axial air as well as swirl air.

Duoflex Swirl Control

The unique Duoflex nozzle design eliminates these problems. Swirl is generated by fixed vanes, located upstream of the air nozzle. Since axial air and swirl air are mixed before entering the nozzle, air pressure – and momentum – remains almost unchanged when the axial/swirl air ratio is changed.

Axial/swirl air distribution is controlled by butterfly valves installed at the burner inlet. During operation the axial air valve must be minimum 50% open since the axial air is used for cooling of the burner pipe. Swirl air can be adjusted from 0-100%. The amount of swirl is characterised by the position only. Therefore no separate swirl air-flow measuring system is necessary. Since the swirler vanes are placed in a low velocity zone the degree of swirl will be reduced when the air velocity is increased in the nozzle. The swirler vane angle is dimensioned in order to compensate for this, meaning that an adequate amount of swirl can be applied without risking flame impingement on the refractory.

Flame momentum

The crucial parameter of flame formation is the primary air momentum which may be expressed as the primary air percentage (% of stoichiometric air requirement) multiplied by the injection velocity. Consequently, if the velocity is doubled, the primary air percentage may be reduced to half.

The primary air consumption will normally be in the range of 6-8%, corresponding to a primary air momentum of approximately 1250-1780% m/s. The adjustable air nozzle is ideally suited for adapting the momentum to the conditions for attaining the best flame shape.

The burner in a rotary kiln functions as an injector, the purpose of which is to draw the secondary air coming from the cooler into the flame in order to make the fuel burn as close as possible to the centre line of the kiln. This explains why the momentum of the burner is the parameter that determines flame formation. A higher momentum means faster mixing and a shorter and hotter flame.

Divergent feeding of fuel and primary air should be avoided as it inevitably leads to wider flames and higher temperatures on the inner surface of the burning zone. Good coating formation is only possible if the inner surface is cold enough for the liquid to solidify upon contact.

The use of a narrow flame in a cement rotary kiln is extremely important since a divergent flame that impinges upon the lining will strip off the coating, resulting in very high kiln shell temperature and short refractory life. Flame impingement upon the material charge will increase the evaporation of sulphates, which usually leads to increased coating formation in the kiln riser duct.

Adjustable for alternative fuels

In order to explore the economical opportunities on the waste market to the maximum a high degree of freedom is desired when adjusting the kiln feed rates of various alternative fuel types.

On the other hand are the requirements that the heat input to the kiln remains stable, that the firing of the fuels does not have a negative impact on the clinker quality and that the coating profile in the kiln remains unchanged.

The combination of the quest for optimum flexibility and the desire to maintain steady kiln operation conditions puts high demands on the kiln burner which - to the extent possible - must be capable of compensating for the variations of the alternative fuels introduced into the kiln.

These demands are met by the superior flame control of the DUOFLEX construction, and the ability of operating with a narrow flame provides for the best possible burnout of the waste particles in the flame itself, so ensuring that the particles do not land in the charge or on the coating.

Precise momentum control

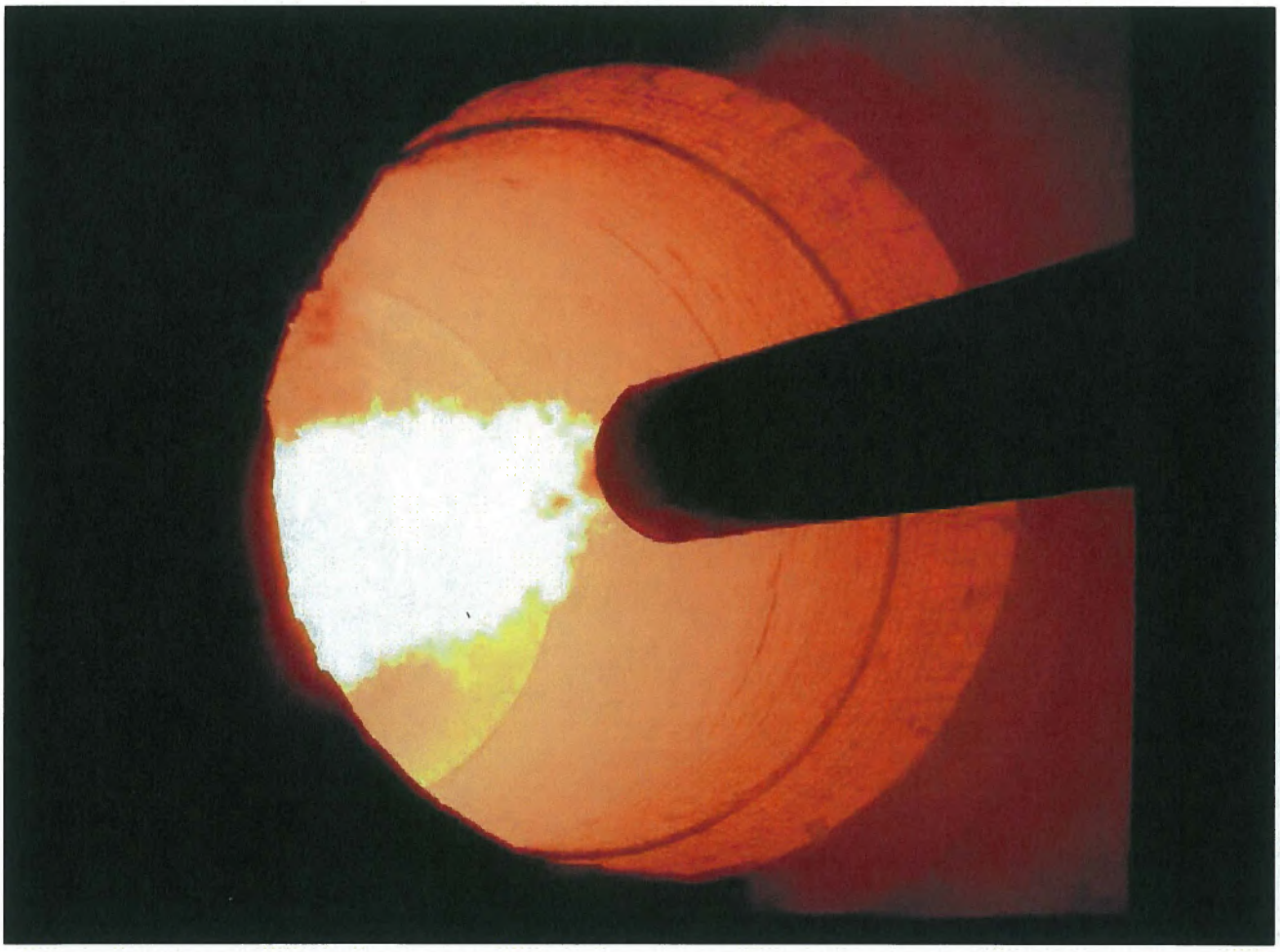
Since good flame formation in the kiln permits operating with very little excess air and without the formation of CO, a burner operating with correct flame momentum despite the higher flame temperature will result in less formation of NO than a low momentum burner operating with more excess air.

Practical experience has shown that the formation of a strong, stable, short and narrow flame requires a momentum of minimum 1400-1600% m/s dependent on fuel type. A flame momentum below this range will result in too long a flame, high kiln shell temperatures above the burning zone and in the kiln back end as well as unstable kiln operation with a too long and cold burning zone thereby permitting undesirable clinker crystal growth.

The two different kiln temperature profiles, before and after introducing the DUOFLEX burner, clearly show the huge effect on both coating formation and kiln shell temperature. NO lining repairs were made while exchanging the two burner installations.

The very easy adjustment of the nozzle area and the different air flows, helped by clear position indicators, make it possible to find and maintain any precise setting during operation as well as between the different production campaigns.

The DUOFLEX burner normally operates with 6-8 % primary air but is designed for maximum 10% as standard and on request up to 15%. This will in all cases provide the kiln operator with the necessary "tool" to quickly stabilise any upset conditions.



Momentum control, example

Calciner kiln:	7000 tpd
Burner output:	118 MW
Max. momentum:	8.7 N/MW (at 12.5% PA)
Momentum required:	5 N/MW

1. Reducing nozzle area:

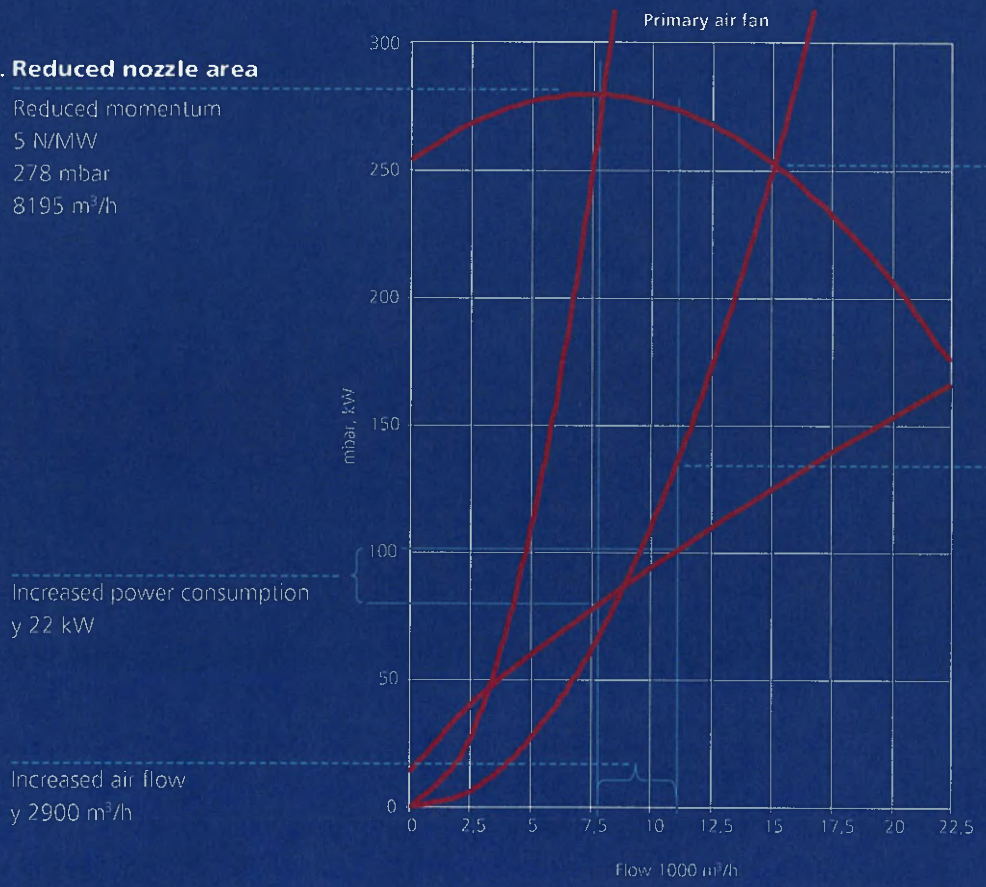
Air flow:	8195 m³/h (6.9% PA)
Air pressure:	278 mbar
Power consumption:	80 kW

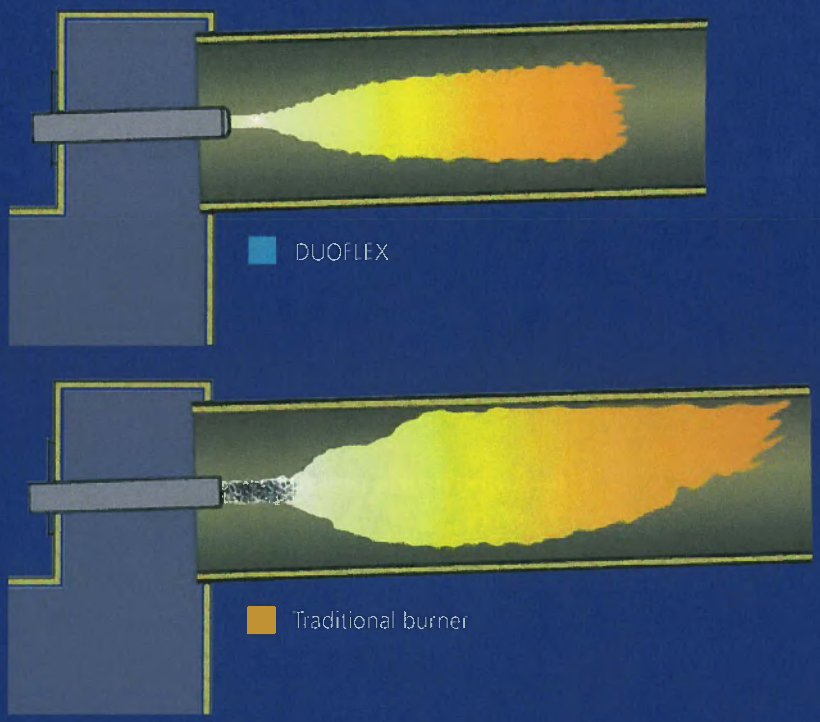
2. Reducing nozzle pressure:

Air flow:	11120 m³/h (9.3% PA)
Air pressure:	140 mbar
Power consumption:	102 kW

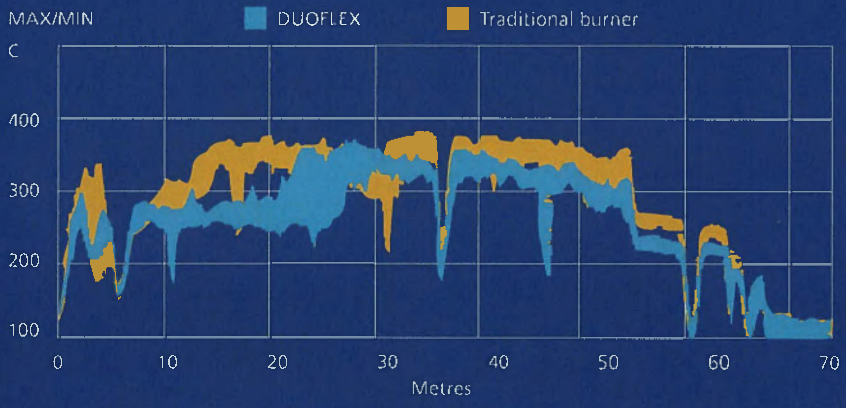
Savings by reducing nozzle area instead of pressure:

Power:	22 kW
Fuel:	2.4% PA y 2.4x0.75 = 1.8 kcal/kg clinker y 12.6 Mcal/24H





Kiln shell temperature



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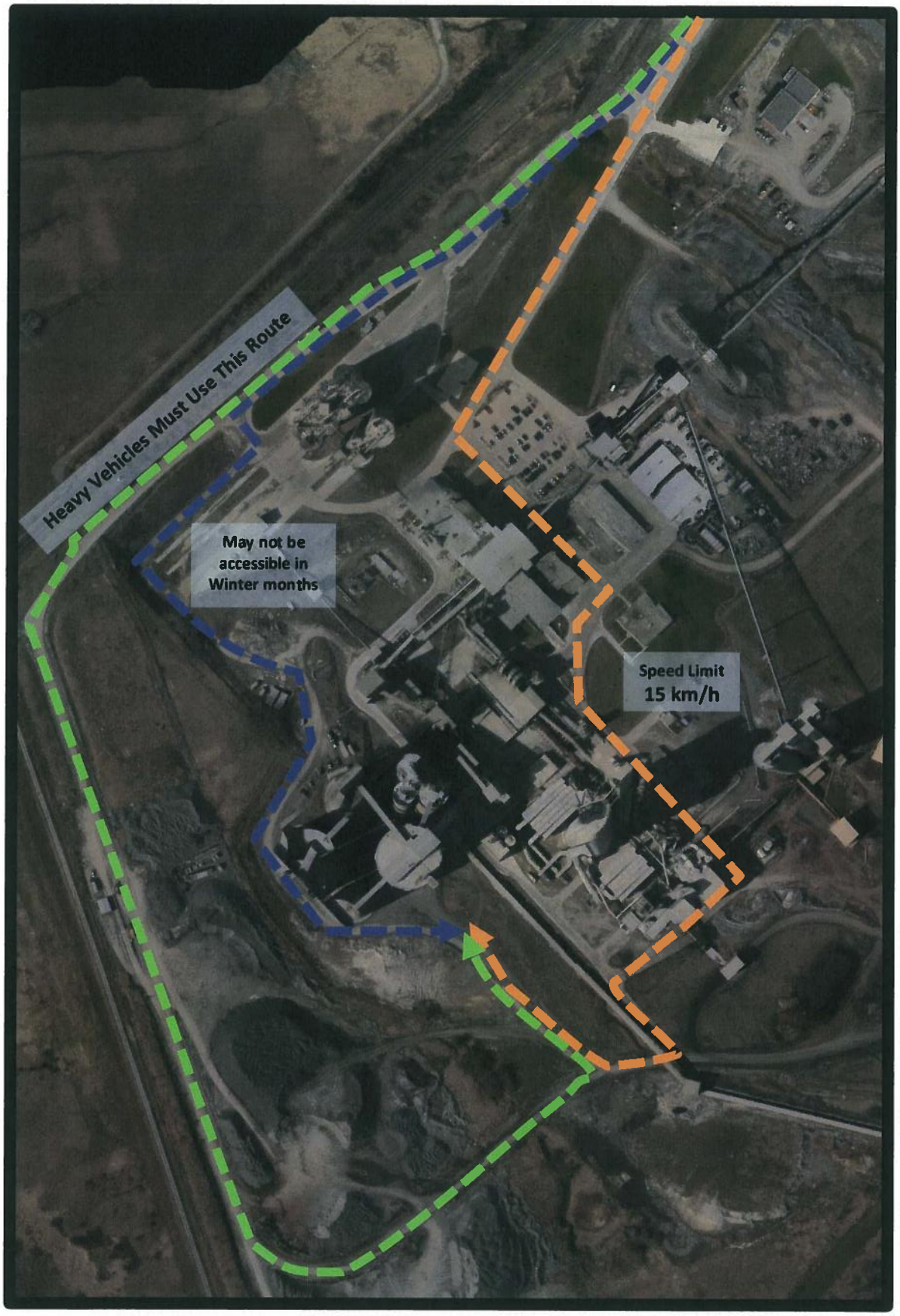
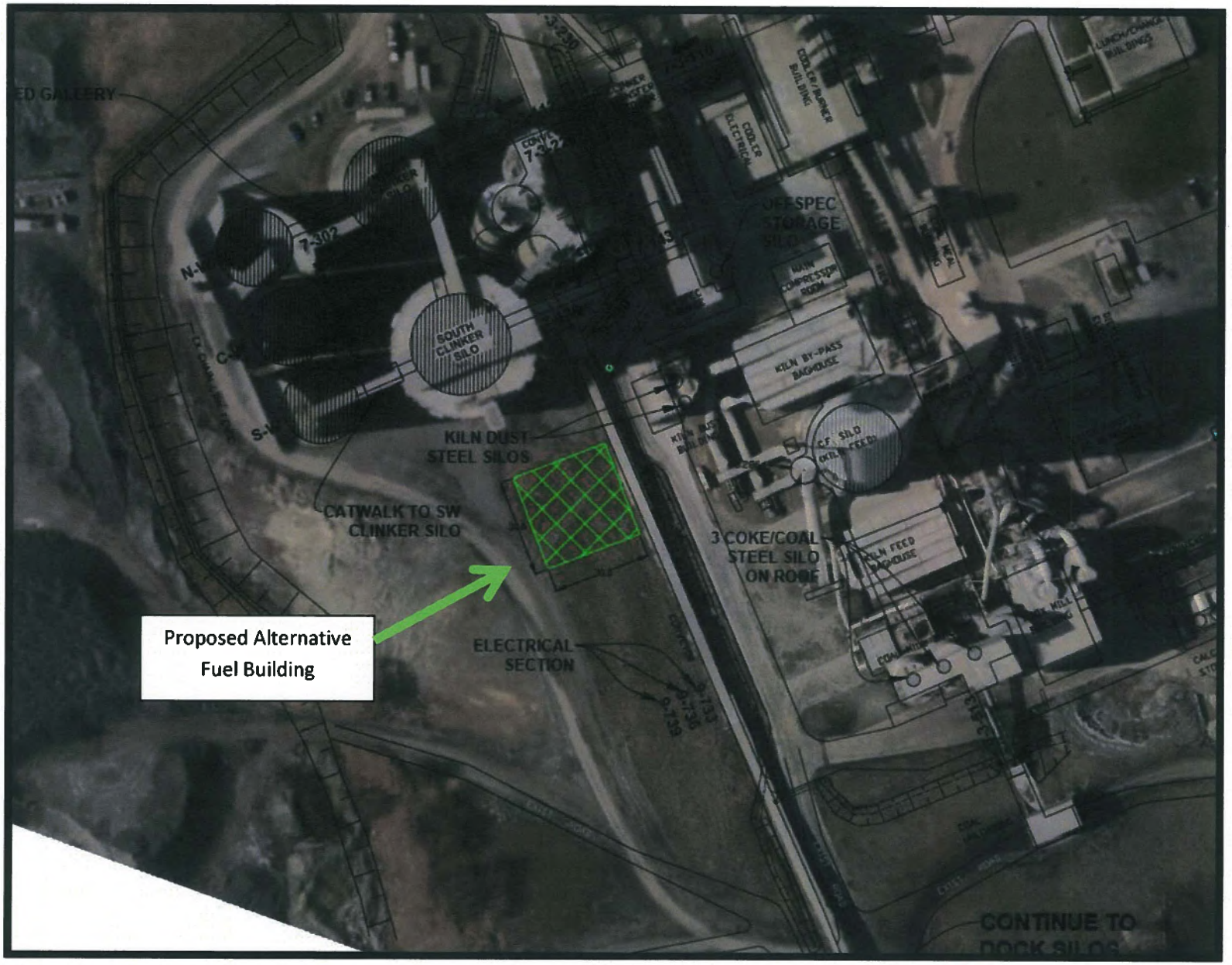


ACCESS ROUTE: ALTERNATIVE FUEL LOCATION


SOUTH CLINKER SILO
KILN DUST STEEL SILOS
CATWALK TO SW CLINKER SILO
OFF-SPEC STORAGE
KILN BY-PASS BAGHOUSE
3 COKE/COAL STEEL SILO ON ROOF
ELECTRICAL SECTION
Proposed Alternative Fuel Building
CONTINUE TO


CONTINUED CONVEYOR
DOCK SILO 2-BANK
DOCK SILO 3-BANK
CONTINUE TO DOCK SILOS
St Marys Cement Inc.

APPENDIX I: EMERGENCY PLANNING AND PREPAREDNESS PROCEEDURE

PURPOSE

The purpose of this procedure is to ensure that all St. Marys Cement Bowmanville facility personnel, visitors, contractors and sub-contractors **know what to do in an emergency situation** such as injury, fire, severe weather, power failures, major spills etc.

Remember – in the event of an Emergency DIAL 292

SCOPE

The scope of this document includes all cases of emergency that will require emergency response and / or the evacuation of an area of the property or complete plant evacuation.

RESPONSIBILITY

Safety Coordinator: Responsible to maintain this document
Production Shift Coordinator: Responsible for and designated as, the Emergency Response Coordinator
Supervisory Staff: Responsible to follow and to train Hourly Employees on this procedure
Hourly Staff: To follow this procedure and report deficiencies to their immediate Supervisor

PROCEDURE

This document utilizes **hyperlinks** to assist with rapid searches while viewing on a computer. The hyperlink list below also acts as a table of contents with page numbers to assist searches while using a hard copy version

MEDICAL EMERGENCY PROCEDURE – dial 292

1. A Medical Emergency occurs any time that professional emergency medical transport or professional emergency services are required.

2. Ambulance services must be used to transport an employee to the Hospital during off-shift hours. At no time should a Taxi Company be used to transport an employee to the Hospital during non-regular hours.

3. Upon discovery of medical emergency call CCR Operator at **EXT: - 292** and calmly relate the nature of the emergency.
    a. The CCR Operator will make the 911 call for appropriate emergency response
    b. The CCR Operator will dispatch internal first aid response to the emergency site.
    c. The CCR Operator will dispatch an employee to the end of the Plant Road (at Waverley Road) to guide the emergency vehicle to the site of the medical emergency

4. Stay calm and assist with the injured if and where possible until internal first aid or external emergency response arrives.

5. The Supervisor in charge (generally the Shift Coordinator), will ensure the following:
    a. Ensure that all injured employees receive treatment as soon as possible.
    b. Verify that someone has been sent to the plant road and Waverley Rd junction to guide the municipal emergency responders to the correct location.
    c. If it is a critical injury as per the OHS Act the site must be secured for ministry investigation. The definition of a critical injury is located in the Definitions section of this document
    d. Where applicable ensure that all employees and other personnel are accounted for.
    e. Ensure that all non-essential employees return to normal workstations.
    f. Assist municipal emergency responders wherever possible.
    g. Contact the Health and Safety Coordinator, the Plant Manager, and the Department Manager responsible for the employee involved in the medical emergency
    h. Co-ordinate the resumption of normal operations in all areas unaffected by the emergency and in the affected areas as soon as the situation allows.
    i. Complete an SAIR Accident Incident Report and distribute it as stated on the form

FIRE EMERGENCY – DISCOVERING A FIRE – dial 292

1. Report all incidents of fire immediately to the CCR Operator by calling **Ext. 292**.

2. When a fire is discovered, two questions must be asked
   a. **Is the fire small enough to be extinguished with a hand held extinguisher?**
   b. **Can I safely extinguish the fire?**

3. If the answer is **No to either** of these questions the employee must:
   a. Pull the local fire alarm in the nearest location to the fire area and evacuate the area.
   b. Once out of the immediate danger area the employee must immediately notify the CCR operator giving detailed information about the location, the type and size of the fire as accurately as possible.
   c. The CCR Operator will call 911 and request emergency assistance from the fire department and other emergency professionals as required.
   d. The CCR Operator will dispatch an employee to the end of the Plant Road at Waverley Road to escort the emergency professionals to the required location

4. If the answer is **Yes to both** of these questions the employee must:
   a. Notify the CCR operator and attempt to extinguish the fire using a hand held extinguisher.
   b. If the use of extinguisher(s) fails to contain the fire follow Step #3 above.

FIRE EMERGENCY – RESPONDING TO A FIRE ALARM
Main Plant Area

1. When a fire alarm is sounded in a normally occupied building all personnel in the building must, if safe to do so close all windows and shut off all equipment in the room they are in and proceed out of the building through the nearest fire exit in an orderly manner closing all doors behind them.
    a. **Building Fire Warden(s)**(see Appendix A) for the assigned area will perform a sweep of the floor they work on checking for stragglers as they leave the building and report to the **Emergency Response Coordinator** upon arriving at the assembly area if the floor is clear of personnel.
    b. **Where safe to do so bring obtain and bring the contractor sign in log book for the department to the assembly area for the head count.**
2. Once outside of the building proceed to the safe assembly area in front of the employee lunch / change room building (or other safe area as is practical in the circumstance directed by the Production Shift Coordinators)
3. **Department Shift Coordinators will do actual head count of employees for their respective departments** and **submit** the department counts to the **Production Supervisor**.
4. No one is permitted to re-enter the building until clearance is given from the fire department through the **Department Shift Coordinators**.

FIRE EMERGENCY – RESPONDING TO A FIRE ALARM
Quarry Area

1. When the fire alarm is sounded in the quarry maintenance building all personnel are required to, if safe to do so close all windows in the room they are in and proceed out of the building through the nearest fire exit in an orderly manner closing all doors behind them.
    a. **Building Fire Warden(s)** (see Appendix A) for the assigned area will perform a sweep of the floor they work on checking for stragglers as they leave the building and report to the **Emergency Response Coordinator** upon arriving at the assembly area if the floor is clear of personnel.
    b. **Where safe to do so obtain and bring the contractor sign in log book for the department to the assembly area for the head count.**
2. Once outside the building proceed to the safe assembly area outside the parking area gate, (or other safe area as is practical in the circumstance directed by the **Quarry / Production Shift Coordinators**), where the **Department Shift Coordinator** will do a head count and provide the information the **St. Marys Emergency Coordinator** who will provide the information to the responding local municipal emergency response authority.
3. Once out of the immediate danger area the **Quarry Shift Coordinator** must immediately notify the CCR operator, by radio or phone, giving information on the location, type and size of fire as accurately as possible.
4. The CCR operator will call 911 and request emergency assistance from the fire department and other emergency professionals as required.
5. No one is permitted to re-enter the building until clearance is given from the fire department through the **Department Shift Coordinators**.

FIRE EMERGENCY – RESPONDING TO A FIRE ALARM
Central Control Room

As the Operator/Assistant Operator is leaving the control room, **(if safe to do so)**, they will record and bring with them:

1. Location of the fire(s) indicated on the fire control panel.
2. Check the Shift Coordinator's office and bring the cell phone to the safe assembly area, if available.
3. Report to the Shift Coordinator at the safe area for the head count.
4. Give the cell phone to the Shift Coordinator to make the appropriate 911 calls using the cell phone.
5. Immediately after checking in for the head count proceed to electrical office to monitor Plant Processes from that location until advised otherwise by the Production Shift Coordinator by following the **"Foxboro Operator Emergency Station Remote Access Procedure"**. A copy of which can be found on "G\SHE\Safety & Health\Linked Docs\Foxboro Operator Emergency Station Remote Access Procedure".

ENVIRONMENTAL EMERGENCY

In the event of an **INTERNAL SPILL** within the Plant:

1. Notify a Supervisor/CCR immediately.
2. Where necessary evacuate personnel to a safe area.
3. Consult MSDS for safety precautions necessary for containment and clean up.
4. Contain and clean up spill by following the procedures outlined in PD00166 "Accident Incident & Non-conformance Reporting" sections 5.1.5 Response, 5.1.6 Cleanup and 5.1.7 Notification.
5. Where possible continue operations in unaffected areas.
6. Notify Environmental Manager.
7. In the absence of the Environmental Manager and Safety Coordinator, immediately notify the Ministry of the Environment Spill Action Centre **(1-800-268-6060)** and the Municipality of Clarington **(905-623-3379)**
8. In case that the spill is larger than St Marys' personnel can handle contact immediately **DETOX emergency spill response service (905-623-1367)** to handle the spill.
9. Where applicable ensure that all employees and other personnel are accounted for.

In the event of an **EXTERNAL SPILL** outside of the Plant:

1. In the event that an external spill occurs that may affect St Marys personnel, St. Marys Bowmanville will be notified by the local police or fire department by phone or in person; please ensure the following:
2. Production Shift Coordinator is informed immediately.
3. Notify management immediately; **Plant Manager, Human Resources Manager; Environmental Manager.**
4. Account for and inform all employees, contractors, visitors, Cargo Dockers, Aggregates as appropriate in the circumstance.
5. Cooperate with local emergency agencies.

EVACUATION EMERGENCY

In the event of a Localized Evacuation **on site**:

1. Where necessary evacuate onsite to a safe location as directed
2. Shift Coordinator will communicate safe assembly location to all employees, contractors, visitors, Cargo Dockers, Aggregates, as appropriate in the circumstance.
3. Where possible continue operations in unaffected areas.
4. Shift Coordinator will keep management informed of information as situation develops
5. Employees may resume normal operations when given notification to do so

In the event of an External Evacuation **off site:**

1. Where necessary, evacuate off site to a safe location as directed (**where safe to do so plant equipment should be safely shutdown before evacuating using PD 00244 Kiln Emergency Procedure**).
2. Upon arrival at the directed safe location the Shift Coordinator is to account for all employees, contractors, visitors, Cargo Dockers, Aggregates as appropriate in the circumstance.
3. Where necessary the Shift Coordinator will send all employees, contractors, visitors, Cargo Dockers, Aggregates as appropriate in the circumstance home and advise them that they will be contacted as information becomes available.
4. The Shift Coordinator will keep management informed of information as situation develops.
5. Where necessary Management will inform potential incoming shift changes of the situation and advise that they will be contacted as information becomes available.
6. Management will coordinate the resumption of operations when given notification to do so by local emergency agencies.

NUCLEAR EMERGENCY

Auto Dial Notification System

In the case of a nuclear emergency St. Marys Cement will be notified by the Nuclear Emergency Auto Dial Notification System. It will call on phone-line (905)-623-7073 which is located in the central control room. It will notify St. Marys Cement that evacuation of the property is necessary. It will indicate the number of days that St. Marys Cement will have to safely shut down its process and evacuate the property. The CCRO immediately upon receiving a notification will relay the notification to the Production Shift Coordinator.

Public Disaster Siren Alerting Sirens

The municipality has placed a Public Disaster Siren Warning System in various locations of the community to alert the public within a 3 km radius of the Nuclear Plant of a disaster. It sounds like **"a very high shrill steady beep"**. If you hear this siren you are to report it immediately to the Production Shift Coordinator. The intent of this siren is not to give notice to evacuate; it is intended to tell those that hear it to go inside and tune to local broadcast media for further instructions.

The Shift Coordinator will perform the following duties in a Nuclear Emergency:

1. Contact the Plant Manager and the Human Resources Manager to inform them of the situation.
2. Notify all personnel on site, employees, contractors, visitors, Cargo Dockers and Aggregates.
3. Follow the direction of the governmental authority directing the emergency.
4. Ensure head counts are done and all parties are accounted for.
5. Coordinate the safe shutdown of the operation as may be necessary before evacuating using PD 00244 Kiln Emergency Procedure) **if** evacuation notice is given by the governmental authority directing the emergency.
6. Coordinate notification to possible incoming shifts as necessary.
7. Remind employees to monitor local media stations for resumption of operations notices.

POWER FAILURE EMERGENCY

In the event of a **major and extended** power failure ensure the following:

Employees / Contractors / Visitors

1. Contact your supervisor/CCR and give your location so that they know you are safe and accounted for in their head count.
2. Report to safe area **if requested** by the Shift Coordinator or their designate.
3. If you are in an area where there is insufficient lighting to safely exit call for assistance to bring a flash light to guide you to safety; if you have no radio stay where you are until someone is dispatched with a flashlight to safely guide you.
4. Cooperate with instructions communicated by Shift Coordinator.
5. When power resumes return to normal operations in a safe and efficient manner.

Production Shift Coordinator

1. Ensure that all employees, contractors and visitors are accounted for;
2. Dispatch lighting assistance where necessary to assist workers to safely exit areas unlit enough to safely see their way out.
3. Designate a safe location for workers to assemble **if required**.
4. Determine the extent and duration of outage where possible.
5. Notify Management; Plant Manager, Production Manager.
6. Where employees or workers are trapped in elevators attempt to arrange for rescue through the Elevator Service Provider.
7. Contact off shift employees for shift cancellation or call-in as necessary in the circumstance.
8. Coordinate the resumption of normal operations when power is restored.

SEVERE WEATHER EMERGENCY

Hurricanes

1. In the event of a Hurricane related emergency; prepare the operation in advance for:
    a. Winds (remove / secure potential materials / goods that may be blown about).
    b. Heavy rains / flooding by securing all known areas susceptible to flooding where possible, have on hand necessary pumping equipment to drain in the event of excess water collection.
2. Ensure that all elevated work in high winds is suspended until safe to do so.
3. Ensure that all employees are reminded to seek shelter where appropriate.
4. Where injuries occur obtain appropriate treatment as soon as possible.
5. Monitor Weather Reports.
6. Resume normal operations when safe to do so.

Tornados

1. Notify employees to take appropriate shelter where there is an actual sighting or report of imminent Tornado activity in the immediate area:
    a. **If indoors**: the basement of the building is best, **if there is no basement**, go under a desk on a centre wall away from windows and possible flying debris.
    b. **If outdoors:** find cover in a building if possible or a ditch or culvert.
2. Where injuries occur obtain appropriate treatment as soon as possible;
3. Monitor Weather Reports.
4. Resume normal operations when safe to do so.

Snow / Ice Storms

1. Prepare the operation as much as possible in advance for:
    a. Winds (remove and/or secure potential materials that may be blown about).
    b. Heavy snows - secure all doors and entry points from snow entry and ensure that essential operations and emergency accesses are cleared as soon as practically possible.
    c. Icy conditions - arrange for clearing, salting and sanding of roads and passageways as soon as practically possible.
2. Ensure that all employees are reminded to work safely and to take appropriate protection for the weather conditions (clothing and shelter as appropriate).
3. Where injuries occur obtain appropriate treatment as soon as possible.
4. Monitor Weather Reports.
5. Maintain operations as normal where possible.

BOMB THREAT EMERGENCY – dial 292

Employees - upon receiving any type of threat such as a bomb etc.:

1. Write down as much detail as given (if possible).
2. Report it immediately to your supervisor/CCR.
3. Await instructions.
4. Cooperate with 911 authorities and management as required.
5. Assist in the efficient resumption of operations when authorized by the authorities and management.

Supervisors/CCR - upon receiving information of a threat:

1. Immediately contact 911 Services.
2. Follow direction of 911 services.
3. Quickly evacuate the affected area(s) in an orderly manner to a safe location.
4. As an added precaution avoid the main parking lot and main lunchroom areas.
5. Use an area that has a clear field of vision.
6. Treat any abnormal condition in that area as suspect and move to alternate location.
7. Ensure a head count is performed and all personnel are informed and given direction as per 911 services.
8. Notify senior management
9. Resume normal operations as directed by the 911 authorities and management.

FIRE DRILLS

Annual Effectiveness Test

The purpose of the fire drill is to test the effectiveness of the evacuation procedure in the event of a fire. A drill will be conducted at least annually during the warm weather months. Things that should be evaluated:

1. Time taken to completely evacuate buildings.
2. Time taken to place call to fire department or other emergency services as required.
3. How well people carried out responsibilities.
4. Is more training required etc.

A record of the evaluation shall be documented and kept on file for two years. Where abnormalities are identified recommendations shall be made and put into place to eliminate the abnormalities.

Real emergencies can be used as well as drills to evaluate emergency response procedures.

REPORTING REQUIREMENTS

All accidents and incidents must be reported to the direct Supervisor who will notify the Health and Safety Coordinator of the occurrence via e-mail or voice-mail before the end of the shift and will furnish an accident report within 24 hours of the occurrence. All after-hours accidents and incidents must be reported to the Shift Coordinator.

In all cases of serious injury or major operation interruption the following personnel must be contacted immediately:

1. Safety Coordinator
2. Human Resources Manager
3. Plant Manager
4. Department Manager of the area or of the individual

DEFINITIONS

Critical Injury: An injury of a serious nature that:

- places life in jeopardy
- produced unconsciousness
- results in a substantial loss of blood
- involves a fracture of a leg or arm but not a finger or toe
- involves the amputation of a leg, arm, hand or foot but not a finger or toe
- consists of burns to a major portion of the body
- causes the loss of sight in an eye

Environmental Emergency: A major spill that causes or is likely to cause any of the following adverse effects:

- Impairment of the quality of the natural environment for any use that can be made of it
- Injury or damage to property or to plant or animal life
- Harm or material discomfort to any person
- An adverse effect on the health of any person
- Impairment of the safety of any person
- Rendering any property, plant or animal life unfit for human use
- Loss of enjoyment of normal use of property
- Interference with the normal conduct of business
- If an emission enters or is likely to enter any waters
- If the volume of the spill exceeds 100 litres

Medical Emergency: Any time the assistance of professional emergency medical transport or professional emergency treatment services are required.

Building Fire Warden: Individuals designated to perform a visual inspection of the building areas that they work on for people as they leave the floor. List of Fire Wardens is supplied in Appendix 1.

APPENDICES

Appendix 1: Fire Wardens

List of Fire Wardens in Normally Occupied Buildings		
Building	**Normal Warden**	**Alternate Warden**
EM Office and Shop	Electrical Supervisor	Shift Electrician
MM Office	Maintenance Planner	Maintenance Supervisor or Shift Millwright
MM Shop Floor and Washrooms	Stores Coordinator	Maintenance Supervisor or Shift Millwright
Stores	Stores Coordinator	Stores Person
Lab	Lab Supervisor	Lab Manager or Lab Technician
Production Dept	Production Manager	Kiln Coordinator or Utility Person
Finance	Finance Manager	Safety Coordinator
Quarry	Quarry Supervisor	Quarry Manager or Mechanic

APPENDIX J: FUGITIVE DUST MANAGEMENT PROCEDURE

ST MARYS	Location: Bowmanville	ST. MARYS CEMENT COMPANY PROCEDURE	Page 1 of 3
	Department: All	Title: Fugitive Dust Management	Revision: 4
	System: ISO 14001	APPROVED AND PUBLISHED ELECTRONICALLY ORIGINAL AVAILABLE ON THE INTRANET	Type: PD

1.0 PURPOSE

1.1 The purpose of this procedure is to ensure that proper control measures to mitigate fugitive dust emissions are implemented in St Marys Cement Bowmanville Plant in order to minimize the impact on the environment, minimize potential nuisance to the community and ensure compliance with environmental legal requirements.

2.0 SCOPE

2.1 This document covers those activities within St Marys Cement Bowmanville Plant's property that generate fugitive dust emissions.

3.0 RESPONSIBILITY

3.1 Employee:

- All employees are responsible to comply and follow the requirements of this procedure.
- All employees are responsible for reporting to the Environmental Manager any emission of fugitive dust that causes or is likely to cause an adverse effect on the environment outside the boundaries of St Marys Cement Bowmanville Plant.

3.2 Dept. Supervisor/Mgr.:

- All supervisors / Managers are responsible to ensure that the requirements of this procedure are followed within their area of responsibility and corrective actions are taken when deviations are identified.

3.3 Environmental Manager:

- The Environmental Manager is responsible to ensure that the requirements of this procedure are followed, identify control measures to mitigate fugitive dust and notify St Marys' personnel of applicable legal requirements.

3.4 Cargo Dockers:

- Cargo Dockers is responsible for dock operations and to ensure compliance with legal requirements.
- Cargo Dockers is responsible to ensure that the requirements of this procedure are followed within their area of responsibility and corrective actions are taken when deviations are identified.

4.0 DEFINITIONS

4.1 Applicable Environmental Legislation: Environmental requirements established by the Ministry of the Environment that regulates the operations of St Marys Cement Bowmanville facility.

4.2 Adverse effect on the environment could be any of the following:

- Impairment of the quality of the natural environment for any use that can be made of it;
- Injury or damage to property or to plant or animal life;
- Harm or material discomfort to any person;
- An adverse effect on the health of any person;
- Impairment of the safety of any person;
- Rendering any property, plant or animal life unfit for human use;
- Loss of enjoyment of normal use of property;
- Interference with the normal conduct of business.

4.3 Muck pile: Broken material after being crushed by blasting.

5.0 PROCEDURE

5.1 Based on the existing and potential impact on the environment by St Marys operations the main activities that need to be controlled to mitigate fugitive dust are:

- Vehicle traffic
- Stockpiles
- Various process locations where material is being transferred/conveyed
- Blasting/Drilling
- Cleaning activities/Vacuum Truck
- Dock unloading

5.2 Vehicle Traffic:

Unpaved Roads:

Watering trucks should be available and operational for mitigating dust as needed.
Written logs are to be kept as to the activity of each watering truck to ensure consistent watering.
Chemical dust suppressants should be applied according to manufacturers' specifications on main unpaved roads
Vehicles should comply with indicated speed limits on post signs.

Paved Roads:

Water flush and/or sweeper should be available and operational for mitigating dust as needed.
Written logs are to be kept to ensure adequate use of the water flush truck and/or sweeper.
Vehicles should comply with indicated speed limits on post signs.
Tanker trucks should drive through the truck wash after loading when possible.

5.3 Stockpiles

Stockpiles of petcoke and salt should be tarped as soon as possible.
When possible the open face of petcoke and coal piles should be treated with dust suppressants at the end of the shift to minimize fugitive dust.
Limit to a minimum the disturbance of the stockpiles.
When using a stacker to build piles limit drop heights to a minimum.
Ensure that the loader bucket is close to the truck to minimize drop height while loading.
When control measures are not effective and handling material activities may cause an adverse effect on the environment, due to high wind speed conditions, activities should be stopped immediately.

5.4 Various process locations where material is being transferred/conveyed:

Free fall of materials should be operated in such a manner as to minimize the free fall distance and fugitive dust emissions.
When applicable install and operate water spray bars to control fugitive dust.

5.5 Blasting/Drilling:

When possible blasting activities should consider weather conditions to diminish fugitive dust.
Ensure that dust collector of driller is operational and maintained.
Muck piles should be watered to diminish fugitive dust by handling activities.

5.6 Cleaning activities/Vacuum Truck:

Ensure that dust collector of vacuum truck is operational and well maintained.
Material from cleaning activities of vacuum truck should be dumped in areas authorized by production supervisor.
When the vacuum truck is used to clean petcoke or coal, the material must be reintroduced into the process without sending the material to the dock.
Vacuumed material such as limestone, waste cement and/or waste clinker should be sent to the quarry for road construction or to be reintroduced into the process.

No waste material should be dumped at the dock area. Material may be dumped at the dock area on an **exceptional basis**, previous authorization from Cargo Dockers. All shipments must be signed in at the office of the dock and initialed by a Cargo Dockers' employee before dumping the material. No material should be left on the dock without authorization of Cargo Dockers.

5.7 Dock unloading:

When unloading, all vessels must apply water at all transfer points and at the end of the boom to control fugitive dust.

Unloading piles should be transferred as soon as possible from unloading area to final storage area at the dock.

When control measures are not effective and handling material activities may cause an adverse effect on the environment, due to high wind speed conditions, activities should be stopped immediately.

Unloading material from vessels should be stopped when wind speeds exceed 40 km/hr.

Cargo Dockers is responsible to notify immediately the Ministry of the Environment and St Marys' personnel when activities at the dock cause or are likely to cause an adverse effect on the environment.

6.0 REFERENCE DOCUMENTS

- PD 00166 Accident Incident and Environmental Nonconformance Reporting
- Environmental Protection Act

Amendments to Application for Approval under Section 27 of the EPA (Design and Operations Report)

St. Marys Cement (Canada) Inc.

Minor Technical Amendment to Environmental Compliance Approval for the Alternative Fuels Demonstration

Bowmanville Cement Plant
April 27, 2017

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Appendices

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OVERVIEW

St. Marys Cement (Canada) Inc. (SMC) is submitting an application to the Ministry of Environment and Climate Change (MOECC) for an Amendment to the Environmental Compliance Approval (ECA) 1255-7QVJ2N to undertake an alternative fuels demonstration project at its cement plant located in Bowmanville, Ontario. A minor technical amendment to the ECA is required to address the relocation of the fuel feed system originally proposed for the project. In lieu of developing a separate fuel feed system for the purpose of the demonstration project, SMC proposes to use the same alternative fuel feed system and alternative fuel building as approved for the Low-Carbon Alternative Fuel project under ECA 7024-9XUK4C (as amended).

This report presents the amendments to components of the Application for Approval under Section 27 of the EPA for the Purpose of Conducting an Alternative Fuels Demonstration: Bowmanville Cement Plant, submitted as part of the original ECA application in November 2008.

It is proposed that the demonstration be relocated to the alternative fuel building and fuel feed equipment that is being installed in the open space east of the preheater, northwest of the ATOX mill feed silos. This change eliminates the need for two separate feed systems, and brings the demonstration project into an enclosed structure.

Amendments to the Executive Summary

Amendments have been made to the preliminary drawings for the proposed alternative fuel handling system that were provided in **Annex F**, including the proposed alternative fuel building and changes to the fuel feed equipment. St. Marys has provided copies of final layout drawings, bearing the stamp of a Professional Engineer, to the Director and District Manager of the MOECC in accordance with Condition 21 of ECA 7024-9XUK4C for the Regular Use of Low-Carbon Alternative Fuel, and Condition 21 of ECA 1255-7QVJ2N for the Alternative Fuels Demonstration.

The alternative fuel types for the demonstration project would consist of the approved waste types indicated in Condition 24 of the existing ECA for the demonstration, consisting of residuals derived from industrial and/or post-consumer sources, including plastic polymers, paper fibres and woody materials, received as single streams or blends of these material types. However, they would not be the specific materials from those sources identified in Sections 3.1.1, 3.1.2 and 3.1.3 of the original application.

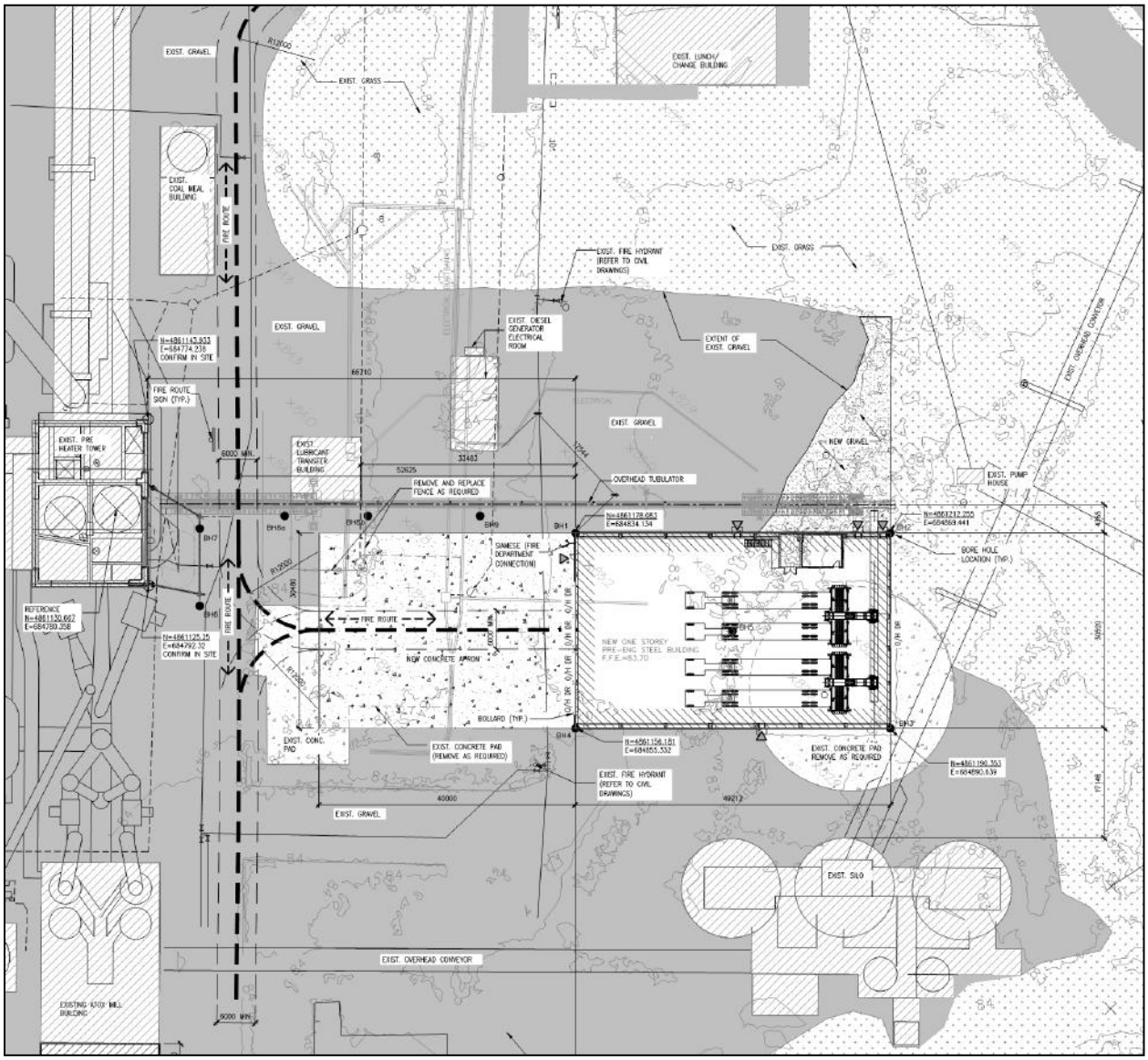
The potential for odour, litter, dust and noise are addressed in Sections 4.1.5 through 4.1.8. It is not expected that there will be any odour, litter, dust or noise impacts from the demonstration project, given that the alternative fuels will be contained either on the transfer trailers or within the alternative fuel building for the duration of the demonstration. The potential for the adjusted location of the alternative fuel building to have any effect on these parameters was assessed, and it was determined that the change in location would not result in any change.

Amendments to Section 2: Description of the Bowmanville Cement Plant

2.5 Layout of Principle Features of the Cement Plant

Amendments have been made to the site layout, originally provided in Figure 1. The revised Figure 1 presents an overview of the layout of the principle features of the cement plant described in more detail in the following sections that discuss the process flow for the facility. On this drawing, the proposed location of the alternative fuel building and fuel feed system that would also be used for the demonstration is indicated.

Figure 1. Principle Features of the Bowmanville Cement Plant (amended)



Amendments to Section 4: Design and Operation: Alternative Fuels Demonstration

4.1 Fuel Reception & Management

4.1.1 Fuel Reception

The alternative fuels will be transported to the site in enclosed trailers. The nominal capacity of each trailer is approximately 25 to 33 tonnes depending upon the density of the material as it is packed into the trailer.

St. Marys Cement intends to construct a dedicated Alternative Fuel Building on the site as the location for the reception, unloading, storage, fuel preparation and feeding of low carbon alternative fuel to the kiln as well as alternative fuels for demonstration. This building will also be used to store and manage clean wood materials, also destined as fuel for the cement making process. The bulk unloading and conveying equipment for managing these fuels will be installed within this building.

The Alternative Fuel Building will be approximately 30 metres wide by 50 metres long. It will be a clear-span metal structure, equipped with four high-speed roll-up doors at the west end of the structure for alternative fuel receipt.

For the purpose of the alternative fuel demonstration, up to 75 tonnes of alternative fuel would be present at the facility at any one time.

4.1.3 Incoming (and Outgoing) Waste Records

Each truck will be weighed upon arrival at the site and directed to the alternative fuel building. After the trailer is unloaded the driver will return to the weigh scale where the truck will be re-weighed and a copy of the bill of lading will be retained as part of the record of the demonstration project.

4.1.4 Visual Screening

Alternative fuels for the demonstration will either been visually inspected by SMC personnel at the point of generation prior to the material being shipped to the Bowmanville site, or will be inspected upon delivery and unloading at the alternative fuels building. If the inspector observes any material in the load which is deemed to be unsuitable for use as an alternative fuel, loading or unloading will cease immediately.

4.1.7 Litter Control

Litter will be controlled during the demonstration as the alternative fuels will not be exposed to the elements and will at all times be contained within either the enclosed transfer trailers delivering the fuel or the alternative fuel building.

4.1.8 Odour Control

The potential for odour from the alternative fuels will be reduced by the processing of the materials by the fuel suppliers that will happen off-site, such as drying of the

material. The alternative fuels will arrive dried and ready to be used as a fuel, and at the specified moisture levels (20 +/- 5%) the potential for microbial action and odour generation from the materials is minimal. The alternative fuels will have been inspected prior to loading onto the transfer trailers to ensure that the materials shipped to the Bowmanville Plant meet specifications. In addition as noted above, the alternative fuels will not be exposed to the elements and will at all times be contained within either closed trailers or the alternative fuel building. Therefore the potential for fugitive odours from the alternative fuels is minimal.

4.1.10 Noise Control

Sensitive noise receptors are located approximately 650 m to the north of the plant close to Highway 401 and more than 1,000 meters to the southeast of the plant along the lakeshore.

The majority of all alternative fuel operations will take place indoors within the alternative fuel building. Measures such as the use of high speed doors to the alternative fuel building are also proposed to further limit the potential for off-site noise from the fuel handing equipment. As a result it is not expected that the noise associated with alternative fuel operations will have a significant impact on the neighbouring environment. A detailed Acoustic Assessment Report (AAR) was previously prepared and submitted to the MOE as supporting documentation for SMC's existing approval for the use of alternative fuels. With the relocation of the alternative fuel building, a review of the AAR was undertaken, which has determined that the change in location of the building would not change the facility-total sound levels predicted at the most potentially impacted offsite points, and that the change to the new location would be acoustically insignificant.

4.1.11 Bird and Non-Bird Vector Control

It is not expected that any measures will be required during the demonstration to control birds and non- bird vectors. The alternative fuel materials will not contain any putrescible organic materials, and will be dried and shredded off-site. Furthermore, these materials will not be exposed to the elements at any time, as at all times the fuels will be contained within either closed trailers, the enclosed fuel feed system or the alternative fuel building.

4.2 Equipment: Fuel Feed System

For the purpose of conducting this alternative fuel demonstration, St. Marys Cement will use the same solid fuel feed system installed for the Low-Carbon Alternative fuel project. This solid feed system will be supplied from a manufacturer who specializes in the design and manufacture of bulk solid conveying systems. **Annex F** includes drawings of this equipment. A brief description of this solid feed system and its normal operation are as follows:

a) material is loaded into a receiving hopper by front end loader or live bottom trailer;

b) at the base of the feed hopper is an in-feed conveyor which can either move the material to a low speed rotary cutter to ensure appropriate particle sizes are

achieved and to blend materials or if the material does not require size reduction it can deliver the material directly to the next stage of the system;

c) a covered conveyor would transfer materials over a drum or belt magnetic separator, to the feed hopper for the alternative fuel feeding system;

d) at the base of the feed hopper is a slowly rotating screw assembly which moves material from the hopper into a discharge chute;

e) from the discharge chute the material flows by gravity onto an incline conveyor;

f) the material discharges from the inclined conveyor onto a horizontal belt which in turn supplies a 120 meter long enclosed tube conveyor;

g) an enclosed hopper/weighfeeder accepts the incoming materials, and meters the material by mass and loss in weight methods to feed airlock and infeed chute to the firing location at the kiln pre-calciner inlet;

h) the system can be adapted to also feed fuel pneumatically to the main kiln burner with the addition of transport air blower and piping system.

For the duration of the demonstration period, the rate of feed of the alternative fuels to the burner location will be controlled by the control room operator via system interlocks. An operator will be on-site in the alternative fuel building and/or the kiln control room 24/7 in order to both oversee the operation of the alternative fuel feed mechanism.

Control of the feed rate of the alternative fuel to the kiln will be adjusted by the control room operator according to a control strategy similar to that used for feeding conventional fuels. Specifically, the alternative fuel feed rate will be adjusted in concert with combustion air and clinker production so as to maintain the desired temperature profile and heat balance throughout the system while simultaneously ensuring that adequate residual oxygen is present for efficient combustion.

The system will be interlocked with the plant control systems, so that it will start/stop with the current fuel system, and will take feed rate set points and operating commands from control room operator and expert optimizer systems. The system will also have local emergency stop and test controls for clearing any blockages.

4.3 Fuel Quantities

Due to the varying energy content of the alternative fuels, different amounts of each fuel sources for the demonstration will be required to yield the same amount of energy to substitute for up to 30% of the conventional fuel in both the calciner and main kiln. The maximum tonnage/day required for the demonstration would be 350 tonnes per day in accordance with the existing ECA for the demonstration project. The maximum quantity of alternative fuel that would be present at the facility at any one time would be 75 tonnes also in accordance with the existing ECA for the demonstration project. Alternative fuel quantities beyond the 75 tonnes that would be present at any one time, would be provided using a ‘just in time’ delivery approach.

4.5 Emissions Control

4.5.1 Alternative Fuels Handling

Alternative fuels will be delivered to the site in totally enclosed transport trailers. The trailers will only be opened once they have been backed in to position for unloading into the alternative fuels building. As a result, no potential for emissions of odour or dust from the alternative fuel handling process is expected during the demonstration.

The potential for changes to air emissions associated with the use of low carbon alternative fuels as part of the ECA application for the Low Carbon Fuels project. The ESDM report concluded that the maximum POI concentrations for all contaminants during use of low carbon alternative fuel would be below their respective POI limits. It was determined that the relocation of the alternative fuel building would be an environmentally insignificant change, and the facility would continue to comply with the MOECC air limits and the plant's ECA conditions. During the alternative fuels demonstration project, data acquisition will proceed in accordance with Section 4.6 to assess the impacts of substituting alternative fuels on the performance of the cement kiln and its associated environmental impacts.

Since the receipt and transfer of the alternative fuels will be performed in a confined area within the existing operating plant surface water control area and since the fuels will be transferred directly from the inbound transfer trailers to the alternative fuel building, there is negligible potential for the proposed demonstration to impact surface water quality.

4.7 Site Inspection

A Trained Person will inspect the entire Alternative Fuel Building each day of operation to ensure that: it is secure; that the operation is not causing any nuisances; that the operation is not causing any adverse effects on the environment and that the alternative fuel system is being operated in compliance with the ECA. On each operating day, a visual inspection of the following areas associated with the alternative fuel demonstration will be carried out:

- Loading/unloading area;
- Storage area; and,
- Fuel Delivery system.

A daily log will be kept that will include the name and signature of the person that completed each inspection, the date and time of each inspection, a list of any deficiencies discovered, any recommendations for action, and the date, time and description of actions taken.

4.8 Start Up and Shut Down Procedures

Before the start of the demonstration and each alternative fuel scenario, the plant will ensure that the cement kiln and all associated equipment and systems are in good

working order and are performing stably within design specifications and operating ranges.

When stable kiln conditions and the appropriate pre-heater temperatures are achieved, it will be confirmed that:

- the alternative fuel feed mechanism has been energized and tested according to the manufacturer's specifications;
- all interlocks and safeties are energized and operational; and,
- the feed hopper of the feeder contains sufficient alternative fuel.

Upon receiving confirmation of all of the preceding, the control room operator will open the control valve admitting flow of alternative fuel into the selected burner assembly. As alternative fuel begins to flow into the burner, the control room operator will trim back the flow of conventional solid fuel while at the same time monitoring critical process and emission parameters for any significant changes. It is anticipated that the computer control system will be capable of adjusting most process flows and conditions in the usual fashion.

To terminate the use of alternative fuel, the control room operator will essentially follow a procedure which is the reverse of the start-up procedure. That is to say, the flow of alternative fuel will be progressively decreased and the flow of conventional solid fuels increased.

A significant component of the demonstration program is to gain information related to the specific techniques which must be employed (if any) when processing alternative fuels. Because of this desire to test the system during fuel changeovers, the control room operator (in addition to the expert control system) is an integral part of the start-up/shut down procedure.

4.9 Emergency Measures

4.9.1 Termination of Alternative Fuels Processing

If the use of low carbon alternative fuel is determined to be adversely affecting operability of the kiln or causing unacceptable environmental emissions, the control room operator has the ability to stop the flow of alternative fuel to the burner assembly by the activation of a single control switch. This switch is interlocked to the controls of the alternative fuel feed system so that when activated the feed system will be de-energized and alternative fuel flow will terminate. It is expected that the expert system will then make the necessary adjustments (such as increasing the flow of conventional solid fuel, decreasing the flow of raw meal, decreasing the flow of combustion air, etcetera) to compensate for the termination of alternative fuel flow.

When the feed system is de-energized, a local alarm will alert the control room operator. They will then render the system inoperable by closing an isolation valve between the alternative fuel feeder and the pre-calciner. All associated equipment will automatically shut down until restarted by the control room operator.

Amendments to Section 5: Conclusion of Demonstration (Closure)

5.1 Management of Residuals

Any alternative fuels that remain at the end of the demonstration project will be transported via a licensed hauler to be disposed at a licensed disposal facility.

Amendments to Section 6: Reporting

6.2 Daily Log

A log book or electronic file will be maintained at the site during the demonstration and will be kept by St. Marys for a minimum of five years. The log will include daily records of the following information:

- The date;
- The types, amounts and source of the alternative fuels received at the Site;
- A record of daily inspections as discussed in section 4.7;
- A record of any spills or process upsets at the site, the nature of a spill or process upset and the action taken to clean up or correct the spill, the time and date of the spill or process upset and for spills the time that the Ministry and other persons were notified of the spill in fulfillment of the reporting requirements of the EPA; and
- The signature of the trained personnel responsible for conducting the inspection and completing the report.

Appendix F. Facility Operations Data

Alternative fuel trial data

Data run

Start: 9/25/2018 0:00

Finish: 9/28/2018 0:00

Hour Start	Hour Finish	NO	NO2	SO2	Opacity	Temperature of gases leaving the kiln	Temperature of gases K5 top	Temperature of gases leaving the calciner	Residual Oxygen at back end of the kiln	Residual Oxygen at calciner down comer duct	CO at back end of the kiln?	CO at calciner down comer duct	THC (as CH4) in kiln stack gas	Kiln negative pressure	Calciner negative pressure	Preheater tower negative pressure	Raw mill negative pressure	Raw material feed rate	Conventional fuel feed rate - kiln	Conventional fuel feed rate - calciner	LCF/Alt fuel feed rate - calciner	Clinker hourly production rate	Calciner feed	Kiln feed
		ppm	ppm	ppm	%	C	C	C	%	%	ppm	ppm	ppm	kPa	kPa	kPa	kPa	t/h	t/h	t/h	t/h	t/d	t/h	t/h
25-Sep-18 00:00:00	25-Sep-18 01:00:00	149.4	3.3588	193.41	3.90	0.00	823.15	902.94	3.75	4.52	446.14	705.67	106.71	-0.08	0.54	8.62	1.31	422.17	8.02	14.48	1.39	5271.52	302.32	95.52
25-Sep-18 01:00:00	25-Sep-18 02:00:00	196.2	3.2331	225.81	4.17	0.00	824.83	903.70	2.88	4.27	476.15	705.64	94.65	-0.08	0.56	8.70	1.29	429.55	8.08	15.22	0.00	5379.77	308.57	97.39
25-Sep-18 02:00:00	25-Sep-18 03:00:00	188	3.1446	209.32	4.27	0.00	825.97	904.08	3.30	3.98	437.16	697.43	92.53	-0.08	0.55	8.69	1.27	434.59	8.00	15.46	0.00	5485.99	314.36	99.16
25-Sep-18 03:00:00	25-Sep-18 04:00:00	196.8	3.0614	298.12	4.44	0.00	826.77	903.75	3.01	3.89	484.65	698.07	91.74	-0.08	0.55	8.80	1.25	433.73	8.00	15.49	0.00	5566.27	318.20	100.26
25-Sep-18 04:00:00	25-Sep-18 05:00:00	171.2	2.9783	414.95	4.20	0.00	827.90	904.40	2.76	4.16	613.82	681.18	103.53	-0.08	0.55	8.78	1.19	436.92	8.00	15.49	0.00	5486.36	314.05	99.28
25-Sep-18 05:00:00	25-Sep-18 06:00:00	149.1	2.8952	346.17	4.32	0.00	830.51	903.78	3.15	3.85	506.31	691.38	106.77	-0.09	0.55	8.79	1.19	436.52	7.99	15.79	0.00	5624.65	322.07	101.61
25-Sep-18 06:00:00	25-Sep-18 07:00:00	144	2.812	359.52	4.36	0.00	831.41	903.92	3.24	3.89	525.87	712.21	108.23	-0.09	0.58	8.83	1.19	436.44	7.94	15.67	0.00	5679.48	325.23	102.62
25-Sep-18 07:00:00	25-Sep-18 08:00:00	191.6	1.8171	284.42	4.24	0.00	831.05	904.07	3.52	4.04	502.44	702.29	106.72	-0.09	0.60	8.81	1.16	442.66	7.96	15.61	0.00	5652.16	323.70	102.20
25-Sep-18 08:00:00	25-Sep-18 09:00:00	156	2.3292	289.23	4.14	0.00	830.70	904.30	14.72	4.30	473.63	681.39	95.02	-0.09	0.59	8.80	1.18	432.00	8.08	15.35	0.00	5536.24	312.49	98.70
25-Sep-18 09:00:00	25-Sep-18 10:00:00	138.4	2.3688	450.51	4.18	0.00	830.85	904.71	20.96	4.71	476.85	672.08	91.67	-0.09	0.61	8.74	1.16	426.79	8.29	14.63	0.00	5464.80	299.28	94.55
25-Sep-18 10:00:00	25-Sep-18 11:00:00	146.7	2.4084	459.1	4.29	0.00	831.31	904.21	10.95	5.02	550.58	659.91	90.96	-0.08	0.60	8.71	1.12	430.54	8.37	14.44	0.00	5318.98	291.34	92.04
25-Sep-18 11:00:00	25-Sep-18 12:00:00	178.2	2.4479	449.86	4.24	0.00	832.33	903.73	2.97	4.89	514.12	652.67	90.99	-0.09	0.60	8.76	1.13	434.50	8.04	14.51	0.00	5448.81	298.29	94.26
25-Sep-18 12:00:00	25-Sep-18 13:00:00	168.4	2.4875	386.85	4.22	0.00	834.34	902.97	3.63	4.62	484.07	640.76	102.95	-0.09	0.59	8.74	1.12	435.70	7.74	15.16	0.00	5519.89	304.79	96.31
25-Sep-18 13:00:00	25-Sep-18 14:00:00	167	2.5271	403.76	4.22	0.00	834.75	904.14	3.79	3.99	473.00	616.65	105.50	-0.09	0.55	8.75	1.13	432.32	7.78	15.83	1.13	5473.79	309.52	97.82
25-Sep-18 14:00:00	25-Sep-18 15:00:00	166.3	2.9363	454.07	4.20	0.00	832.12	904.47	3.86	3.79	461.81	598.48	106.33	-0.09	0.54	8.69	1.11	427.66	7.69	15.19	2.99	5506.35	311.59	98.39
25-Sep-18 15:00:00	25-Sep-18 16:00:00	54.91	8.7689	50.71	4.13	0.00	830.23	903.74	3.43	4.05	493.52	611.78	101.09	-0.09	0.58	8.73	1.09	431.79	7.69	15.70	0.34	5525.87	312.75	98.87
25-Sep-18 16:00:00	25-Sep-18 17:00:00	197.9	8.5154	377.58	4.21	0.00	829.36	902.92	3.13	4.28	479.99	600.85	100.60	-0.09	0.59	8.72	1.07	430.38	7.80	15.69	0.00	5388.23	306.80	96.99
25-Sep-18 17:00:00	25-Sep-18 18:00:00	149.2	2.7896	268.2	4.18	0.00	828.50	904.13	3.28	3.91	467.41	641.54	96.91	-0.09	0.58	8.61	1.10	430.17	8.04	16.39	0.00	5313.28	313.42	98.93
25-Sep-18 18:00:00	25-Sep-18 19:00:00	173.2	2.7328	363.09	4.13	0.00	828.00	905.29	2.33	3.97	471.59	628.41	95.12	-0.08	0.56	8.69	1.10	425.28	8.08	15.40	2.30	5244.99	309.44	97.71
25-Sep-18 19:00:00	25-Sep-18 20:00:00	189.1	2.676	284.05	4.05	0.00	829.86	904.28	2.51	4.33	476.75	596.60	96.15	-0.09	0.55	8.59	1.08	429.48	7.98	14.68	3.00	5074.81	299.24	94.58
25-Sep-18 20:00:00	25-Sep-18 21:00:00	186.9	2.6192	279.83	4.06	0.00	831.28	903.91	2.67	4.62	481.91	601.08	95.33	-0.09	0.59	8.55	1.13	426.69	7.94	14.73	1.91	5007.12	296.68	91.73
25-Sep-18 21:00:00	25-Sep-18 22:00:00	187.5	2.5625	345.29	3.99	0.00	832.15	905.71	2.72	4.75	487.07	600.74	101.00	-0.09	0.55	8.50	1.11	429.24	7.84	13.68	3.00	4910.85	290.93	90.02
25-Sep-18 22:00:00	25-Sep-18 23:00:00	178.5	2.5057	276.14	3.98	0.00	832.53	903.19	2.91	4.57	492.23	618.91	102.95	-0.10	0.54	8.52	1.09	429.98	7.64	13.95	2.16	4976.25	293.50	92.36
25-Sep-18 23:00:00	26-Sep-18 00:00:00	178.5	2.4489	284.42	4.22	0.00	831.70	904.64	0.67	4.11	497.39	624.15	105.25	-0.10	0.57	8.63	1.10	429.84	7.81	14.86	1.71	5101.84	298.41	97.35
26-Sep-18 00:00:00	26-Sep-18 01:00:00	173.4	2.4144	277.56	4.57	0.00	830.81	904.45	0.44	4.48	502.55	610.17	99.36	-0.09	0.57	8.56	1.07	429.99	8.02	13.98	3.00	4913.27	286.07	95.10
26-Sep-18 01:00:00	26-Sep-18 02:00:00	186.9	2.4099	447.48	4.42	0.00	830.08	904.17	1.64	4.52	510.39	604.24	96.70	-0.09	0.58	8.58	1.03	427.50	8.15	14.04	3.00	4944.45	291.05	92.55
26-Sep-18 02:00:00	26-Sep-18 03:00:00	158.6	2.4056	323.09	4.43	0.00	832.45	902.98	16.64	3.95	522.48	613.55	104.26	-0.09	0.57	8.53	1.10	426.31	8.02	14.06	3.74	5100.89	297.31	93.90
26-Sep-18 03:00:00	26-Sep-18 04:00:00	128	2.4013	604.31	4.38	0.00	832.74	904.95	21.17	4.21	534.62	579.30	94.65	-0.10	0.58	8.50	1.05	428.01	7.98	13.57	3.99	5078.20	286.13	90.36
26-Sep-18 04:00:00	26-Sep-18 05:00:00	163.5	2.3969	554.03	4.33	0.00	831.31	904.70	15.57	4.53	546.77	569.95	92.99	-0.09	0.58	8.56	1.05	426.11	7.68	14.02	3.98	4965.69	278.33	90.14
26-Sep-18 05:00:00	26-Sep-18 06:00:00	190.5	2.3932	411.1	4.33	0.00	833.21	901.78	4.76	3.77	558.91	565.39	105.84	-0.09	0.53	8.66	1.05	425.08	7.41	14.73	3.98	5109.08	280.88	97.48
26-Sep-18 06:00:00	26-Sep-18 07:00:00	199.2	2.8146	348.09	4.43	0.00	834.38	905.11	4.80	3.26	548.09	621.26	105.37	-0.08	0.53	8.62	1.06	423.90	7.47	16.02	1.53	5402.35	303.11	98.65
26-Sep-18 07:00:00	26-Sep-18 08:00:00	141.8	2.2654	345.48	4.37	0.00	833.17	903.19	4.73	2.92	504.61	725.91	122.48	-0.08	0.54	8.63	1.07	425.03	7.56	16.92	0.00	5528.14	312.77	98.75
26-Sep-18 08:00:00	26-Sep-18 09:00:00	151.5	2.928	311.2	4.36	0.00	831.92	904.87	14.93	3.27	510.24	677.22	103.40	-0.08	0.56	8.63	1.04	423.12	7.65	16.28	0.00	5626.92	312.07	98.66
26-Sep-18 09:00:00	26-Sep-18 10:00:00	135.2	2.9384	481.37	4.28	0.00	830.68	904.54	21.15	3.95	515.88	619.55	97.86	-0.07	0.55	8.61	1.06	421.82	7.99	15.58	0.00	5378.44	294.28	93.10
26-Sep-18 10:00:00	26-Sep-18 11:00:00	179.6	2.9488	330.62	3.99	0.00	830.26	904.45	21.18	4.64	521.51	612.31	210.43	-0.08	0.56	8.63	1.08	428.80	7.82	14.86	0.00	5204.60	284.04	89.73
26-Sep-18 11:00:00	26-Sep-18 12:00:00	178.1	2.9592	381.28	3.83	0.00	831.82	905.08	21.18	5.04	527.14	615.78	91.20	-0.08	0.58	8.57	1.05	434.82	7.88	14.45	0.00	5066.58	276.10	87.36
26-Sep-18 12:00:00	26-Sep-18 13:00:00	178.7	2.945	402.2	3.80	0.00	832.93	907.24	13.08	5.37	532.77	608.55	101.22	-0.07	0.53	8.44	1.06	436.99	8.13	13.56	1.77	4775.71	259.19	81.91
26-Sep-18 13:00:00	26-Sep-18 14:00:00	172.5	2.8739	309.5	3.83	0.00	833.16	904.38	4.40	4.75	538.41	610.23	96.76	-0.06	0.51	8.41	1.07	433.95	8.16	12.85	8.63	4992.37	272.63	86.13
26-Sep-18 14:00:00	26-Sep-18 15:00:00	172.4	2.8004	385.77	3.86	0.00	833.38	903.41	3.62	4.68	606.14	650.80	89.40	-0.07	0.54	8.55	1.08	434.36	8.12	13.96	5.68	5263.79	287.54	90.83
26-Sep-18 15:00:00	26-Sep-18 16:00:00	194.8	2.7269	402.57	3.90	0.00	833.59	904.08	3.79	4.31	563.95	650.20	88.73	-0.06	0.55	8.61	1.10	436.26	7.98	13.77	8.10	5442.31	298.00	94.02
26-Sep-18 16:00:00	26-Sep-18 17:00:00	188.8	2.6533	489.13	3.87	0.00	833.80	902.88	3.74	4.34	601.93	665.01	96.79	-0.07	0.57	8.71	1.10	439.06	7.86	14.67	4.87	5522.53	302.70	95.61
26-Sep-18 17:00:00	26-Sep-18 18:00:00	86.04	1.7153	187.99	3.82	0.00	833.58	904.39	3.93	4.78	613.78	674.57	88.92	-0.08	0.59	8.68	1.10	440.22	8.05	14.40	3.44	5425.33	297.00	93.68
26-Sep-18 18:00:00	26-Sep-18 19:00:00	186.8	2.294	434.47	3.86	0.00	833.14	903.84	3.69	4.52	579.01	667.11	76.14	-0.06	0.56	8.68	1.07	441.23	8.18	14.77	2.81	5430.65	297.21	94.13
26-Sep-18 19:00:00	26-Sep-18 20:00:00	181.2	2.3749	475.76	3.84	0.00	832.71	903.92	4.07	4.05	567.80	667.81	72.44	-0.06	0.55	8.66	1.07	432.05	8.06	14.47	3.03	5604.85	307.44	96.90
26-Sep-18 20:00:00	26-Sep-18 21:00:00	150	2.4559	518.74	3.89	0.00	832.27	903.96	11.55	3.83	578.40	700.53	68.55	-0.06	0.55	8.72	1.09	429.38	8.19	15.48	2.70	5677.69	311.72	98.59
26-Sep-18 21:00:00	26-Sep-18 22:00:00	165.2	2.5369	557.49	3.86	0.00	831.40	903.23	21.08	4.00	569.70	659.17	59.71	-0.06	0.54	8.55	1.05	424.21	7.79	15.39	0.87	5419.41	300.12	89.95
26-Sep-18 22:00:00	26-Sep-18 23:00:00	202.3	2.8709	584.19	3.89	0.00	827.44	904.81	15.89	4.31	571.86	655.41	58.37	-0.07	0.57	8.68	1.10	421.27	8.07	15.46	0.61	5507.89	303.97	92.93
26-Sep-18 23:00:00	27-Sep-18 00:00:00	181	2.8833	528.83	3.80	0.00	828.72	903.60	4.84	4.56	569.19	641.89	56.16	-0.08	0.58	8.73	1.11	430.64	7.86	15.04	0.78	5565.80	305.17	96.49
27-Sep-18 00:00:00	27-Sep-18 01:00:00	175.6	2.5226	392.29	3.81	0.00	834.02	904.06	5.28	4.34	572.64	634.17	66.76	-0.07	0.57	8.68	1.09	433.64	7.90	15.30	0.63	5554.06	304.45	96.15
27-Sep-18 01:00:00	27-Sep-18 02:00:00	174.7	2.4408	392.72	3.77	0.00	833.25	904.76	4.76	4.88	576.10	614.29	61.15	-0.07	0.60	8.64	1.08	430.58	7.94	14.69	0.37	5383.96	294.60	93.26
27-Sep-18 02:00:00	27-Sep-18 03:00:00	187	2.359	474.22	3.75	0.00	832.55	904.46	4.22	5.44	579.14	611.72	60.64	-0.07	0.55	8.63	1.08	431.17	8.22	14.00	0.02	5229.12	284.56	91.17
27-Sep-18 03:00:00	27-Sep-18 04:00:00	166.9	2.2772	468.49	3.79	0.00	833.53	903.15	4.33	4.84	569.92	604.15	67.77	-0.05	0.47	8.73	1.08	429.19	8.24	14.01	1.00	5356.53	288.29	96.86
27-Sep-18 04:00:00	27-Sep-18 05:00:00	192.1	2.2	556.76	3.80	0.00	835.13	904.92	4.02	4.58	564.42	596.82	56.81	-0.06	0.55	8.71	1.10	427.48	8.17	14.79	1.13	5497.51	301.08	95.04
27-Sep-18 05:00:00	27-Sep-18 06:00:00	159.6	2.192	505.59	3.73	0.00	834.98	903.31	4.28	3.98	576.26	593.92	62.59	-0.06	0.54	8.74	1.09	418.65	8.02	14.24	3.99	5610.25	307.71	97.10
27-Sep-18 06:00:00	27-Sep-18 07:00:00	155.1	2.2072	496.2	3.84	0.00	834.57	904.10	4.02	3.75	648.03	626.46	63.37	-0.06	0.53	8.78	1.12	418.63	8.12	14.62	3.99	5672.60	311.46	98.53
27-Sep-18 07:00:00	27-Sep-18 08:00:00	204.7	1.9141	474.28	3.83	0.00	834.15	905.00	3.33	4.24	605.87	576.24	59.54	-0.06	0.55	8.75	1.12	416.12	8.04	14.06	3.99	5428.20	297.21	93.95
27-Sep-18 08:00:00	27-Sep-18 09:00:00	145.6	2.3498	403.68	3.80	0.00	833.74	903.42	9.28	4.41	571.72	599.16	65.31	-0.06	0.54	8.74	1.12	420.90	7.99	13.93	3.97	5365.59	293.45	92.69
27-Sep-18 09:00:00	27-Sep-18 10:00:00	147.1	2.4808	394.25	3.77	0.00	832.40	902.24	11.92	4.64	524.22	601.00	66.30	-0.06	0.55	8.64	1.12	425.98	8.01	15.10	2.19	5300.81	289.70	91.56
27-Sep-18 10:00:00	27-Sep-18 11:00:00	172.7	2.6118	389.36	3.88	0.00	827.35	902.74	0.10	4.13	0.49	610.30	64.34	-0.06	0.58	8.51	1.12	421.58	8.01	16.58	0.00	5260.62	287.04	90.47
27-Sep-18 11:00:00	27-Sep-18 12:00:00	192.6	2.7121	609.4	3.86	0.00	825.36	904.82	1.16	3.26	332.86	650.69	34.72	-0.05	0.51	8.63	1.09	416.30	7.86	16.85	1.72	5661.54	310.55	98.01
27-Sep-18 12:00:00	27-Sep-18 13:00:00	189.6	2.6901	460.65	3.83	0.00	828.60	904.24	2.95	3.49	29.15	593.25	22.88	-0.06	0.52	8.71	1.10	420.54	8.03	16.21	1.94	5548.38	303.99	96.04
27-Sep-18 13:00:00	27-Sep-18 14:00:00	174.9	2.6555	364.99	3.85	0.00	830.86	906.02	2.82	4.28	269.25	602.83	18.69	-0.06	0.53	8.65	1.11	426.35	8.19	14.14	4.01	5545.71	304.01	95.98
27-Sep-18 14:00:00	27-Sep-18 15:00:00	175.1	2.6208	415.68	3.83	0.00	831.41	903.05	2.31	5.01	313.15	626.13	67.71	-0.07	0.58	8.66	1.10	425.89	8.10	15.14	0.32	5418.79	296.47	93.83
27-Sep-18 15:00:00	27-Sep-18 16:00:00	167.1	2.5862	329.64	3.79	0.00	831.54	903.82	2.62	5.02	61.03	643.13	52.66	-0.07	0.57	8.66	1.07	423.95	8.39	15.21	0.00	5432.19	297.27	93.96
27-Sep-18 16:00:00	27-Sep-18 17:00:00	170.8	2.5516	337.42	3.96	0.00	831.67	904.18	2.43	5.25	168.05	631.88	53.73	-0.07	0.56	8.69	1.07	425.40	8.32	14.96	0.00	5299.46	289.53	91.47
27-Sep-18 17:00:00	27-Sep-18 18:00:00	180.7	2.5169	398.58	3.86	0.00	831.80	903.76	2.30	5.11	73.20	644.88	53.76	-0.07	0.57	8.72	1.08	424.65	8.22	15.30	0.00	5287.04	288.80	91.26
27-Sep-18 18:00:00	27-Sep-18 19:00:00	169.8	2.4823	367.72	3.89	0.00	831.93	903.95	2.22	5.00	121.08	662.31	54.77	-0.06	0.55	8.72	1.05	424.67	8.20	15.33	0.00	5303.59	289.73	91.41
27-Sep-18 19:00:00	27-Sep-18 20:00:00	156.1	2.4809	341.68	3.87	0.00	832.05	903.60	2.20	4.64	126.46	682.51	53.60	-0.06	0.55	8.73	1.08	420.17	8.26	15.73	0.00	5465.48	299.12	94.49
27-Sep-18 20:00:00	27-Sep-18 21:00:00	159.9	2.5908	330.22	3.97	0.00	832.18	904.31	2.69	4.50	158.01	672.27	52.50	-0.07	0.54	8.70	1.07	420.60	8.38	15.76	0.00	5505.51	301.48	95.33
27-Sep-18 21:00:00	27-Sep-18 22:00:00	160.4	2.7096	304.93	3.88	0.00	831.91	903.29	2.98	4.58	78.62	654.43	51.49	-0.07	0.56	8.68	1.04	420.80	8.38	15.70	0.00	5497.47	301.13	95.20
27-Sep-18 22:00:00	27-Sep-18 23:00:00	170.8	2.8285	248.31	3.87	0.00	829.29	904.56	3.49	4.76	88.04	637.12	53.64	-0.07	0.56	8.61	1.05	422.24	8.39	15.66	0.00	5255.47	286.96	90.87
27-Sep-18 23:00:00	28-Sep-18 00:00:00	169.2	2.9474	212.86	3.89	0.00	826.28	903.94	10.74	4.64	69.96	647.26	54.07	-0.07	0.54	8.50	1.04	422.71	8.39	16.10	0.00	5183.18	282.59	89.32

Alternative fuel trial data

Data run

Start: 9/28/2018 0:00

Finish: 10/16/2018 0:00

Time stamp		NO	NO2	SO2	Opacity	Temperature of gases leaving the kiln	Temperature of gases K5 top	Temperature of gases leaving the calciner	Residual Oxygen at back end of the kiln	Residual Oxygen at calciner down comer duct	CO at back end of the kiln?	CO at calciner down comer duct	THC (as CH4) in kiln stack gas	Kiln negative pressure	Calciner negative pressure	Preheater tower negative pressure	Raw mill negative pressure	Raw material feed rate	Conventional fuel feed rate - kiln	Conventional fuel feed rate - calciner	LCF/Alt fuel feed rate - calciner	Clinker hourly production rate	Calciner feed	Kiln feed
		ppm	ppm	ppm	%	C	C	C	%	%	ppm	ppm	ppm	kPa	kPa	kPa	kPa	t/h	t/h	t/h	t/h	t/d	t/h	t/h
03-Oct-18 00:00:00	03-Oct-18 01:00:00	173.96	2.61	289.89	3.85	1147.56	820.03	904.23	4.65	2.75	26.07	717.32	177.84	-0.06	0.51	8.85	1.08	420.90	7.88	16.63	0.00	5511.02	304.01	96.14
03-Oct-18 01:00:00	03-Oct-18 02:00:00	174.46	2.64	297.76	3.72	1161.56	819.65	904.12	4.16	2.75	26.07	707.85	166.33	-0.06	0.53	8.89	1.12	420.95	7.91	16.53	0.00	5510.81	304.01	96.11
03-Oct-18 02:00:00	03-Oct-18 03:00:00	172.11	2.68	288.67	3.78	1133.80	819.27	903.81	3.43	2.65	57.87	728.15	180.73	-0.06	0.54	8.89	1.12	423.77	7.89	16.52	0.00	5510.83	303.99	95.98
03-Oct-18 03:00:00	03-Oct-18 04:00:00	163.98	2.72	265.31	3.80	1101.60	818.89	903.92	3.05	2.85	76.46	793.58	179.32	-0.06	0.56	8.88	1.11	415.96	7.94	16.57	0.00	5481.43	303.09	94.90
03-Oct-18 04:00:00	03-Oct-18 05:00:00	164.89	2.76	229.95	3.77	1067.99	818.50	904.53	3.07	3.15	95.95	758.54	174.04	-0.08	0.60	8.88	1.09	415.81	8.08	16.46	0.00	5421.10	299.68	93.21
03-Oct-18 05:00:00	03-Oct-18 06:00:00	165.01	2.80	256.36	3.74	1078.88	818.12	903.60	4.27	2.70	80.96	939.83	175.13	-0.06	0.56	8.92	1.11	414.91	8.11	17.08	0.00	5487.88	302.58	95.55
03-Oct-18 06:00:00	03-Oct-18 07:00:00	169.94	2.60	217.47	3.73	1122.36	817.74	903.96	16.69	2.72	67.07	728.84	186.57	-0.06	0.57	8.91	1.11	418.30	8.20	16.98	0.00	5504.55	303.60	95.84
03-Oct-18 07:00:00	03-Oct-18 08:00:00	187.14	2.13	255.93	3.73	1100.67	817.36	904.36	2.42	2.71	164.10	770.79	173.64	-0.06	0.59	8.89	1.12	426.44	8.29	16.43	0.00	5496.84	303.19	95.57
03-Oct-18 08:00:00	03-Oct-18 09:00:00	132.00	2.72	188.29	3.75	1086.65	817.05	904.33	2.69	2.87	92.25	737.62	171.88	-0.07	0.62	8.91	1.16	430.55	8.24	16.15	0.00	5464.50	297.07	99.29
03-Oct-18 09:00:00	03-Oct-18 10:00:00	142.72	2.60	157.16	3.72	1055.36	816.87	905.47	3.05	4.40	69.11	693.08	165.34	-0.09	0.72	8.98	1.16	421.10	8.09	14.52	0.29	5219.61	279.69	98.49
03-Oct-18 10:00:00	03-Oct-18 11:00:00	134.06	2.49	143.84	3.71	1018.23	816.68	904.18	2.66	5.51	78.14	688.62	156.22	-0.08	0.69	8.91	1.12	420.68	8.37	13.70	0.23	4852.46	258.85	91.23
03-Oct-18 11:00:00	03-Oct-18 12:00:00	153.24	2.37	188.36	3.69	1007.57	816.49	906.87	2.29	5.27	145.70	673.56	163.05	-0.07	0.56	8.86	1.11	421.82	8.61	13.14	0.79	4741.83	252.43	88.67
03-Oct-18 12:00:00	03-Oct-18 13:00:00	140.77	2.26	253.29	3.82	1015.46	816.31	903.32	2.13	5.02	95.20	666.76	166.42	-0.07	0.54	8.84	1.14	415.80	8.70	13.89	0.41	4900.64	264.32	89.02
03-Oct-18 13:00:00	03-Oct-18 14:00:00	132.77	2.14	270.75	3.86	1089.41	816.30	904.81	1.55	5.77	554.67	680.10	156.53	-0.07	0.56	8.75	1.15	407.25	8.78	12.99	0.01	4740.07	258.35	83.38
03-Oct-18 14:00:00	03-Oct-18 15:00:00	142.31	2.03	125.39	4.06	1060.32	817.90	904.24	2.09	6.44	52.29	670.05	135.25	-0.08	0.57	8.69	1.13	405.58	8.80	12.76	0.19	4456.22	242.77	76.88
03-Oct-18 15:00:00	03-Oct-18 16:00:00	131.51	1.95	108.87	3.75	1046.34	818.36	903.82	2.37	6.76	83.52	653.76	135.98	-0.08	0.56	8.67	1.15	406.82	8.69	12.49	0.18	4334.95	235.62	74.18
03-Oct-18 16:00:00	03-Oct-18 17:00:00	128.71	1.99	119.56	3.74	1028.35	816.28	904.09	2.40	6.71	65.80	649.15	131.86	-0.08	0.57	8.65	1.12	414.07	8.57	12.79	0.00	4335.15	235.65	74.65
03-Oct-18 17:00:00	03-Oct-18 18:00:00	121.63	2.04	162.13	3.80	1034.34	814.16	904.11	2.21	6.61	56.83	650.97	132.67	-0.07	0.53	8.64	1.10	412.49	8.59	12.87	0.60	4335.26	235.62	74.60
03-Oct-18 18:00:00	03-Oct-18 19:00:00	131.04	2.09	174.41	3.85	1040.11	812.94	903.88	1.92	6.63	120.73	660.63	132.43	-0.07	0.54	8.68	1.13	418.08	8.59	12.66	1.30	4346.27	236.21	74.52
03-Oct-18 19:00:00	03-Oct-18 20:00:00	134.29	2.13	153.63	3.89	1040.58	812.74	903.88	2.24	5.94	140.19	674.02	137.86	-0.07	0.53	8.72	1.12	423.83	8.57	13.37	0.67	4524.33	246.68	77.79
03-Oct-18 20:00:00	03-Oct-18 21:00:00	140.26	2.18	143.27	3.91	1038.20	812.54	903.36	1.70	5.97	279.94	695.70	142.23	-0.07	0.56	8.81	1.13	429.75	8.58	12.92	0.26	4642.67	253.55	79.74
03-Oct-18 21:00:00	03-Oct-18 22:00:00	144.20	2.23	146.16	3.98	1066.50	812.34	903.46	2.06	5.16	152.52	689.60	148.57	-0.06	0.52	8.87	1.14	430.26	8.34	14.05	0.01	4741.48	259.22	81.75
03-Oct-18 22:00:00	03-Oct-18 23:00:00	139.17	2.28	143.89	3.94	1075.12	812.14	904.60	1.80	4.84	178.34	700.30	150.58	-0.06	0.53	8.93	1.14	428.46	8.29	14.22	0.01	4964.92	272.29	86.05
03-Oct-18 23:00:00	04-Oct-18 00:00:00	136.74	2.31	137.93	3.94	1069.31	811.49	900.64	1.87	5.02	307.36	695.82	150.36	-0.08	0.55	8.84	1.10	432.57	8.00	13.99	0.01	4832.57	264.70	83.71
04-Oct-18 00:00:00	04-Oct-18 01:00:00	135.77	2.30	151.30	4.03	1062.30	810.39	899.07	1.64	5.14	400.08	697.02	149.25	-0.09	0.55	8.56	1.13	431.03	8.02	13.80	0.01	4726.09	258.40	81.54
04-Oct-18 01:00:00	04-Oct-18 02:00:00	142.66	2.29	152.57	4.05	1054.84	809.30	898.35	16.18	5.41	76.55	703.55	150.60	-0.09	0.55	8.56	1.10	435.48	8.01	13.31	0.01	4629.29	252.86	79.95
04-Oct-18 02:00:00	04-Oct-18 03:00:00	134.48	2.28	163.51	4.01	1047.34	808.20	899.25	20.90	5.59	52.27	708.94	150.28	-0.07	0.54	8.52	1.10	434.90	8.01	13.19	0.01	4594.94	250.79	79.23
04-Oct-18 03:00:00	04-Oct-18 04:00:00	133.15	2.33	215.18	3.95	1037.01	806.67	898.56	20.90	4.99	47.00	697.73	150.46	-0.06	0.52	8.42	0.98	377.95	8.02	14.13	0.01	4596.22	250.81	79.08
04-Oct-18 04:00:00	04-Oct-18 05:00:00	121.91	2.06	286.54	4.12	1030.19	800.25	898.68	20.91	5.49	41.73	712.84	138.40	-0.08	0.54	7.99	0.92	312.71	7.90	13.35	0.01	4412.53	238.00	78.28
04-Oct-18 05:00:00	04-Oct-18 06:00:00	148.91	1.58	135.85	4.05	1013.80	793.01	899.89	20.92	5.58	36.46	693.67	149.10	-0.07	0.55	8.34	1.09	422.70	8.28	13.79	0.01	4372.43	233.25	79.49
04-Oct-18 06:00:00	04-Oct-18 07:00:00	140.79	1.45	134.69	4.60	1003.34	794.50	898.38	20.92	5.50	31.18	691.34	142.78	-0.07	0.55	8.34	1.04	426.25	8.23	14.04	0.01	4500.95	240.60	81.94
04-Oct-18 07:00:00	04-Oct-18 08:00:00	157.62	1.66	187.77	4.66	991.96	795.43	899.12	8.83	5.64	25.91	696.97	138.77	-0.07	0.53	8.36	1.09	423.40	8.33	13.75	0.01	4430.05	239.47	79.22
04-Oct-18 08:00:00	04-Oct-18 09:00:00	118.72	2.47	194.38	4.62	980.99	508.89	900.63	14.66	6.01	20.64	692.92	113.47	-0.08	0.55	8.34	0.75	198.72	8.48	13.27	0.01	4441.75	238.64	80.42
04-Oct-18 09:00:00	04-Oct-18 10:00:00	127.23	2.63	144.77	4.07	979.12	695.50	904.40	20.92	5.68	22.38	713.99	137.10	-0.08	0.55	8.29	0.98	320.56	8.37	13.56	0.01	4529.10	238.68	81.21
04-Oct-18 10:00:00	04-Oct-18 11:00:00	137.43	2.64	95.97	3.82	975.59	799.17	903.75	20.91	5.39	33.67	682.98	144.26	-0.07	0.53	8.20	1.09	424.97	8.38	14.24	0.01	4464.11	238.70	81.18
04-Oct-18 11:00:00	04-Oct-18 12:00:00	138.62	2.64	113.24	3.81	1028.40	798.17	904.65	17.17	5.87	45.01	677.37	105.64	-0.08	0.55	8.23	1.02	299.98	8.38	13.55	0.01	4397.05	238.65	81.04
04-Oct-18 12:00:00	04-Oct-18 13:00:00	138.79	2.76	90.10	3.79	1066.87	797.50	903.68	3.24	5.88	59.96	716.37	128.56	-0.08	0.56	8.25	1.06	406.33	8.72	13.42	0.01	4556.08	247.59	78.78
04-Oct-18 13:00:00	04-Oct-18 14:00:00	143.75	2.95	104.55	3.79	1076.02	799.09	903.95	2.45	5.52	44.00	717.76	129.55	-0.07	0.55	8.38	1.05	405.31	8.80	13.80	0.01	4815.48	262.76	82.75
04-Oct-18 14:00:00	04-Oct-18 15:00:00	160.47	3.15	116.76	3.79	1077.10	803.22	903.71	2.24	5.21	79.78	717.31	128.07	-0.07	0.56	8.61	1.05	409.39	8.80	14.05	0.01	5010.16	274.72	86.70
04-Oct-18 15:00:00	04-Oct-18 16:00:00	152.87	3.34	126.15	3.83	1077.39	807.36	904.39	2.05	5.17	105.85	713.83	125.87	-0.07	0.57	8.71	1.05	352.28	8.78	14.08	0.03	5076.62	278.81	87.88
04-Oct-18 16:00:00	04-Oct-18 17:00:00	151.16	3.87	197.01	4.15	1063.77	810.20	905.17	2.46	5.72	77.74	725.75	71.96	-0.08	0.63	8.64	0.24	0.11	8.78	13.65	0.49	5084.84	278.49	88.06
04-Oct-18 17:00:00	04-Oct-18 18:00:00	158.76	4.44	190.35	4.23	1041.74	811.53	903.77	2.30	5.65	73.23	740.93	73.46	-0.08	0.63	8.60	0.25	0.10	8.79	13.94	0.00	5036.16	274.95	86.92
04-Oct-18 18:00:00	04-Oct-18 19:00:00	143.48	4.20	167.84	4.11	1045.91	812.86	904.38	11.73	5.77	84.51	738.19	71.40	-0.07	0.60	8.50	0.43	37.15	8.81	13.95	0.00	4883.30	265.16	84.02
04-Oct-18 19:00:00	04-Oct-18 20:00:00	127.14	3.16	128.70	3.87	1071.00	813.83	903.33	9.13	5.35	108.51	759.10	110.49	-0.06	0.56	8.57	1.12	326.03	9.01	14.38	0.00	4854.08	256.12	84.72
04-Oct-18 20:00:00	04-Oct-18 21:00:00	130.88	3.05	163.03	3.80	1098.01	814.29	905.04	1.61	5.71	269.32	713.65	123.22	-0.05	0.54	8.63	1.16	402.49	9.36	13.90	0.00	4738.60	258.19	86.54
04-Oct-18 21:00:00	04-Oct-18 22:00:00	163.65	3.18	93.25	3.78	1082.86	814.74	903.17	2.32	5.53	86.36	715.94	117.53	-0.07	0.57	8.67	1.18	410.90	8.89	13.93	0.00	4845.14	269.52	88.96
04-Oct-18 22:00:00	04-Oct-18 23:00:00	161.80	3.31	128.43	3.78	1094.12	815.19	904.15	2.15	5.33	101.74	740.96	117.85	-0.06	0.56	8.67	1.18	404.65	8.81	13.79	0.00	4898.77	274.95	86.90
04-Oct-18 23:00:00	05-Oct-18 00:00:00	163.14	3.44	108.57	3.77	1098.79	815.63	904.24	2.76	5.06	113.11	754.98	116.13	-0.07	0.55	8.68	1.14	409.14	8.55	14.28	0.00	4908.15	275.01	87.17
10-Oct-18 00:00:00	10-Oct-18 01:00:00	140.88	3.82	200.82	3.95	1093.73	814.52	904.63	1.63	5.09	340.41	623.33	78.91	-0.06	0.53	8.46	1.13	416.86	8.73	14.54	0.00	5150.31	310.76	82.66
10-Oct-18 01:00:00	10-Oct-18 02:00:00	138.88	3.80	221.02	3.93	1107.81	816.67	904.29	1.52	5.29	521.90	638.29	85.04	-0.06	0.53	8.41	1.13	415.87	8.81	13.80	0.00	5072.53	306.03	81.26
10-Oct-18 02:00:00	10-Oct-18 03:00:00	140.10	3.79	222.63	3.95	1119.38	818.95	903.94	1.63	5.49	401.75	634.59	72.84	-0.06	0.54	8.39	1.14	413.17	8.82	13.61	0.00	5021.20	302.94	80.72
10-Oct-18 03:00:00	10-Oct-18 04:00:00	146.70	3.78	225.87	3.97	1122.17	818.73	903.85	1.46	5.87	565.16	636.97	74.00	-0.07	0.60	8.38	1.07	410.23	8.86	13.76	0.00	5074.02	306.10	81.44
10-Oct-18 04:00:00	10-Oct-18 05:00:00	161.34	3.77	218.22	3.92	1107.63	818.12	903.87	2.14	5.73	445.12	628.14	75.98	-0.07	0.59	8.42	1.11	405.76	8.98	14.00	0.00	5183.31	312.73	83.15
10-Oct-18 05:00:00	10-Oct-18 06:00:00	155.60	3.75	267.34	3.99	1099.71	817.48	904.06	20.84	5.78	57.91	643.57	78.96	-0.07	0.60	8.30	1.06	413.25	8.99	13.97	0.00	5188.42	313.03	83.05
10-Oct-18 06:00:00	10-Oct-18 07:00:00	173.57	3.76	225.01	3.99	1084.18	816.83	903.71	15.46	5.69	77.24	630.80	77.18	-0.07	0.58	8.35	1.07	409.54	8.96	14.14	0.00	5158.77	311.20	82.77
10-Oct-18 07:00:00	10-Oct-18 08:00:00	172.54	3.79	178.17	3.87	1065.30	816.10	904.03	1.83	5.51	197.05	618.85	79.07	-0.07	0.56	8.36	1.09	408.62	8.97	14.40	0.00	5211.51	314.41	83.51
10-Oct-18 08:00:00	10-Oct-18 09:00:00	190.53	3.93	198.98	3.93	1046.01	814.83	904.10	1.25	5.74	907.11	622.05	78.43	-0.07	0.56	8.35	1.10	410.57	8.86	14.00	0.00	5205.76	314.12	83.60
10-Oct-18 09:00:00	10-Oct-18 10:00:00	167.99	4.27	175.80	3.89	1028.68	813.45	906.31	1.58	5.44	185.81	617.05	82.60	-0.07	0.56	8.38	0.96	332.06	8.73	13.62	2.24	5210.10	314.43	83.69
10-Oct-18 10:00:00	10-Oct-18 11:00:00	158.94	4.21	225.00	4.18	1013.19	811.93	903.45	2.08	5.78	108.18	614.58	64.22	-0.08	0.61	8.59	0.19	0.28	8.69	14.37	0.00	5211.02	314.40	83.44
10-Oct-18 11:00:00	10-Oct-18 12:00:00	154.58	3.88	213.41	4.03	992.06	809.55	905.23	1.94	5.23	127.25	608.36	85.50	-0.07	0.56	8.46	0.67	163.16	8.69	14.23	2.19	5210.87	314.37	83.58
10-Oct-18 12:00:00	10-Oct-18 13:00:00	159.28	3.81	159.98	3.80	979.11	809.68	904.16	1.55	5.00	171.37	616.55	124.05	-0.07	0.54	8.32	1.09	413.62	8.69	13.13	5.48	5209.15	314.37	83.52
10-Oct-18 13:00:00	10-Oct-18 14:00:00	156.43	3.82	166.05	3.79	857.07	810.65	903.38	1.63	5.27	307.27	658.03	125.21	-0.07	0.55	8.32	1.13	418.60	8.63	13.18	5.02	5211.67	314.57	83.55
10-Oct-18 14:00:00	10-Oct-18 15:00:00	154.20	3.91	161.16	3.84	1112.46	811.61	904.11	1.82	5.00	175.20	647.60	128.22	-0.07	0.56	8.41	1.13	419.44	8.69	14.54	0.00	5347.55	320.46	87.74
10-Oct-18 15:00:00	10-Oct-18 16:00:00	162.25	3.81	181.57	3.84	1122.02	812.34	903.74	2.02	5.00	193.50	645.87	127.38	-0.07	0.57	8.40	1.14	419.83	8.61	14.42	0.00	5440.59	326.44	89.37
10-Oct-18 16:00:00	10-Oct-18 17:00:00	173.11	3.75	183.27	3.78	1094.72	812.87	903.76	2.08	4.94	190.01	650.88	123.70	-0.08	0.58	8.39	1.17	419.87	8.58	14.52	0.00	5506.20	332.33	88.37
10-Oct-18 17:00:00	10-Oct-18 18:00:00	178.16	3.69	207.73	3.84	1033.62	813.41	904.04	3.46	4.88	119.38	651.50	113.85	-0.08	0.57	8.42	1.15	418.89	8.53	14.68	0.00	5510.59	332.53	88.27
10-Oct-18 18:00:00	10-Oct-18 19:00:00	164.80	3.64	303.87	3.97	1066.52	812.80	904.01	20.86	4.76	67.39	651.91	113.30	-0.08	0.58	8.37	1.14	420.21	8.51	14.63	0.00	5464.75	329.82	87.75
10-Oct-18 19:00:00	10-Oct-18 20:00:00	167.91	3.67	254.96	3.94	1129.83	812.21	903.80	10.70	4.85	142.65	649.81	120.70	-0.08	0.56	8.39	1.14	419.92	8.59	14.74	0.00	5496.05	331.65	88.15
10-Oct-18 20:00:00	10-Oct-18 21:00:00	171.74	3.74	250.00	3.99	1135.82	816.88	904.14	2.13	4.86	193.56	631.42	120.08	-0.08	0.58	8.36	1.11	418.08	8.54	14.65	0.00	5510.50	332.57	88.43
10-Oct-18 21:00:00	10-Oct-18 22:00:00	160.16	3.82	243.19	4.00	1134.61	816.33	904.19	1.83	4.84	353.27	629.13	116.08	-0.08	0.58	8.37	1.12	419.51	8.55	14.64	0.00	5510.52	332.60	88.42
10-Oct-18 22:00:00	10-Oct-18 23:00:00	163.33	3.89	222.16	3.94	1128.24	815.77	903.28	1.90	4.72	485.19	630.43	120.53	-0.08	0.57	8.36	1.11	418.91	8.56	14.85	0.00	5510.81	332.56	88.49
10-Oct-18 23:00:00	11-Oct-18 00:00:00	161.11	3.97	250.89	3.93	1141.67	815.21	904.45	1.52	4.67	617.10	627.82	120.26	-0.08	0.55	8.33	1.11	418.92	8.52	14.91	0.00	5510.87	332.50	88.49

Time stamp		NO	NO2	SO2	Opacity	Temperature of gases leaving the kiln	Temperature of gases K5 top	Temperature of gases leaving the calciner	Residual Oxygen at back end of the kiln	Residual Oxygen at calciner down comer duct	CO at back end of the kiln?	CO at calciner down comer duct	THC (as CH4) in kiln stack gas	Kiln negative pressure	Calciner negative pressure	Preheater tower negative pressure	Raw mill negative pressure	Raw material feed rate	Conventional fuel feed rate - kiln	Conventional fuel feed rate - calciner	LCF/Alt fuel feed rate - calciner	Clinker hourly production rate	Calciner feed	Kiln feed
		ppm	ppm	ppm	%	C	C	C	%	%	ppm	ppm	ppm	kPa	kPa	kPa	kPa	t/h	t/h	t/h	t/h	t/d	t/h	t/h
11-Oct-18 00:00:00	11-Oct-18 01:00:00	161.88	4.05	237.07	3.84	1126.64	814.64	903.61	2.17	4.75	229.68	605.56	121.13	-0.09	0.59	8.36	1.11	418.59	8.38	14.72	0.00	5510.44	332.72	88.43
11-Oct-18 01:00:00	11-Oct-18 02:00:00	165.09	4.12	184.24	3.79	1093.19	813.58	903.75	2.16	4.55	127.78	581.30	121.27	-0.07	0.56	8.37	1.13	419.10	8.43	15.28	0.00	5511.28	332.54	88.37
11-Oct-18 02:00:00	11-Oct-18 03:00:00	172.27	4.20	197.59	3.81	1087.08	810.49	903.71	1.67	4.62	247.48	569.57	123.15	-0.07	0.55	8.36	1.08	417.35	8.57	15.35	0.00	5511.50	332.63	88.38
11-Oct-18 03:00:00	11-Oct-18 04:00:00	168.31	4.21	201.16	3.87	1088.79	810.29	904.23	1.79	4.73	315.60	563.52	121.70	-0.07	0.55	8.33	1.09	415.21	8.57	15.29	0.00	5510.14	332.50	88.26
11-Oct-18 04:00:00	11-Oct-18 05:00:00	168.78	4.20	217.80	3.95	1102.90	810.66	903.74	2.00	4.81	283.24	558.73	135.28	-0.07	0.55	8.35	1.07	415.01	8.59	15.23	0.00	5509.82	332.49	88.44
11-Oct-18 05:00:00	11-Oct-18 06:00:00	189.07	4.19	243.01	4.18	1128.96	809.04	903.93	20.84	4.23	71.99	574.55	132.81	-0.07	0.55	8.28	1.05	412.77	8.58	15.50	0.00	5511.76	332.56	88.60
11-Oct-18 06:00:00	11-Oct-18 07:00:00	193.87	4.18	189.22	4.26	1115.39	805.59	904.64	5.06	4.16	107.20	582.31	135.19	-0.07	0.54	8.29	1.06	415.94	8.53	15.60	0.00	5511.84	332.57	88.32
11-Oct-18 07:00:00	11-Oct-18 08:00:00	211.29	2.73	231.03	4.36	1094.02	805.59	903.74	1.83	4.47	124.85	598.88	135.33	-0.07	0.55	8.28	1.04	413.80	8.58	15.34	0.00	5511.35	332.57	88.31
11-Oct-18 08:00:00	11-Oct-18 09:00:00	176.08	3.93	194.44	4.28	1079.47	805.58	904.28	1.84	4.72	115.97	598.97	134.53	-0.07	0.55	8.30	1.07	414.19	8.59	15.09	0.00	5462.24	329.65	87.66
11-Oct-18 09:00:00	11-Oct-18 10:00:00	189.77	4.46	280.59	4.62	1071.50	805.58	903.58	2.09	4.99	186.41	583.50	77.65	-0.08	0.58	8.68	0.47	56.17	8.59	15.30	0.00	5501.42	331.97	88.26
11-Oct-18 10:00:00	11-Oct-18 11:00:00	187.93	4.81	296.45	4.50	1066.73	805.57	903.39	2.37	4.52	109.57	578.53	68.29	-0.08	0.58	8.83	0.25	0.16	8.55	16.13	0.00	5512.64	332.58	88.52
11-Oct-18 11:00:00	11-Oct-18 12:00:00	209.27	5.15	263.99	4.39	1067.99	805.57	904.66	2.72	4.52	94.95	606.28	64.43	-0.08	0.58	8.83	0.22	0.16	8.50	15.91	0.00	5512.28	332.63	88.43
11-Oct-18 12:00:00	11-Oct-18 13:00:00	212.94	5.29	314.43	4.27	1066.51	806.80	904.45	1.80	4.98	160.91	596.19	44.74	-0.08	0.59	8.81	0.38	61.15	8.48	15.41	0.00	5511.50	332.52	88.54
11-Oct-18 13:00:00	11-Oct-18 14:00:00	189.21	3.70	224.85	3.83	1065.48	811.48	903.45	1.60	4.78	305.05	616.90	124.88	-0.07	0.56	8.37	1.09	417.05	8.40	15.12	0.00	5511.03	332.54	88.45
11-Oct-18 14:00:00	11-Oct-18 15:00:00	200.64	3.68	156.23	3.80	1050.63	807.48	904.38	2.28	4.54	104.37	622.17	120.35	-0.07	0.55	8.36	1.15	418.68	8.39	15.33	0.00	5511.33	332.65	88.40
11-Oct-18 15:00:00	11-Oct-18 16:00:00	199.75	3.66	179.95	3.86	1035.30	804.20	903.75	2.44	4.67	99.03	625.65	124.54	-0.07	0.55	8.35	1.10	418.93	8.59	15.29	0.19	5511.16	332.49	88.48
11-Oct-18 16:00:00	11-Oct-18 17:00:00	192.91	3.64	180.67	3.79	1023.05	804.17	906.47	2.58	4.35	93.85	670.42	128.62	-0.06	0.52	8.37	1.05	405.46	8.60	15.30	2.06	5511.55	332.63	88.45
11-Oct-18 17:00:00	11-Oct-18 18:00:00	201.70	3.63	184.49	3.83	1018.24	804.15	903.74	3.64	4.36	96.28	607.59	125.15	-0.06	0.53	8.35	1.04	407.69	8.58	14.68	3.80	5510.60	332.57	88.44
11-Oct-18 18:00:00	11-Oct-18 19:00:00	186.89	3.61	202.76	3.85	1009.13	804.22	903.87	17.65	4.33	98.74	586.41	121.23	-0.06	0.53	8.31	1.06	408.60	8.59	14.91	3.74	5509.51	332.49	88.19
11-Oct-18 19:00:00	11-Oct-18 20:00:00	185.40	3.59	182.31	3.79	998.78	804.83	903.98	3.24	4.31	104.10	589.30	118.09	-0.06	0.52	8.41	1.09	414.56	8.60	15.20	3.47	5511.36	332.61	88.42
11-Oct-18 20:00:00	11-Oct-18 21:00:00	179.85	3.57	189.63	3.85	989.62	805.54	904.24	2.29	4.27	141.38	596.45	120.81	-0.06	0.52	8.40	1.10	419.21	8.79	16.12	1.19	5512.83	332.59	88.44
11-Oct-18 21:00:00	11-Oct-18 22:00:00	186.47	3.54	204.78	3.79	986.30	806.12	906.22	2.12	4.52	253.54	584.91	126.16	-0.07	0.53	8.40	1.10	417.39	8.86	15.28	2.52	5511.87	332.60	88.59
11-Oct-18 22:00:00	11-Oct-18 23:00:00	175.82	3.51	160.32	3.81	980.79	806.31	904.29	2.71	4.65	113.48	580.59	119.20	-0.06	0.52	8.38	1.13	417.89	8.68	15.50	2.21	5435.06	327.91	86.88
11-Oct-18 23:00:00	12-Oct-18 00:00:00	185.98	3.47	166.53	3.83	972.89	806.45	904.06	2.57	4.22	80.75	585.73	120.15	-0.06	0.51	8.37	1.13	415.90	8.69	15.52	3.77	5511.52	332.55	88.43
12-Oct-18 00:00:00	12-Oct-18 01:00:00	178.62	3.44	177.77	3.82	967.20	806.60	904.99	2.34	4.48	87.58	605.64	122.78	-0.06	0.52	8.36	1.10	413.19	8.70	15.30	2.42	5514.16	332.76	88.56
12-Oct-18 01:00:00	12-Oct-18 02:00:00	161.26	3.41	176.62	3.78	955.76	806.75	904.89	2.23	5.12	143.33	654.94	122.53	-0.06	0.53	8.31	1.08	413.58	9.00	15.63	0.00	5278.65	318.46	84.81
12-Oct-18 02:00:00	12-Oct-18 03:00:00	169.77	3.37	156.97	3.80	941.40	806.89	903.65	2.11	5.36	176.12	659.32	124.02	-0.06	0.55	8.32	1.06	412.97	9.11	15.42	0.00	5268.48	317.74	84.36
12-Oct-18 03:00:00	12-Oct-18 04:00:00	172.89	3.34	151.79	3.78	928.28	807.04	903.89	1.91	5.26	166.89	630.41	126.78	-0.06	0.54	8.31	1.08	411.14	9.21	15.74	0.00	5307.44	320.11	84.98
12-Oct-18 04:00:00	12-Oct-18 05:00:00	178.75	3.29	186.95	3.85	920.20	807.18	903.91	1.39	4.95	562.40	647.00	127.72	-0.05	0.52	8.36	1.11	412.48	9.26	15.87	0.00	5465.79	329.64	87.63
12-Oct-18 05:00:00	12-Oct-18 06:00:00	157.28	2.98	203.52	3.78	914.35	806.09	904.00	13.84	4.92	121.08	687.66	124.89	-0.05	0.55	8.37	1.11	410.08	9.06	15.89	0.00	5397.07	325.64	86.72
12-Oct-18 06:00:00	12-Oct-18 07:00:00	142.23	2.53	211.70	3.78	906.79	796.83	903.83	16.15	5.45	83.36	640.27	123.56	-0.06	0.54	8.27	1.12	410.35	9.20	15.60	0.00	5145.74	310.29	82.49
12-Oct-18 07:00:00	12-Oct-18 08:00:00	195.79	2.03	211.30	3.80	898.99	805.57	903.56	2.42	5.02	127.39	679.37	128.84	-0.06	0.54	8.35	1.11	411.15	9.19	16.15	0.00	5374.33	324.04	86.02
12-Oct-18 08:00:00	12-Oct-18 09:00:00	146.40	2.50	187.55	3.84	896.24	809.87	904.76	2.22	4.54	157.38	652.75	122.45	-0.03	0.51	8.42	1.15	408.69	9.18	16.06	1.47	5512.12	332.52	88.56
12-Oct-18 09:00:00	12-Oct-18 10:00:00	175.95	2.55	209.17	3.72	899.78	811.57	904.87	2.01	4.33	185.47	607.79	114.83	-0.05	0.50	8.40	1.16	410.96	9.16	14.94	5.26	5511.76	332.58	88.42
12-Oct-18 10:00:00	12-Oct-18 11:00:00	170.88	2.60	180.97	3.69	902.55	812.77	903.86	2.43	4.66	123.86	656.47	118.12	-0.04	0.51	8.40	1.14	411.04	8.87	14.56	5.08	5510.90	332.57	88.42
12-Oct-18 11:00:00	12-Oct-18 12:00:00	165.86	2.66	169.67	3.69	899.60	811.30	903.85	2.77	4.53	129.75	669.03	121.76	-0.05	0.50	8.39	1.14	413.23	8.77	14.79	4.66	5511.08	332.59	88.36
12-Oct-18 12:00:00	12-Oct-18 13:00:00	167.01	2.71	225.09	3.79	897.02	811.39	903.66	1.81	4.45	242.00	650.13	135.65	-0.06	0.52	8.43	1.15	412.38	9.10	14.91	4.66	5511.56	332.58	88.49
12-Oct-18 13:00:00	12-Oct-18 14:00:00	171.21	2.76	265.07	3.81	899.56	814.69	905.44	1.47	4.64	636.79	614.98	154.45	-0.06	0.49	8.41	1.15	415.46	9.09	14.20	5.02	5510.68	332.57	88.41
12-Oct-18 14:00:00	12-Oct-18 15:00:00	167.27	2.81	269.38	3.89	905.77	818.02	903.61	1.75	4.91	763.15	610.09	167.47	-0.06	0.53	8.43	1.17	415.99	8.89	13.80	4.27	5509.90	332.61	88.39
12-Oct-18 15:00:00	12-Oct-18 16:00:00	164.14	2.85	270.33	3.89	908.00	819.75	905.04	1.86	5.13	884.86	588.96	181.54	-0.06	0.49	8.41	1.16	416.92	8.93	13.37	4.43	5635.42	328.63	87.50
12-Oct-18 16:00:00	12-Oct-18 17:00:00	156.10	2.87	254.32	3.96	908.41	820.17	903.28	1.39	5.11	1408.31	605.81	177.18	-0.06	0.50	8.41	1.15	413.42	8.96	13.27	4.41	5270.57	316.54	84.40
12-Oct-18 17:00:00	12-Oct-18 18:00:00	152.86	2.89	254.77	3.97	909.27	820.59	904.28	1.50	5.03	1208.51	604.64	182.90	-0.06	0.50	8.36	1.17	408.11	8.90	13.59	4.21	5229.71	315.60	83.77
12-Oct-18 18:00:00	12-Oct-18 19:00:00	152.42	2.91	309.45	3.97	908.51	821.00	904.30	1.86	5.40	603.95	581.85	179.64	-0.06	0.52	8.35	1.12	410.02	8.89	13.09	3.47	5223.40	315.26	83.89
12-Oct-18 19:00:00	12-Oct-18 20:00:00	157.16	2.92	229.49	3.90	905.19	821.42	905.01	1.88	6.09	1077.09	602.19	175.23	-0.06	0.52	8.35	1.11	411.85	8.77	13.45	0.66	5126.17	306.20	85.36
12-Oct-18 20:00:00	12-Oct-18 21:00:00	171.09	2.94	202.02	3.86	897.86	818.57	904.32	2.34	6.19	110.26	616.87	174.53	-0.06	0.52	8.41	1.16	414.95	8.38	13.34	0.00	4913.56	287.91	87.48
12-Oct-18 21:00:00	12-Oct-18 22:00:00	179.44	2.96	182.38	3.77	886.50	814.20	904.12	1.91	6.41	113.06	627.47	184.43	-0.06	0.53	8.38	1.17	419.10	8.40	13.16	0.00	4842.94	284.82	85.07
12-Oct-18 22:00:00	12-Oct-18 23:00:00	181.14	2.97	211.89	3.78	872.51	813.32	903.72	1.76	6.37	112.00	613.61	186.50	-0.05	0.51	8.38	1.14	419.72	8.49	13.47	0.00	4806.11	280.93	85.81
12-Oct-18 23:00:00	13-Oct-18 00:00:00	187.57	2.98	212.24	3.82	861.55	812.17	903.95	2.01	6.33	82.80	616.36	184.70	-0.05	0.51	8.43	1.15	418.97	8.65	13.51	0.00	4831.92	281.65	87.37

Alternative fuel trial data

Data run

Start: 11/19/2018 0:00

Finish: 11/23/2018 0:00

		NO	NO2	SO2	Opacity	Temperature of gases leaving the kiln	Temperature of gases K5 top	Temperature of gases leaving the calciner	Residual Oxygen at back end of the kiln	Residual Oxygen at calciner down comer duct	CO at back end of the kiln?	CO at calciner down comer duct	THC (as CH4) in kiln stack gas	Kiln negative pressure	Calciner negative pressure	Preheater tower negative pressure	Raw mill negative pressure	Raw material feed rate	Conventional fuel feed rate - kiln	Conventional fuel feed rate - calciner	LCF/Alt fuel feed rate - calciner	Clinker hourly production rate	Calciner feed	Kiln feed
		ppm	ppm	ppm	%	C	C	C	%	%	ppm	ppm	ppm	kPa	kPa	kPa	kPa	t/h	t/h	t/h	t/h	t/d	t/h	t/h
19-Nov-18 00:00:00	19-Nov-18 01:00:00	168.26	2.79	359.75	3.30	503.29	818.96	903.72	15.40	3.40	344.86	555.26	187.89	-0.06	0.48	8.35	1.05	409.64	9.59	18.03	0.00	5409.62	294.16	108.74
19-Nov-18 01:00:00	19-Nov-18 02:00:00	152.59	2.79	370.26	3.27	497.20	813.84	903.72	20.23	3.47	344.45	593.51	187.04	-0.06	0.49	8.33	1.07	411.46	9.72	18.15	0.00	5409.74	294.20	108.69
19-Nov-18 02:00:00	19-Nov-18 03:00:00	163.69	2.78	280.93	3.24	499.58	820.96	904.28	9.50	3.31	344.04	566.74	185.36	-0.06	0.52	8.38	1.08	410.88	9.47	18.34	0.00	5408.02	294.12	108.63
19-Nov-18 03:00:00	19-Nov-18 04:00:00	138.45	10.77	205.19	3.22	508.23	820.38	904.50	3.23	3.43	366.09	553.40	186.49	-0.06	0.51	8.37	1.05	410.62	9.53	17.90	0.00	5409.45	294.20	108.67
19-Nov-18 04:00:00	19-Nov-18 05:00:00	142.07	2.52	226.48	3.22	518.12	820.91	902.90	3.14	3.56	394.72	580.06	193.69	-0.06	0.52	8.39	1.09	409.29	9.30	17.87	0.00	5409.08	294.18	108.76
19-Nov-18 05:00:00	19-Nov-18 06:00:00	232.56	2.36	286.13	3.22	526.50	822.75	904.51	3.21	3.45	360.29	563.83	206.27	-0.06	0.51	8.41	1.05	410.16	9.11	18.17	0.00	5409.21	294.22	108.77
19-Nov-18 06:00:00	19-Nov-18 07:00:00	132.13	13.80	185.75	3.22	533.41	821.81	905.09	3.60	3.42	352.27	563.16	215.79	-0.05	0.51	8.38	1.05	409.52	9.09	17.59	0.00	5408.42	294.23	108.86
19-Nov-18 07:00:00	19-Nov-18 08:00:00	171.91	3.41	252.13	3.22	537.63	820.73	903.56	3.36	3.51	344.25	591.72	210.75	-0.05	0.51	8.40	1.08	405.86	8.99	17.39	0.00	5408.03	294.21	108.56
19-Nov-18 08:00:00	19-Nov-18 09:00:00	168.57	3.23	231.27	3.22	539.81	819.90	903.13	3.79	3.36	336.23	565.06	213.05	-0.06	0.51	8.39	1.04	406.77	8.99	17.80	0.00	5408.57	294.17	108.93
19-Nov-18 09:00:00	19-Nov-18 10:00:00	155.24	3.05	219.92	3.22	541.00	819.44	905.30	3.60	3.20	370.42	565.34	216.19	-0.05	0.49	8.38	1.10	408.14	9.15	17.52	1.37	5408.39	294.17	108.80
19-Nov-18 10:00:00	19-Nov-18 11:00:00	160.69	2.88	266.67	3.21	540.95	819.28	906.24	2.85	3.21	370.90	571.29	223.37	-0.06	0.51	8.38	1.06	406.63	8.99	16.50	2.70	5406.70	294.21	108.71
19-Nov-18 11:00:00	19-Nov-18 12:00:00	160.07	2.70	241.89	3.20	538.58	819.89	904.73	15.09	3.44	371.38	570.94	222.98	-0.07	0.48	8.45	1.08	409.84	8.71	16.09	2.26	5405.77	294.18	108.78
19-Nov-18 12:00:00	19-Nov-18 13:00:00	153.28	2.52	269.37	3.18	533.55	818.97	904.50	13.64	3.40	371.85	543.76	211.22	-0.07	0.50	8.43	1.07	410.51	8.74	15.87	2.87	5405.52	294.20	108.58
19-Nov-18 13:00:00	19-Nov-18 14:00:00	150.97	2.34	289.26	3.17	523.43	817.94	903.43	3.53	3.03	372.33	545.02	210.12	-0.06	0.49	8.45	1.07	407.61	8.80	15.64	3.98	5405.28	294.20	108.80
19-Nov-18 14:00:00	19-Nov-18 15:00:00	146.61	2.20	282.19	3.16	513.24	819.97	904.13	3.27	3.17	372.80	550.06	208.97	-0.06	0.51	8.46	1.07	411.71	8.77	15.20	3.98	5404.65	294.21	108.67
19-Nov-18 15:00:00	19-Nov-18 16:00:00	143.30	2.24	339.22	3.15	504.83	819.88	903.71	2.65	2.79	381.24	552.20	209.17	-0.05	0.50	8.44	1.06	404.69	9.01	16.06	3.99	5406.08	294.19	108.79
19-Nov-18 16:00:00	19-Nov-18 17:00:00	140.21	2.30	323.63	3.13	499.10	819.63	904.61	2.65	3.04	389.48	550.94	211.58	-0.06	0.52	8.44	1.06	408.40	9.03	15.18	3.99	5404.99	294.21	108.68
19-Nov-18 17:00:00	19-Nov-18 18:00:00	152.78	2.36	315.49	3.12	491.12	819.37	903.45	15.96	2.95	384.02	564.84	209.50	-0.05	0.51	8.41	1.04	411.12	8.95	15.37	3.99	5405.07	294.17	108.56
19-Nov-18 18:00:00	19-Nov-18 19:00:00	164.22	2.42	301.80	3.27	482.75	820.95	903.78	11.83	2.89	378.56	558.14	161.56	-0.05	0.49	8.50	1.04	412.57	8.71	15.90	3.99	5405.52	294.20	108.70
19-Nov-18 19:00:00	19-Nov-18 20:00:00	170.55	2.48	295.96	3.42	474.51	823.66	903.86	3.67	2.87	374.02	547.59	156.36	-0.05	0.49	8.49	1.03	408.39	8.62	16.00	3.99	5405.62	294.20	108.82
19-Nov-18 20:00:00	19-Nov-18 21:00:00	171.09	2.54	315.82	3.26	465.85	824.01	904.41	3.64	3.25	377.77	575.50	177.61	-0.05	0.55	8.55	1.04	410.21	8.48	16.67	1.66	5406.33	294.23	108.46
19-Nov-18 21:00:00	19-Nov-18 22:00:00	160.40	2.60	267.28	3.11	457.29	824.11	903.37	4.07	3.35	380.52	621.61	204.91	-0.06	0.57	8.62	1.02	407.86	8.44	17.99	0.00	5408.05	294.20	108.94
19-Nov-18 22:00:00	19-Nov-18 23:00:00	167.35	2.67	213.32	3.11	448.84	816.90	902.56	11.54	3.00	396.59	605.51	208.36	-0.05	0.57	8.45	1.02	403.52	8.26	18.88	0.00	5409.04	294.17	108.93
19-Nov-18 23:00:00	20-Nov-18 00:00:00	161.61	2.79	227.21	3.11	441.42	802.20	904.71	20.19	2.83	412.71	640.80	219.45	-0.04	0.53	8.34	1.00	401.29	8.52	19.11	0.00	5409.75	294.18	108.51
20-Nov-18 00:00:00	20-Nov-18 01:00:00	151.91	2.92	248.20	3.24	433.67	805.33	903.75	20.20	3.07	428.83	634.62	172.60	-0.05	0.56	8.36	1.00	397.68	8.97	18.83	0.00	5409.92	294.20	108.86
20-Nov-18 01:00:00	20-Nov-18 02:00:00	152.81	3.04	342.10	3.34	429.46	815.20	905.17	8.22	3.26	542.67	648.79	158.55	-0.05	0.57	8.47	1.00	398.55	9.16	18.39	0.00	5409.62	294.19	108.72
20-Nov-18 02:00:00	20-Nov-18 03:00:00	191.26	3.31	462.13	3.25	448.20	828.06	905.13	1.97	3.71	593.96	626.87	191.21	-0.06	0.59	8.68	0.96	353.53	8.84	17.34	0.51	5407.70	294.14	108.75
20-Nov-18 03:00:00	20-Nov-18 04:00:00	182.26	3.09	293.58	3.18	482.95	829.03	903.59	3.21	3.57	404.80	591.02	217.51	-0.06	0.54	8.61	1.00	401.21	8.76	16.72	2.44	5408.36	294.31	108.84
20-Nov-18 04:00:00	20-Nov-18 05:00:00	179.25	3.07	262.35	3.19	512.43	821.52	904.32	3.29	3.55	424.89	563.31	217.87	-0.05	0.53	8.44	1.01	407.26	8.69	16.15	3.98	5405.87	294.22	108.62
20-Nov-18 05:00:00	20-Nov-18 06:00:00	194.09	3.04	222.35	3.25	572.35	818.25	903.26	3.44	3.47	265.28	553.34	178.62	-0.05	0.50	8.37	1.00	408.27	8.68	16.44	3.98	5406.31	294.17	108.84
20-Nov-18 06:00:00	20-Nov-18 07:00:00	189.08	3.01	206.57	3.30	633.86	814.98	904.48	4.15	3.48	228.54	545.42	148.89	-0.06	0.48	8.28	0.97	401.87	8.51	16.73	3.98	5200.45	284.39	103.68
20-Nov-18 07:00:00	20-Nov-18 08:00:00	241.79	3.22	179.64	3.24	675.42	811.80	905.92	4.43	4.85	233.81	509.44	104.28	-0.05	0.45	8.12	0.98	399.87	8.46	15.40	3.91	4531.19	250.64	85.31
20-Nov-18 08:00:00	20-Nov-18 09:00:00	228.50	3.17	173.04	3.21	699.13	810.68	901.87	5.80	5.79	239.09	491.85	0.00	-0.06	0.44	8.00	0.95	376.91	8.11	15.23	2.01	4297.79	237.36	80.72
20-Nov-18 09:00:00	20-Nov-18 10:00:00	225.67	3.17	201.87	3.13	714.52	810.40	905.62	5.79	6.01	244.36	512.20	0.00	-0.05	0.44	7.99	0.66	199.03	8.10	14.95	0.99	4146.08	228.67	77.77
20-Nov-18 10:00:00	20-Nov-18 11:00:00	211.42	3.12	184.14	3.17	728.37	810.12	902.84	5.86	5.27	249.64	458.95	0.00	-0.06	0.46	7.98	0.78	284.70	8.04	11.97	7.17	4333.27	241.17	79.81
20-Nov-18 11:00:00	20-Nov-18 12:00:00	202.97	3.14	166.53	3.32	739.57	809.99	899.62	5.38	4.78	254.92	482.68	0.00	-0.05	0.43	8.06	0.88	264.53	7.89	9.42	11.96	4432.90	246.91	81.91
20-Nov-18 12:00:00	20-Nov-18 13:00:00	185.76	3.16	113.23	3.18	749.75	810.76	893.69	5.81	4.87	260.19	529.57	0.00	-0.06	0.48	8.15	0.99	399.84	7.99	15.17	3.00	4678.04	259.77	87.11
20-Nov-18 13:00:00	20-Nov-18 14:00:00	166.76	3.15	250.99	2.93	753.56	812.03	895.12	4.57	4.40	267.60	523.52	0.00	-0.06	0.52	8.35	1.07	405.86	8.77	17.96	2.71	5436.35	303.21	101.89
20-Nov-18 14:00:00	20-Nov-18 15:00:00	173.00	3.14	226.92	2.88	756.49	817.25	900.09	13.59	3.36	279.61	572.36	0.00	-0.06	0.55	8.32	1.02	408.06	9.05	19.35	1.25	5410.83	301.66	101.16
20-Nov-18 15:00:00	20-Nov-18 16:00:00	144.01	3.14	348.71	2.97	763.55	818.07	901.07	20.20	2.60	291.78	753.44	0.00	-0.06	0.59	8.54	1.01	402.07	9.59	12.47	11.71	5402.03	301.57	101.35
20-Nov-18 16:00:00	20-Nov-18 17:00:00	152.02	3.13	205.43	3.09	772.08	818.60	897.67	11.86	2.93	365.70	741.58	0.00	-0.06	0.58	8.55	1.03	405.79	9.80	15.02	6.67	5400.51	295.04	107.39
20-Nov-18 17:00:00	20-Nov-18 18:00:00	195.93	3.15	229.59	2.97	764.64	819.09	904.34	4.17	3.55	291.79	512.97	0.00	-0.07	0.62	8.36	1.04	407.99	9.65	18.07	0.33	5253.63	285.40	105.58
20-Nov-18 18:00:00	20-Nov-18 19:00:00	200.81	3.26	129.18	2.96	754.27	817.50	903.80	4.76	3.30	284.77	493.51	0.00	-0.08	0.67	8.32	1.05	407.37	9.38	18.70	0.01	5254.19	285.45	105.54
20-Nov-18 19:00:00	20-Nov-18 20:00:00	190.12	3.38	107.94	2.96	744.49	811.18	904.35	5.80	3.21	284.77	490.74	0.00	-0.08	0.71	8.33	1.04	410.30	9.08	18.79	0.01	5253.92	285.39	105.48
20-Nov-18 20:00:00	20-Nov-18 21:00:00	172.78	3.49	117.08	2.96	733.94	807.62	903.39	10.89	3.12	284.77	496.07	0.00	-0.06	0.67	8.27	1.06	404.25	8.81	19.00	0.01	5253.75	285.46	105.51
20-Nov-18 21:00:00	20-Nov-18 22:00:00	189.44	3.61	141.74	3.01	725.69	809.29	904.78	20.20	3.29	284.77	503.55	0.00	-0.06	0.62	8.31	1.07	405.06	8.69	18.70	0.01	5253.23	285.45	105.53
20-Nov-18 22:00:00	20-Nov-18 23:00:00	192.86	3.84	186.08	3.11	717.80	808.80	904.99	20.19	3.50	284.77	520.94	0.00	-0.07	0.65	8.28	1.02	406.15	8.69	18.44	0.01	5224.42	283.88	104.88
20-Nov-18 23:00:00	21-Nov-18 00:00:00	202.39	3.75	242.19	3.08	716.89	812.22	903.26	18.77	4.08	284.77	475.81	0.00	-0.07	0.61	8.14	1.03	405.60	8.69	17.88	0.01	4948.40	271.47	96.26
21-Nov-18 00:00:00	21-Nov-18 01:00:00	201.14	3.65	127.14	3.10	759.19	807.49	903.13	5.85	3.72	304.18	481.23	0.23	-0.06	0.61	8.18	1.03	401.41	8.71	18.74	0.01	5068.32	277.42	99.29
21-Nov-18 01:00:00	21-Nov-18 02:00:00	213.73	3.62	215.88	3.13	793.92	808.58	905.13	3.32	3.91	601.92	496.24	153.59	-0.06	0.58	8.21	1.03	408.79	9.45	18.44	0.01	5150.47	281.35	101.45
21-Nov-18 02:00:00	21-Nov-18 03:00:00	233.18	3.57	189.58	3.15	912.84	813.39	903.92	2.99	4.00	412.60	483.01	247.16	-0.06	0.53	8.22	1.06	405.36	9.52	17.93	0.01	5288.10	288.67	104.88
21-Nov-18 03:00:00	21-Nov-18 04:00:00	212.82	3.41	247.25	3.20	1086.31	811.57	903.03	3.00	3.71	403.38	483.63	179.28	-0.06	0.48	8.27	1.05	403.83	9.41	18.38	0.01	5353.45	291.31	107.18
21-Nov-18 04:00:00	21-Nov-18 05:00:00	198.93	3.24	186.06	3.23	1065.59	809.93	904.01	4.70	3.25	325.04	482.91	172.20	-0.07	0.52	8.28	1.04	408.75	9.16	18.96	0.01	5410.36	294.18	108.86
21-Nov-18 05:00:00	21-Nov-18 06:00:00	196.74	3.08	277.14	3.03	1095.37	808.65	904.40	4.37	3.31	323.97	522.63	211.42	-0.08	0.55	8.29	1.02	409.65	9.01	18.24	0.01	5409.20	294.17	108.88
21-Nov-18 06:00:00	21-Nov-18 07:00:00	121.47	15.61	155.28	2.93	1103.55	812.36	903.39	5.32	2.74	311.67	579.98	235.90	-0.06	0.55	8.27	1.02	410.61	8.85	18.89	0.01	5409.96	294.19	108.70
21-Nov-18 07:00:00	21-Nov-18 08:00:00	175.94	2.74	162.22	2.90	1097.40	810.30	903.71	5.94	2.55	303.89	650.32	187.24	-0.07	0.56	8.28	1.02	410.54	8.69	19.41	0.01	5410.35	294.16	108.60
21-Nov-18 08:00:00	21-Nov-18 09:00:00	167.50	2.80	176.32	2.87	1098.33	807.56	904.47	8.88	2.56	296.10	629.15	121.94	-0.07	0.55	8.29	1.03	410.69	8.69	19.36	0.19	5410.37	294.22	108.81
21-Nov-18 09:00:00	21-Nov-18 10:00:00	168.93	2.87	187.11	2.92	1098.20	807.82	905.75	3.60	2.81	288.32	591.25	94.65	-0.06	0.56	8.30	1.12	403.20	8.69	17.16	3.42	5407.36	294.19	108.70
21-Nov-18 10:00:00	21-Nov-18 11:00:00	175.69	2.93	177.10	3.04	1100.96	808.44	903.56	1.58	2.85	368.33	591.94	0.00	-0.06	0.53	8.30	1.15	399.87	8.68	18.04	1.89	5408.72	294.18	108.88
21-Nov-18 11:00:00	21-Nov-18 12:00:00	190.97	3.00	257.57	2.96	1105.27	809.19	904.76	4.71	3.18	41.53	569.05	0.00	-0.06	0.53	8.34	1.13	400.52	8.69	18.24	1.05	5408.93	294.19	108.63
21-Nov-18 12:00:00	21-Nov-18 13:00:00	188.60	3.06	272.75	2.88	1105.03	815.08	899.80	4.49	3.59	67.06	501.52	0.00	-0.07	0.55	8.36	1.06	413.31	8.70	16.31	4.00	5401.79	293.98	108.71
21-Nov-18 13:00:00	21-Nov-18 14:00:00	193.00	3.13	170.16	2.89	1048.96	811.31	898.17	5.43	3.56	69.15	494.76	0.00	-0.07	0.58	8.35	1.08	400.06	8.69	18.44	0.62	5409.31	294.19	108.96
21-Nov-18 14:00:00	21-Nov-18 15:00:00	184.32	3.17	193.20	2.90	1055.00	807.02	899.30	5.43	3.52	70.64	462.20	0.00	-0.06	0.55	8.34	1.08	402.24	8.69	16.80	3.48	5407.09	294.24	108.55
21-Nov-18 15:00:00	21-Nov-18 16:00:00	164.14	3.12	238.91	2.91	1045.83	805.00	899.82	18.08	3.33	72.12	462.32	0.00	-0.06	0.56	8.28	1.10	403.83	8.73	16.65	4.00	5406.87	294.17	108.60
21-Nov-18 16:00:00	21-Nov-18 17:00:00	167.74	3.07	245.31	2.91	1074.31	799.23	897.77	20.16	3.87	73.61	442.99	0.00	-0.05	0.54	8.25	1.08	410.22	9.08	16.81	4.01	5288.44	290.08	104.06
21-Nov-18 17:00:00	21-Nov-18 18:00:00	169.24	3.02	346.50	2.91	1117.62	806.53	897.37	9.96	4.16	81.89	430.20	0.00	-0.05	0.58	8.33	1.02	411.96	9.15	17.18	4.01	5372.26	296.13	103.84
21-Nov-18 18:00:00	21-Nov-18 19:00:00	155.97	2.97	279.83	2.91	1112.00	814.38	897.39	5.43	3.67	91.16	435.23	0.00	-0.06	0.62	8.34	1.09	398.76	8.91	17.83	4.00	5408.75	298.19	104.50
21-Nov-18 19:00:00	21-Nov-18 20:00:00	141.22	2.92	296.59	2.91	1114.69	814.05	898.99	5.79	3.64	95.06	452.95	0.00	-0.06	0.64	8.37	1.08	406.39	8.80	17.46	4.00	5368.12	296.02	103.98
21-Nov-18 20:00:00	21-Nov-18 21:00:00	150.07	2.87	255.59	3.14	1103.14	813.73	898.10	5.23	4.27	98.95	426.51	0.00	-0.07	0.67	8.41	1.07	402.62	9.60	16.48	4.00	5102.96	280.85	98.43
21-Nov-18 21:00:00	21-Nov-18 22:00:00	157.81	2.83	344.12	2.95	1121.25	815.04	896.84	4.36	4.42	122.99	482.59	0.00	-0.08	0.65	8.44	1.05	315.24	9.88	17.13	2.03	5214.77	287.20	101.08
21-Nov-18 22:00:00	21-Nov-18 23:00:00	159.11	2.81	255.14	2.96	1109.07	819.87	896.97	5.32	4.29	124.46	476.97	0.00	-0.07	0.55	8.24	1.11	398.56	9.98	18.96	0.01	5123.84	281.82	98.90
21-Nov-18 23:00:00	22-Nov-18 00:00:00	177.81	2.99	347.71	3.00	1109.77	817.70	899.37	3.79	4.49	311.12	474.52	0.00	-0.07	0.57	8.33	1.14	393.30	10.31	18.64	0.01	5176.11	284.82	100.07

		NO	NO2	SO2	Opacity	Temperature of gases leaving the kiln	Temperature of gases K5 top	Temperature of gases leaving the calciner	Residual Oxygen at back end of the kiln	Residual Oxygen at calciner down comer duct	CO at back end of the kiln?	CO at calciner down comer duct	THC (as CH4) in kiln stack gas	Kiln negative pressure	Calciner negative pressure	Preheater tower negative pressure	Raw mill negative pressure	Raw material feed rate	Conventional fuel feed rate - kiln	Conventional fuel feed rate - calciner	LCF/Alt fuel feed rate - calciner	Clinker hourly production rate	Calciner feed	Kiln feed
		ppm	ppm	ppm	%	C	C	C	%	%	ppm	ppm	ppm	kPa	kPa	kPa	kPa	t/h	t/h	t/h	t/h	t/d	t/h	t/h
22-Nov-18 00:00:00	22-Nov-18 01:00:00	211.56	3.10	294.98	3.16	1066.99	821.39	897.77	4.37	5.04	114.42	477.96	0.00	-0.08	0.53	8.33	1.14	390.67	10.56	17.57	0.01	5105.31	280.87	98.73
22-Nov-18 01:00:00	22-Nov-18 02:00:00	208.10	3.09	409.73	2.85	1034.08	822.79	898.43	3.35	5.11	158.95	475.10	0.00	-0.07	0.49	8.43	1.12	393.19	10.94	17.24	0.01	5140.09	282.80	99.53
22-Nov-18 02:00:00	22-Nov-18 03:00:00	209.53	3.08	401.61	2.85	1004.22	827.81	898.38	3.93	4.95	128.84	481.49	0.00	-0.07	0.50	8.53	1.13	390.74	10.98	17.11	0.01	5133.30	282.46	99.00
22-Nov-18 03:00:00	22-Nov-18 04:00:00	192.43	3.07	484.74	2.88	971.11	829.05	898.14	2.52	5.02	256.92	484.60	0.00	-0.07	0.50	8.57	1.07	390.83	10.98	16.93	0.01	5213.38	287.00	100.92
22-Nov-18 04:00:00	22-Nov-18 05:00:00	169.02	2.94	483.80	2.91	946.42	838.19	897.78	2.30	5.23	1808.28	489.35	0.00	-0.07	0.49	9.00	1.08	393.14	10.03	16.50	0.01	5128.59	282.39	99.43
22-Nov-18 05:00:00	22-Nov-18 06:00:00	199.43	3.39	414.14	2.90	909.29	832.91	898.44	3.54	4.95	457.98	481.85	0.00	-0.07	0.46	8.98	1.09	394.09	10.29	16.85	0.01	5083.48	279.61	98.05
22-Nov-18 06:00:00	22-Nov-18 07:00:00	197.80	3.08	636.22	2.73	898.19	836.35	897.79	1.96	4.81	1094.70	497.77	0.00	-0.07	0.46	9.11	1.13	390.54	10.50	16.84	0.01	5268.77	290.22	101.89
22-Nov-18 07:00:00	22-Nov-18 08:00:00	178.46	2.77	541.12	2.77	817.14	840.82	897.74	2.59	4.80	541.45	486.88	0.00	-0.08	0.50	9.11	1.08	388.63	10.66	16.55	0.01	5307.67	292.48	102.82
22-Nov-18 08:00:00	22-Nov-18 09:00:00	158.71	2.55	514.04	2.82	749.59	836.95	899.29	2.36	4.76	808.66	471.16	0.00	-0.07	0.54	9.07	1.06	396.39	10.80	16.44	1.67	5326.28	293.42	102.88
22-Nov-18 09:00:00	22-Nov-18 10:00:00	160.67	2.56	530.30	3.07	701.30	836.50	898.14	2.79	4.53	368.37	481.45	0.00	-0.07	0.59	9.09	1.07	404.99	10.69	15.15	4.01	5349.34	294.94	103.56
22-Nov-18 10:00:00	22-Nov-18 11:00:00	167.81	2.58	550.77	3.07	639.53	839.29	897.91	2.25	4.75	594.07	494.78	0.00	-0.08	0.58	9.15	1.11	405.85	10.38	14.63	4.00	5373.70	296.40	104.35
22-Nov-18 11:00:00	22-Nov-18 12:00:00	190.93	2.60	517.96	2.97	561.99	840.08	897.88	2.84	3.89	301.19	482.30	0.00	-0.07	0.53	9.16	1.16	412.67	10.19	15.31	3.02	5360.68	295.56	103.63
22-Nov-18 12:00:00	22-Nov-18 13:00:00	185.46	2.62	520.71	2.92	516.77	838.54	897.83	2.37	4.10	432.10	472.03	0.00	-0.07	0.52	9.16	1.12	412.78	10.19	15.09	4.01	5370.56	295.51	104.10
22-Nov-18 13:00:00	22-Nov-18 14:00:00	187.06	2.64	441.03	3.17	490.95	836.14	897.31	3.28	3.63	243.13	485.31	0.00	-0.06	0.51	9.06	1.12	413.99	9.64	15.88	4.01	5392.65	296.75	104.25
22-Nov-18 14:00:00	22-Nov-18 15:00:00	162.77	2.65	340.91	3.06	483.55	827.53	898.25	4.52	3.05	194.29	499.17	0.00	-0.04	0.49	8.42	1.12	414.78	9.08	16.56	4.00	5427.97	297.73	104.36
22-Nov-18 15:00:00	22-Nov-18 16:00:00	175.28	2.67	468.56	2.74	474.09	824.88	898.43	4.32	3.36	233.22	480.32	0.00	-0.04	0.51	8.30	1.11	415.59	8.78	15.88	4.00	5426.23	297.58	104.71
22-Nov-18 16:00:00	22-Nov-18 17:00:00	161.51	2.66	374.93	2.53	461.41	823.08	897.57	13.98	3.22	221.56	470.45	0.00	-0.04	0.53	7.98	1.11	412.58	8.64	16.24	4.00	5411.99	297.77	104.67
22-Nov-18 17:00:00	22-Nov-18 18:00:00	127.98	2.61	479.57	2.36	455.64	818.33	897.91	14.26	3.09	326.61	483.18	0.00	-0.05	0.59	8.10	1.13	410.61	9.47	16.13	4.00	5406.62	298.17	104.54
22-Nov-18 18:00:00	22-Nov-18 19:00:00	163.22	2.55	468.88	2.36	441.85	830.48	898.06	3.79	3.30	293.36	471.28	0.00	-0.06	0.62	8.31	1.14	415.32	9.13	16.05	4.00	5406.65	298.21	105.06
22-Nov-18 19:00:00	22-Nov-18 20:00:00	152.37	2.50	306.79	2.36	428.57	829.78	897.92	5.48	3.01	253.02	468.75	0.00	-0.06	0.62	8.13	1.13	413.27	8.46	16.06	4.00	5405.72	298.18	104.60
22-Nov-18 20:00:00	22-Nov-18 21:00:00	134.94	2.44	251.70	2.38	437.98	818.94	898.03	5.98	2.90	211.02	490.99	0.00	-0.06	0.64	8.02	1.15	404.67	8.26	16.17	4.00	5334.56	294.28	103.29
22-Nov-18 21:00:00	22-Nov-18 22:00:00	139.14	2.39	272.02	2.46	438.76	817.97	898.20	5.75	3.07	201.08	478.63	0.00	-0.06	0.63	8.22	1.14	410.26	8.69	15.84	4.00	5288.68	291.57	102.39
22-Nov-18 22:00:00	22-Nov-18 23:00:00	146.13	2.33	396.34	2.45	411.41	822.12	898.71	4.93	3.21	214.24	498.50	0.00	-0.06	0.64	8.11	1.13	410.21	9.20	15.51	4.00	5184.28	285.77	100.65
22-Nov-18 23:00:00	23-Nov-18 00:00:00	171.51	2.28	197.36	2.34	377.30	825.43	897.49	5.76	4.01	227.41	466.48	0.00	-0.06	0.64	8.00	1.12	404.02	9.37	16.57	0.75	4957.22	272.57	95.83

Alternative fuel trial data
Data run
Start: 12/2/2018 0:00
Finish: 12/10/2018 0:00

		NO	NO2	SO2	Opacity	Temperature of gases leaving the kiln	Temperature of gases K5 top	Temperature of gases leaving the calciner	Residual Oxygen at back end of the kiln	Residual Oxygen at calciner down comer duct	CO at back end of the kiln?	CO at calciner down comer duct	THC (as CH4) in kiln stack gas	Kiln negative pressure	Calciner negative pressure	Preheater tower negative pressure	Raw mill negative pressure	Raw material feed rate	Conventional fuel feed rate - kiln	Conventional fuel feed rate - calciner	LCF/Alt fuel feed rate - calciner	Clinker hourly production rate	Calciner feed	Kiln feed
		ppm	ppm	ppm	%	C	C	C	%	%	ppm	ppm	ppm	kPa	kPa	kPa	kPa	t/h	t/h	t/h	t/h	t/d	t/h	t/h
02-Dec-18 00:00:00	02-Dec-18 01:00:00	258.75	3.76	218.18	2.67	373.49	798.96	898.95	4.31	4.45	351.55	383.39	239.94	-0.07	0.49	7.38	1.01	410.45	9.38	17.92	0.00	5212.47	277.47	92.47
02-Dec-18 01:00:00	02-Dec-18 02:00:00	258.97	3.63	221.57	2.87	372.90	799.10	897.96	5.00	4.48	361.93	388.00	246.06	-0.07	0.50	7.42	0.99	412.55	9.47	17.78	0.00	5212.43	277.48	92.46
02-Dec-18 02:00:00	02-Dec-18 03:00:00	253.50	3.44	219.98	3.02	371.36	799.11	898.00	5.02	4.11	355.10	397.77	219.92	-0.06	0.49	7.43	0.99	412.98	9.66	17.99	0.00	5213.04	277.57	92.54
02-Dec-18 03:00:00	02-Dec-18 04:00:00	235.14	3.27	219.62	3.08	370.04	799.13	897.04	4.63	4.03	341.51	414.64	207.73	-0.06	0.50	7.47	0.99	414.86	9.82	18.22	0.00	5203.30	276.91	92.29
02-Dec-18 04:00:00	02-Dec-18 05:00:00	216.45	3.09	230.76	3.14	369.49	800.72	898.86	3.14	4.05	357.01	398.76	202.58	-0.06	0.50	7.67	0.98	419.23	10.25	18.10	0.00	5213.70	277.51	92.60
02-Dec-18 05:00:00	02-Dec-18 06:00:00	190.16	2.85	336.34	3.20	368.05	806.04	899.09	1.22	4.79	1513.10	402.32	171.20	-0.06	0.51	7.72	0.97	418.92	9.95	16.92	0.00	5211.02	277.38	92.47
02-Dec-18 06:00:00	02-Dec-18 07:00:00	168.86	13.26	215.21	3.26	368.51	813.76	897.82	2.23	4.91	565.37	388.88	163.14	-0.06	0.51	7.81	0.96	418.18	9.38	16.81	0.00	5210.95	277.51	92.66
02-Dec-18 07:00:00	02-Dec-18 08:00:00	207.87	3.16	364.74	3.46	367.84	811.54	898.31	1.46	5.10	1273.86	398.17	175.85	-0.06	0.52	7.78	0.97	418.96	9.36	16.65	0.00	5210.65	277.51	92.66
02-Dec-18 08:00:00	02-Dec-18 09:00:00	216.97	3.37	345.70	3.60	367.20	816.30	897.99	4.97	5.01	503.92	412.81	220.10	-0.06	0.51	7.78	0.99	419.81	8.99	16.55	0.00	5209.97	277.54	92.51
02-Dec-18 09:00:00	02-Dec-18 10:00:00	210.14	3.13	331.38	3.68	366.65	814.85	897.03	4.47	4.93	435.01	421.80	199.39	-0.07	0.52	7.80	0.93	330.15	8.92	16.95	0.00	5210.47	277.49	92.40
02-Dec-18 10:00:00	02-Dec-18 11:00:00	212.86	2.64	247.57	3.57	365.00	811.26	898.36	12.60	4.78	390.54	415.14	191.95	-0.07	0.51	7.63	1.05	412.38	8.76	17.07	0.00	5210.32	277.49	92.80
02-Dec-18 11:00:00	02-Dec-18 12:00:00	197.48	2.72	282.41	3.43	364.74	804.90	898.23	6.75	4.92	376.15	418.48	145.36	-0.07	0.51	7.75	1.07	409.00	9.51	16.75	0.00	5197.82	276.73	92.27
02-Dec-18 12:00:00	02-Dec-18 13:00:00	212.20	2.81	274.14	3.30	363.07	811.67	897.35	1.74	4.62	501.87	408.11	141.83	-0.07	0.51	7.73	1.05	412.97	9.56	17.40	0.00	5141.67	284.07	94.56
02-Dec-18 13:00:00	02-Dec-18 14:00:00	208.42	2.89	206.05	3.15	362.87	812.74	896.60	2.84	4.03	417.49	411.02	153.64	-0.07	0.51	7.77	1.01	418.66	9.00	18.17	0.00	5200.55	290.25	96.79
02-Dec-18 14:00:00	02-Dec-18 15:00:00	231.90	2.89	212.53	3.00	360.49	809.74	898.20	3.17	3.55	399.57	408.10	200.73	-0.06	0.48	7.59	1.00	420.81	8.68	18.78	0.00	5200.97	290.22	96.52
02-Dec-18 15:00:00	02-Dec-18 16:00:00	241.01	2.86	171.73	2.87	359.04	806.00	897.74	3.28	3.35	401.62	416.77	206.86	-0.06	0.49	7.32	0.98	421.37	8.68	19.01	0.00	5201.21	290.28	96.89
02-Dec-18 16:00:00	02-Dec-18 17:00:00	229.73	2.83	199.76	2.77	357.22	804.03	898.97	3.51	3.48	425.73	418.93	208.73	-0.06	0.49	7.34	0.98	420.67	8.69	18.85	0.00	5261.34	286.00	95.19
02-Dec-18 17:00:00	02-Dec-18 18:00:00	200.02	2.80	239.64	2.68	355.52	802.18	897.90	3.82	3.88	420.75	415.35	207.24	-0.06	0.49	7.28	0.97	418.27	8.75	18.15	0.00	5211.54	277.50	92.90
02-Dec-18 18:00:00	02-Dec-18 19:00:00	181.07	2.79	188.92	2.62	353.61	801.21	897.63	3.27	3.49	415.77	435.69	178.38	-0.06	0.49	7.24	1.00	419.02	8.73	18.56	0.00	5189.76	286.28	95.15
02-Dec-18 19:00:00	02-Dec-18 20:00:00	197.43	2.79	194.72	2.71	351.36	801.85	897.91	3.04	3.68	410.79	425.00	207.11	-0.06	0.50	7.30	1.01	421.78	8.69	18.50	0.00	5200.34	290.23	96.88
02-Dec-18 20:00:00	02-Dec-18 21:00:00	225.02	2.78	109.86	3.06	349.83	800.92	897.93	5.00	3.46	405.81	421.20	153.36	-0.07	0.49	7.34	1.05	424.52	8.79	18.66	0.00	5200.73	290.28	96.77
02-Dec-18 21:00:00	02-Dec-18 22:00:00	235.62	3.41	152.46	3.19	346.85	796.83	897.68	4.47	3.60	400.84	427.83	152.59	-0.07	0.50	7.31	0.94	346.47	9.07	18.67	0.00	5201.15	290.21	96.95
02-Dec-18 22:00:00	02-Dec-18 23:00:00	209.28	3.32	269.24	2.95	343.17	801.11	898.55	2.53	3.49	454.92	460.42	120.83	-0.07	0.51	7.40	0.84	281.93	8.93	18.89	0.00	5197.34	290.04	96.60
02-Dec-18 23:00:00	03-Dec-18 00:00:00	234.59	2.64	293.77	2.94	339.75	812.51	898.78	2.02	4.38	1006.81	438.00	189.67	-0.07	0.51	7.89	1.01	425.11	9.04	17.56	0.00	5124.04	285.94	95.32
03-Dec-18 00:00:00	03-Dec-18 01:00:00	244.38	2.86	188.96	2.97	335.88	809.07	897.99	20.04	4.10	422.69	426.25	204.44	-0.08	0.52	7.94	0.99	424.55	9.02	17.60	0.00	5185.04	289.43	96.31
03-Dec-18 01:00:00	03-Dec-18 02:00:00	232.81	2.99	145.66	3.01	321.39	802.93	897.94	14.39	3.97	436.84	417.78	203.51	-0.08	0.51	7.97	0.95	408.42	9.52	17.94	0.00	5200.56	290.22	96.80
03-Dec-18 02:00:00	03-Dec-18 03:00:00	205.79	3.12	157.45	3.14	274.77	805.38	897.19	3.33	3.94	609.84	420.63	171.78	-0.07	0.50	7.95	0.99	410.71	10.11	18.00	0.00	5201.61	290.23	96.72
03-Dec-18 03:00:00	03-Dec-18 04:00:00	183.36	8.37	189.65	3.23	274.56	807.40	899.78	1.65	4.47	1069.47	424.01	165.17	-0.08	0.52	7.93	1.03	418.61	10.25	17.13	0.00	5200.75	290.33	96.86
03-Dec-18 04:00:00	03-Dec-18 05:00:00	227.95	2.95	179.46	3.23	273.00	811.31	897.46	2.44	4.74	492.99	421.89	194.99	-0.09	0.52	7.90	1.02	418.05	10.06	16.84	0.00	5200.13	290.25	96.65
03-Dec-18 05:00:00	03-Dec-18 06:00:00	275.32	2.55	187.66	3.23	264.68	807.72	897.75	3.87	4.51	480.57	416.92	189.66	-0.08	0.52	7.92	1.00	417.48	10.05	17.32	0.00	5200.73	290.20	96.67
03-Dec-18 06:00:00	03-Dec-18 07:00:00	147.90	13.37	212.16	3.23	256.09	806.70	898.39	1.62	4.81	2026.49	423.54	147.71	-0.07	0.50	7.87	1.02	419.69	10.25	17.04	0.00	5188.31	289.57	96.66
03-Dec-18 07:00:00	03-Dec-18 08:00:00	261.13	3.68	193.66	3.22	253.94	811.85	897.93	3.40	4.64	716.27	423.23	151.64	-0.08	0.52	7.63	1.02	419.87	9.68	17.33	0.00	5200.30	290.24	96.77
03-Dec-18 08:00:00	03-Dec-18 09:00:00	189.15	8.76	108.59	3.03	256.56	806.88	897.03	13.82	4.13	450.31	409.10	187.70	-0.07	0.51	7.51	0.98	412.03	9.07	18.10	0.00	5200.50	290.20	96.62
03-Dec-18 09:00:00	03-Dec-18 10:00:00	195.86	3.14	154.67	2.91	260.17	795.69	898.13	9.25	3.99	1054.80	411.19	184.11	-0.06	0.50	7.49	1.00	414.69	9.12	18.60	0.00	5219.70	282.42	94.07
03-Dec-18 10:00:00	03-Dec-18 11:00:00	183.50	3.15	178.74	2.79	259.79	796.42	898.23	5.82	4.60	59.86	410.18	180.91	-0.06	0.51	7.46	1.00	413.34	9.37	17.93	0.00	5211.43	277.47	92.64
03-Dec-18 11:00:00	03-Dec-18 12:00:00	199.80	3.16	198.32	2.68	259.23	800.51	898.44	3.29	4.83	78.86	414.34	135.62	-0.07	0.52	7.51	1.01	415.17	9.38	17.61	0.00	5211.89	277.49	92.72
03-Dec-18 12:00:00	03-Dec-18 13:00:00	228.81	3.17	247.91	2.62	264.50	805.89	898.72	2.36	5.00	131.28	415.46	154.09	-0.07	0.53	7.59	1.02	419.05	9.34	17.21	0.00	5211.31	277.54	92.27
03-Dec-18 13:00:00	03-Dec-18 14:00:00	211.61	3.18	190.92	2.63	267.13	808.14	897.45	3.29	5.12	135.15	419.04	192.06	-0.07	0.53	7.55	1.02	421.00	9.22	17.09	0.00	5210.98	277.53	92.40
03-Dec-18 14:00:00	03-Dec-18 15:00:00	198.21	3.19	171.67	2.63	270.10	805.81	897.42	3.63	4.86	95.29	413.67	194.34	-0.07	0.52	7.52	1.03	420.79	9.31	17.40	0.00	5211.58	277.49	92.61
03-Dec-18 15:00:00	03-Dec-18 16:00:00	181.67	3.20	176.70	2.63	270.25	803.16	898.18	3.50	4.64	112.40	402.15	201.63	-0.06	0.51	7.29	1.00	419.44	9.63	17.86	0.00	5212.71	277.55	92.32
03-Dec-18 16:00:00	03-Dec-18 17:00:00	195.66	3.21	235.66	2.63	272.74	802.75	897.99	2.23	4.94	170.51	391.13	156.06	-0.06	0.53	7.31	1.01	422.36	9.97	17.36	0.00	5212.10	277.51	92.54
03-Dec-18 17:00:00	03-Dec-18 18:00:00	217.92	3.22	257.20	2.63	275.96	808.29	898.68	2.16	5.17	189.38	395.74	173.80	-0.07	0.52	7.49	1.05	424.39	9.87	16.84	0.00	5211.54	277.51	92.25
03-Dec-18 18:00:00	03-Dec-18 19:00:00	227.57	3.23	241.45	2.63	280.35	808.53	898.38	2.67	5.16	137.15	388.53	165.05	-0.06	0.50	7.53	1.02	423.17	9.80	16.47	0.00	5218.45	277.92	92.64
03-Dec-18 19:00:00	03-Dec-18 20:00:00	216.80	3.24	256.72	2.63	284.28	808.42	897.42	2.01	4.83	182.31	404.95	176.29	-0.06	0.50	7.67	1.04	424.74	9.94	16.76	0.00	5376.02	286.90	95.81
03-Dec-18 20:00:00	03-Dec-18 21:00:00	219.44	3.24	273.51	2.62	285.88	808.66	897.93	2.34	4.97	156.38	409.49	163.04	-0.07	0.51	7.90	1.06	423.63	9.98	16.83	0.00	5404.32	288.60	96.07
03-Dec-18 21:00:00	03-Dec-18 22:00:00	114.09	2.52	234.44	2.61	288.59	808.90	897.69	2.62	4.90	147.52	421.33	190.34	-0.07	0.51	8.00	1.03	420.73	9.94	16.87	0.00	5406.78	288.73	96.10
03-Dec-18 22:00:00	03-Dec-18 23:00:00	207.57	2.73	212.49	2.60	289.80	809.15	898.27	2.46	4.89	160.51	426.34	174.71	-0.07	0.52	7.99	1.05	421.06	9.94	17.23	0.00	5407.47	288.73	96.32
03-Dec-18 23:00:00	04-Dec-18 00:00:00	219.51	3.28	211.14	2.58	291.41	809.15	897.96	2.52	4.95	227.68	428.80	171.62	-0.07	0.52	7.97	1.05	423.72	9.79	17.43	0.00	5407.58	288.72	96.11
04-Dec-18 00:00:00	04-Dec-18 01:00:00	207.52	3.47	198.35	2.57	294.45	808.94	897.32	2.84	4.87	138.12	425.73	193.69	-0.06	0.53	8.01	1.01	421.19	9.81	17.41	0.00	5407.54	288.77	96.35
04-Dec-18 01:00:00	04-Dec-18 02:00:00	189.00	3.40	218.23	2.56	294.72	808.73	898.01	2.82	4.82	148.15	417.03	189.36	-0.06	0.53	8.04	1.04	422.49	9.90	17.57	0.00	5407.76	288.75	96.19
04-Dec-18 02:00:00	04-Dec-18 03:00:00	179.01	3.33	241.39	2.54	296.62	808.53	898.20	2.59	4.64	147.49	421.74	175.35	-0.06	0.53	8.04	1.05	424.56	9.76	17.74	0.00	5407.77	288.54	96.36
04-Dec-18 03:00:00	04-Dec-18 04:00:00	186.28	3.26	242.19	2.53	298.08	808.35	898.35	2.94	4.73	144.54	424.75	172.33	-0.06	0.54	8.04	1.04	423.27	9.80	17.69	0.00	5407.72	288.74	96.14
04-Dec-18 04:00:00	04-Dec-18 05:00:00	186.85	3.19	245.64	2.53	296.24	809.73	898.24	2.76	4.85	300.45	420.60	148.20	-0.06	0.52	8.06	1.03	423.32	9.98	17.50	0.00	5407.86	288.77	96.32
04-Dec-18 05:00:00	04-Dec-18 06:00:00	208.62	3.13	343.97	2.53	296.84	815.96	898.07	1.45	5.19	1420.32	424.74	39.18	-0.06	0.53	7.99	1.03	423.32	9.79	16.95	0.00	5407.99	288.73	96.47
04-Dec-18 06:00:00	04-Dec-18 07:00:00	154.41	13.14	273.15	2.53	297.88	820.76	898.10	19.11	4.99	130.65	432.93	0.00	-0.06	0.53	7.99	1.08	421.06	9.49	16.95	0.00	5408.13	288.72	96.26
04-Dec-18 07:00:00	04-Dec-18 08:00:00	201.84	2.61	264.03	2.53	297.07	815.74	897.93	4.21	4.94	225.34	434.23	0.00	-0.06	0.51	8.02	1.05	421.23	9.46	17.29	0.00	5408.26	288.81	96.26
04-Dec-18 08:00:00	04-Dec-18 09:00:00	175.50	2.60	215.39	2.63	296.15	813.44	896.76	3.66	4.84	171.16	425.66	0.00	-0.06	0.52	7.98	1.03	418.86	9.54	17.45	0.00	5407.76	288.82	96.34
04-Dec-18 09:00:00	04-Dec-18 10:00:00	167.14	2.58	193.45	2.62	296.00	809.35	898.36	3.53	4.70	143.26	424.30	0.00	-0.07	0.52	7.79	1.03	416.99	9.61	17.88	0.01	5407.83	288.73	96.18
04-Dec-18 10:00:00	04-Dec-18 11:00:00	153.58	2.57	340.48	2.61	295.98	808.65	896.99	2.11	4.71	1070.03	431.05	0.00	-0.05	0.53	7.76	1.06	413.86	9.74	18.92	0.00	5379.13	287.07	95.97
04-Dec-18 11:00:00	04-Dec-18 12:00:00	169.92	2.56	350.99	2.59	294.39	821.04	900.14	2.21	5.15	270.56	430.80	2.96	-0.07	0.52	7.93	1.08	410.82	9.60	16.97	0.00	5338.29	284.80	94.68
04-Dec-18 12:00:00	04-Dec-18 13:00:00	157.63	2.54	258.77	2.58	291.79	819.22	901.58	2.46	4.65	243.53	446.50	69.27	-0.07	0.49	7.98	1.06	403.62	9.48	15.46	3.40	5404.38	288.67	96.17
04-Dec-18 13:00:00	04-Dec-18 14:00:00	132.97	2.53	222.93	2.57	289.43	818.67	899.19	3.06	3.97	134.71	455.44	189.86	-0.06	0.47	7.90	1.03	404.22	9.43	11.52	11.94	5398.95	288.80	96.46
04-Dec-18 14:00:00	04-Dec-18 15:00:00	162.41	2.53	141.85	2.56	286.43	815.11	895.90	3.99	4.84	181.67	449.62	132.81	-0.06	0.48	7.76	1.06	402.55	9.29	15.71	2.65	5402.76	288.65	96.19
04-Dec-18 15:00:00	04-Dec-18 16:00:00	133.67	2.55	219.40	2.54	281.50	811.03	898.93	3.77	4.55	254.67	461.74	No Data	-0.06	0.51	7.66	1.07	403.91	9.38	16.20	2.29	5401.14	288.51	95.98
04-Dec-18 16:00:00	04-Dec-18 17:00:00	126.16	2.58	199.54	2.54	279.54	810.55	900.11	3.32	3.61	200.29	443.70	No Data	-0.05	0.49	7.57	1.03	408.51	9.34	11.43	11.93	5398.69	288.78	96.13
04-Dec-18 17:00:00	04-Dec-18 18:00:00	141.01	2.62	200.78	2.54	278.99	810.40	898.94	3.08	4.04	195.90	424.07	No Data	-0.06	0.51	7.44	1.05	405.74	9.39	10.84	11.95	5398.00	288.70	96.13
04-Dec-18 18:00:00	04-Dec-18 19:00:00	131.29	2.65	235.96	2.54	278.41	811.87	898.20	2.79	4.39	209.05	415.03	No Data	-0.06	0.51	7.38	1.08	398.98	9.39	10.23	11.93	5397.10	288.78	96.26
04-Dec-18 19:00:00	04-Dec-18 20:00:00	187.31	2.68	278.83	2.54	280.97	813.53	894.48	2.61	4.83	222.26	420.42	No Data	-0.06	0.52	7.38	1.07	404.77	9.39	12.33	6.75	5411.09	289.41	96.57
04-Dec-18 20:00:00	04-Dec-18 21:00:00	166.84	2.71	314.88	2.54	281.88	811.70	897.59	2.45	4.70	310.51	420.06	No Data	-0.05	0.52	7.40	1.04	416.53	9.60	14.22	4.00	5415.22	289.51	96.18
04-Dec-18 21:00:00	04-Dec-18 22:00:00	169.23	2.74	337.33	2.54	281.01	810.59	895.65	14.41	4.89	236.39	423.27	No Data	-0.05	0.50	7.58	1.02	417.38	9.83	15.97	1.42	5418.57	289.47	96.29
04-Dec-18 22:00:00	04-Dec-18 23:00:00	174.75	2.76	289.15	2.54	283.04	809.14	898.01	17.76	4.92	192.18	421.83	No Data	-0.05	0.44	7.78	1.00	415.73	10.12	17.38	0.00	5419.21	289.41	96.62
04-Dec-18 23:00:00	05-Dec-18 00:00:00	184.47	2.75	254.18	2.54	293.16	811.61	898.04	3.25	4.75	228.79	416.88	No Data	-0.05	0.44	7.82	1.00	413.62	9.88	17.67	0.00	5420.96	289.53	96.49

		NO	NO2	SO2	Opacity	Temperature of gases leaving the kiln	Temperature of gases K5 top	Temperature of gases leaving the calciner	Residual Oxygen at back end of the kiln	Residual Oxygen at calciner down comer duct	CO at back end of the kiln?	CO at calciner down comer duct	THC (as CH4) in kiln stack gas	Kiln negative pressure	Calciner negative pressure	Preheater tower negative pressure	Raw mill negative pressure	Raw material feed rate	Conventional fuel feed rate - kiln	Conventional fuel feed rate - calciner	LCF/Alt fuel feed rate - calciner	Clinker hourly production rate	Calciner feed	Kiln feed
		ppm	ppm	ppm	%	C	C	C	%	%	ppm	ppm	ppm	kPa	kPa	kPa	kPa	t/h	t/h	t/h	t/h	t/d	t/h	t/h
05-Dec-18 00:00:00	05-Dec-18 01:00:00	200.76	2.73	244.43	2.54	297.67	812.52	898.26	3.42	5.02	166.75	422.96	No Data	-0.06	0.46	7.78	1.03	412.64	9.80	16.87	0.00	5419.70	289.53	96.37
05-Dec-18 01:00:00	05-Dec-18 02:00:00	191.29	2.71	241.52	2.54	301.81	812.79	897.78	3.43	5.01	173.11	429.06	No Data	-0.05	0.45	7.81	1.04	402.70	9.75	16.89	0.00	5419.70	289.44	96.43
05-Dec-18 02:00:00	05-Dec-18 03:00:00	191.47	2.70	259.71	2.54	306.63	813.06	897.76	3.03	4.93	205.77	425.35	No Data	-0.05	0.45	7.83	1.04	403.98	9.87	17.48	0.00	5420.73	289.54	96.19
05-Dec-18 03:00:00	05-Dec-18 04:00:00	185.64	2.68	255.36	2.54	310.11	813.03	898.02	3.09	4.98	198.35	435.65	No Data	-0.05	0.45	7.82	1.05	407.11	9.80	17.23	0.00	5420.11	289.49	96.59
05-Dec-18 04:00:00	05-Dec-18 05:00:00	178.63	2.66	212.67	2.54	312.38	811.68	897.56	3.55	4.71	148.57	433.06	No Data	-0.04	0.46	7.52	1.05	407.10	9.65	17.61	0.00	5420.55	289.52	96.45
05-Dec-18 05:00:00	05-Dec-18 06:00:00	181.06	2.65	232.07	2.54	311.30	809.29	898.28	3.05	4.72	142.50	449.83	No Data	-0.04	0.47	7.57	1.03	406.09	9.81	17.58	0.00	5420.80	289.46	96.46
05-Dec-18 06:00:00	05-Dec-18 07:00:00	142.64	13.36	184.73	2.54	311.62	809.64	898.00	10.96	4.64	155.74	449.75	No Data	-0.05	0.48	7.60	1.04	403.81	9.60	17.69	0.00	5420.63	289.46	96.30
05-Dec-18 07:00:00	05-Dec-18 08:00:00	175.16	2.94	236.59	2.54	312.09	807.28	898.39	14.44	4.54	168.98	443.27	No Data	-0.05	0.48	7.50	1.04	401.87	9.40	17.57	0.12	5420.13	289.54	96.69
05-Dec-18 08:00:00	05-Dec-18 09:00:00	160.60	2.70	203.27	2.64	312.57	805.84	899.49	3.49	4.37	627.68	445.99	No Data	-0.04	0.49	7.48	1.02	402.34	9.05	16.94	1.75	5418.80	289.51	96.31
05-Dec-18 09:00:00	05-Dec-18 10:00:00	151.69	2.66	226.65	2.47	314.12	808.00	900.17	2.26	3.43	175.20	483.33	No Data	-0.04	0.48	7.56	1.00	404.96	9.77	11.94	11.64	5412.98	289.48	96.59
05-Dec-18 10:00:00	05-Dec-18 11:00:00	168.30	2.64	172.68	2.49	320.16	812.31	897.80	2.53	4.13	190.16	467.30	No Data	-0.05	0.50	7.55	1.01	404.87	9.70	11.36	10.07	5410.84	289.41	96.49
05-Dec-18 11:00:00	05-Dec-18 12:00:00	149.55	2.63	145.64	2.51	325.96	811.67	898.58	3.08	3.91	189.40	476.41	No Data	-0.06	0.52	7.52	1.08	404.91	9.39	10.72	11.97	5410.88	289.57	96.46
05-Dec-18 12:00:00	05-Dec-18 13:00:00	152.39	2.62	189.19	2.52	332.10	810.76	897.38	2.92	3.95	191.63	475.85	No Data	-0.06	0.51	7.45	1.10	408.59	9.48	10.73	11.97	5410.92	289.51	96.43
05-Dec-18 13:00:00	05-Dec-18 14:00:00	159.80	2.60	209.80	2.54	337.15	811.64	897.74	2.59	3.79	201.37	493.00	145.37	-0.05	0.48	7.43	1.11	409.26	9.67	11.14	11.15	5411.36	289.53	96.55
05-Dec-18 14:00:00	05-Dec-18 15:00:00	176.30	2.59	316.02	2.56	340.28	814.55	895.09	1.67	4.81	232.66	517.72	36.44	-0.07	0.52	7.62	1.11	412.47	9.70	13.94	2.82	5411.60	289.27	96.65
05-Dec-18 15:00:00	05-Dec-18 16:00:00	177.09	2.57	315.62	2.57	343.87	817.50	897.06	1.74	4.89	295.59	525.07	0.64	-0.07	0.53	7.84	1.11	413.56	9.72	15.55	0.29	5361.91	286.26	95.36
05-Dec-18 16:00:00	05-Dec-18 17:00:00	168.00	2.55	295.67	2.59	345.52	816.99	897.82	2.48	4.92	225.38	531.77	0.46	-0.07	0.55	7.84	1.11	413.04	9.71	15.68	0.02	5330.96	284.48	94.73
05-Dec-18 17:00:00	05-Dec-18 18:00:00	175.54	2.50	315.37	2.59	347.88	816.28	898.20	14.31	4.84	226.87	538.12	0.37	-0.08	0.60	7.79	1.10	412.02	9.71	15.91	0.02	5409.46	289.02	96.53
05-Dec-18 18:00:00	05-Dec-18 19:00:00	153.89	2.45	357.98	2.58	349.19	816.13	898.61	19.28	4.71	240.54	554.28	0.34	-0.07	0.58	7.68	1.08	412.97	9.70	15.79	0.01	5331.35	284.52	94.74
05-Dec-18 19:00:00	05-Dec-18 20:00:00	153.32	2.40	319.16	2.56	351.50	820.05	897.43	2.41	4.66	263.09	526.64	0.25	-0.07	0.58	7.70	1.11	415.30	9.68	15.81	0.01	5371.58	286.81	95.94
05-Dec-18 20:00:00	05-Dec-18 21:00:00	148.07	2.35	365.23	2.55	354.06	821.68	898.02	2.02	4.56	325.46	526.19	0.08	-0.07	0.60	7.83	1.11	417.78	9.64	15.71	0.01	5399.88	288.44	95.87
05-Dec-18 21:00:00	05-Dec-18 22:00:00	159.14	2.30	295.95	2.54	356.25	821.16	897.83	2.97	4.28	214.91	499.83	0.14	-0.07	0.58	7.86	1.11	418.99	9.39	16.43	0.01	5417.79	289.44	96.85
05-Dec-18 22:00:00	05-Dec-18 23:00:00	158.88	2.25	302.39	2.53	357.88	818.09	897.06	3.13	4.26	217.89	499.02	0.30	-0.06	0.59	7.86	1.10	420.46	9.39	16.49	0.01	5418.51	289.53	96.27
05-Dec-18 23:00:00	06-Dec-18 00:00:00	166.84	2.20	252.74	2.51	357.91	816.47	898.40	3.43	4.05	220.87	496.20	0.40	-0.06	0.60	7.80	1.11	409.88	9.39	16.82	0.01	5419.07	289.45	96.34
06-Dec-18 00:00:00	06-Dec-18 01:00:00	169.78	2.18	264.84	2.50	356.93	814.35	897.30	3.33	3.97	223.85	496.01	0.23	-0.06	0.56	7.77	1.12	411.80	9.42	16.98	0.01	5419.29	289.53	96.61
06-Dec-18 01:00:00	06-Dec-18 02:00:00	182.72	2.23	290.21	2.50	358.14	815.40	899.25	3.05	4.38	226.83	510.73	0.05	-0.06	0.59	7.77	1.11	417.82	9.39	16.30	0.01	5418.38	289.50	96.44
06-Dec-18 02:00:00	06-Dec-18 03:00:00	179.71	2.29	270.38	2.50	356.17	815.79	898.12	2.94	4.62	213.28	523.65	0.00	-0.07	0.63	7.88	1.11	417.93	9.39	15.91	0.01	5417.88	289.50	96.34
06-Dec-18 03:00:00	06-Dec-18 04:00:00	186.68	2.35	259.54	2.50	353.60	815.52	897.68	3.33	4.42	209.89	509.87	0.00	-0.06	0.58	7.83	1.12	413.72	9.39	16.37	0.01	5418.53	289.49	96.34
06-Dec-18 04:00:00	06-Dec-18 05:00:00	191.80	2.41	263.84	2.50	349.49	815.25	898.20	3.09	4.38	209.97	513.17	0.00	-0.06	0.56	7.81	1.11	410.50	9.39	16.21	0.01	5418.36	289.51	96.65
06-Dec-18 05:00:00	06-Dec-18 06:00:00	181.37	2.47	298.86	2.50	343.97	814.13	897.36	18.12	4.27	210.06	516.79	0.00	-0.06	0.58	7.72	1.11	408.87	9.41	16.45	0.01	5418.65	289.49	96.07
06-Dec-18 06:00:00	06-Dec-18 07:00:00	129.41	13.12	230.65	2.50	340.42	810.64	897.56	12.17	4.07	210.15	538.19	0.00	-0.05	0.56	7.78	1.11	409.27	9.70	17.13	0.01	5419.78	289.49	96.61
06-Dec-18 07:00:00	06-Dec-18 08:00:00	192.61	2.62	291.92	2.49	337.10	818.47	897.88	9.29	4.29	210.23	514.03	28.06	-0.06	0.57	7.80	1.11	411.04	9.44	16.81	0.01	5419.23	289.55	96.39
06-Dec-18 08:00:00	06-Dec-18 09:00:00	180.35	2.52	196.62	2.45	333.72	815.93	899.67	4.17	3.57	177.82	562.23	115.11	-0.05	0.51	7.61	1.11	396.32	9.38	17.56	1.23	5420.23	289.45	96.42
06-Dec-18 09:00:00	06-Dec-18 10:00:00	129.08	2.42	230.87	2.41	331.05	814.16	893.43	2.14	3.69	1648.38	939.23	147.96	-0.04	0.52	7.58	1.11	394.63	9.41	13.98	6.22	5392.04	288.23	96.10
06-Dec-18 10:00:00	06-Dec-18 11:00:00	112.28	2.31	231.53	2.43	327.56	823.29	890.88	2.16	3.75	1690.28	951.40	147.04	-0.05	0.63	7.80	1.17	400.67	9.31	15.73	2.34	5316.82	283.76	95.17
06-Dec-18 11:00:00	06-Dec-18 12:00:00	123.25	2.21	150.65	2.46	328.49	821.21	900.43	4.16	3.03	54.16	913.68	135.78	-0.04	0.59	7.59	1.14	413.63	8.72	10.93	8.54	4994.35	264.15	89.50
06-Dec-18 12:00:00	06-Dec-18 13:00:00	151.83	2.10	222.38	2.49	329.99	819.59	899.71	2.59	2.89	79.29	1141.87	142.09	-0.05	0.65	7.83	1.14	408.38	9.39	9.85	11.70	5371.15	285.38	97.54
06-Dec-18 13:00:00	06-Dec-18 14:00:00	142.99	2.04	178.23	2.50	331.49	819.96	889.45	2.79	3.99	550.66	790.77	133.38	-0.05	0.63	7.89	1.15	396.99	9.39	15.16	3.68	5405.45	284.98	99.89
06-Dec-18 14:00:00	06-Dec-18 15:00:00	175.36	2.05	184.07	2.50	332.97	818.77	898.49	3.41	3.80	99.26	567.15	99.86	-0.03	0.60	7.86	1.14	408.75	9.39	18.05	0.01	5420.95	285.64	100.49
06-Dec-18 15:00:00	06-Dec-18 16:00:00	168.39	2.07	191.70	2.50	334.31	816.94	898.19	3.49	4.16	65.04	519.12	120.59	-0.03	0.58	7.84	1.10	411.32	9.40	17.63	0.02	5420.40	285.65	100.27
06-Dec-18 16:00:00	06-Dec-18 17:00:00	140.78	2.08	270.68	2.50	335.12	817.88	900.67	2.48	3.77	138.11	819.22	125.48	-0.05	0.60	7.81	1.10	411.86	9.40	12.79	6.63	5415.80	285.75	100.35
06-Dec-18 17:00:00	06-Dec-18 18:00:00	151.06	2.10	188.58	2.50	336.10	820.11	894.98	3.36	3.68	103.82	699.31	128.26	-0.05	0.55	7.82	1.14	408.37	9.39	14.11	5.22	5412.35	285.44	100.34
06-Dec-18 18:00:00	06-Dec-18 19:00:00	151.82	2.11	204.69	2.50	336.00	817.11	899.44	7.01	3.44	65.82	791.89	126.73	-0.05	0.57	7.86	1.15	414.28	9.38	12.08	7.86	5412.68	285.69	100.26
06-Dec-18 19:00:00	06-Dec-18 20:00:00	178.71	2.13	266.77	2.51	336.00	812.26	897.02	13.32	4.14	65.82	507.64	129.87	-0.06	0.58	7.48	1.11	418.54	9.72	13.85	4.43	5292.94	278.63	97.89
06-Dec-18 20:00:00	06-Dec-18 21:00:00	157.91	2.14	232.78	2.51	334.77	812.65	897.88	3.39	4.83	65.82	477.29	127.41	-0.07	0.59	7.64	1.11	419.07	9.86	15.67	1.83	5396.88	284.41	99.69
06-Dec-18 21:00:00	06-Dec-18 22:00:00	164.58	2.17	247.05	2.51	334.40	814.46	896.07	3.66	4.71	65.82	474.73	128.49	-0.07	0.55	7.74	1.11	418.10	9.72	14.99	3.94	5417.15	285.65	100.33
06-Dec-18 22:00:00	06-Dec-18 23:00:00	159.13	2.22	215.88	2.51	332.51	816.02	899.05	3.75	4.80	65.82	485.23	18.33	-0.07	0.58	7.78	1.14	410.56	9.69	16.98	0.00	5419.83	285.66	100.19
06-Dec-18 23:00:00	07-Dec-18 00:00:00	161.44	2.27	213.76	2.51	328.53	814.86	898.07	4.07	4.90	65.82	469.09	0.84	-0.07	0.57	7.78	1.12	407.71	9.80	17.16	0.00	5420.26	285.62	100.22
07-Dec-18 00:00:00	07-Dec-18 01:00:00	156.81	2.32	173.13	2.51	325.83	812.10	897.62	4.86	4.82	65.82	475.18	0.85	-0.07	0.57	7.71	1.15	416.52	9.64	17.30	0.00	5420.24	285.65	100.53
07-Dec-18 01:00:00	07-Dec-18 02:00:00	161.22	2.37	168.83	2.51	323.92	808.16	897.74	4.58	4.68	68.03	486.10	0.98	-0.06	0.55	7.53	1.15	420.04	9.59	17.68	0.00	5420.74	285.65	100.30
07-Dec-18 02:00:00	07-Dec-18 03:00:00	158.07	2.42	200.49	2.51	323.40	808.15	898.56	3.81	4.69	73.16	484.64	0.94	-0.06	0.55	7.44	1.14	421.22	9.71	17.69	0.00	5420.81	285.64	100.24
07-Dec-18 03:00:00	07-Dec-18 04:00:00	165.39	2.47	212.12	2.51	321.89	809.19	897.57	3.64	4.90	78.31	476.15	1.12	-0.06	0.52	7.48	1.12	412.62	9.87	17.41	0.00	5420.69	285.65	100.35
07-Dec-18 04:00:00	07-Dec-18 05:00:00	156.32	2.52	181.77	2.51	320.15	809.52	897.36	4.47	4.61	83.45	469.50	1.23	-0.06	0.52	7.49	1.06	403.01	9.68	18.15	0.00	5421.44	285.67	100.25
07-Dec-18 05:00:00	07-Dec-18 06:00:00	150.19	2.62	174.63	2.51	320.15	805.28	897.66	9.78	4.08	88.60	454.14	1.27	-0.05	0.51	7.36	1.14	405.61	9.69	18.93	0.00	5422.52	285.66	100.32
07-Dec-18 06:00:00	07-Dec-18 07:00:00	134.48	13.21	147.63	2.51	319.98	804.36	898.41	16.10	4.19	93.74	452.81	1.37	-0.05	0.51	7.33	1.15	417.95	9.82	18.76	0.00	5422.45	285.63	100.31
07-Dec-18 07:00:00	07-Dec-18 08:00:00	168.64	2.69	183.64	2.51	318.66	804.82	898.05	4.48	4.70	98.89	442.53	2.96	-0.06	0.52	7.33	1.14	422.47	9.71	18.19	0.00	5421.55	285.69	100.49
07-Dec-18 08:00:00	07-Dec-18 09:00:00	159.01	2.66	151.22	2.51	316.16	804.68	897.34	4.68	4.14	104.04	486.86	35.97	-0.04	0.48	7.40	1.12	416.91	9.77	18.93	0.00	5422.11	285.59	100.19
07-Dec-18 09:00:00	07-Dec-18 10:00:00	159.99	2.64	95.53	2.51	315.00	804.49	898.35	4.62	4.43	114.08	451.04	79.64	-0.04	0.51	7.39	1.11	409.89	9.81	18.76	0.00	5422.52	285.65	100.59
07-Dec-18 10:00:00	07-Dec-18 11:00:00	155.82	2.62	97.71	2.49	314.44	804.30	897.45	4.71	3.96	128.44	466.58	152.63	-0.04	0.49	7.42	1.14	400.71	9.74	19.35	0.00	5422.85	285.67	100.50
07-Dec-18 11:00:00	07-Dec-18 12:00:00	161.90	2.60	89.66	2.31	314.79	804.12	898.00	4.79	4.00	147.14	471.86	160.50	-0.04	0.50	7.43	1.12	407.99	9.75	19.24	0.00	5423.08	285.57	100.19
07-Dec-18 12:00:00	07-Dec-18 13:00:00	159.76	2.57	112.86	2.60	314.95	804.00	897.70	3.70	4.19	146.09	477.16	162.41	-0.05	0.52	7.46	1.12	409.72	10.24	19.28	0.00	5423.71	285.70	100.43
07-Dec-18 13:00:00	07-Dec-18 14:00:00	160.92	2.55	120.37	2.42	316.28	806.91	899.17	3.88	4.61	156.33	470.78	165.41	-0.05	0.54	7.46	1.12	412.77	10.10	18.26	0.00	5422.19	285.67	100.19
07-Dec-18 14:00:00	07-Dec-18 15:00:00	163.26	2.54	99.56	2.42	315.42	807.73	898.11	4.26	4.44	166.58	475.94	167.59	-0.05	0.52	7.44	1.12	409.51	9.88	18.45	0.00	5422.08	285.64	100.17
07-Dec-18 15:00:00	07-Dec-18 16:00:00	157.90	2.57	129.23	2.43	315.63	807.29	898.21	3.53	4.47	176.82	471.02	158.64	-0.05	0.54	7.51	1.12	413.70	10.18	18.51	0.00	5422.60	285.61	100.51
07-Dec-18 16:00:00	07-Dec-18 17:00:00	159.93	2.60	140.92	2.45	316.67	807.64	898.31	3.36	4.81	187.07	469.50	160.79	-0.05	0.51	7.47	1.10	413.05	10.15	18.06	0.00	5421.92	285.64	100.47
07-Dec-18 17:00:00	07-Dec-18 18:00:00	158.16	2.63	147.39	2.46	317.33	808.61	897.86	3.28	4.86	197.31	466.07	No Data	-0.05	0.51	7.52	1.11	412.92	10.18	17.87	0.00	5421.66	285.60	100.41
07-Dec-18 18:00:00	07-Dec-18 19:00:00	203.50	2.66	185.60	2.47	318.02	809.59	897.85	13.94	4.87	207.56	462.09	No Data	-0.06	0.52	7.52	1.12	405.89	10.14	17.96	0.00	5421.77	285.66	100.38
07-Dec-18 19:00:00	07-Dec-18 20:00:00	207.68	2.69	187.02	2.48	319.23	805.70	898.15	11.61	4.63	217.54	466.79	No Data	-0.05	0.52	7.48	1.12	408.70	10.04	18.27	0.00	5422.03	285.61	100.11
07-Dec-18 20:00:00	07-Dec-18 21:00:00	214.50	2.72	152.22	2.50	320.72	804.55	897.18	4.63	4.66	224.61	452.15	No Data	-0.05	0.50	7.46	1.11	403.91	9.60	18.37	0.00	5421.57	285.65	100.30
07-Dec-18 21:00:00	07-Dec-18 22:00:00	202.49	2.75	155.98	2.50	321.34	805.50	898.15	4.09	4.30	230.86	454.77	No Data	-0.04	0.50	7.46	1.13	399.94	9.79	18.73	0.00	5422.35	285.65	100.53
07-Dec-18 22:00:00	07-Dec-18 23:00:00	206.03	2.79	172.54	2.50	320.75	806.46	897.77	3.51	4.45	237.11	468.86	No Data	-0.04	0.49	7.48	1.13	413.47	9.87	18.36	0.00	5421.93	285.68	100.32
07-Dec-18 23:00:00	08-Dec-18 00:00:00	227.83	2.88	171.17	2.50	319.62	807.65	898.79	3.68	4.63	243.36	467.29	No Data	-0.05	0.50	7.53	1.12	405.66	9.81	18.11	0.00	5421.51	285.68	100.31

		NO	NO2	SO2	Opacity	Temperature of gases leaving the kiln	Temperature of gases K5 top	Temperature of gases leaving the calciner	Residual Oxygen at back end of the kiln	Residual Oxygen at calciner down comer duct	CO at back end of the kiln?	CO at calciner down comer duct	THC (as CH4) in kiln stack gas	Kiln negative pressure	Calciner negative pressure	Preheater tower negative pressure	Raw mill negative pressure	Raw material feed rate	Conventional fuel feed rate - kiln	Conventional fuel feed rate - calciner	LCF/Alt fuel feed rate - calciner	Clinker hourly production rate	Calciner feed	Kiln feed
		ppm	ppm	ppm	%	C	C	C	%	%	ppm	ppm	ppm	kPa	kPa	kPa	kPa	t/h	t/h	t/h	t/h	t/d	t/h	t/h
08-Dec-18 00:00:00	08-Dec-18 01:00:00	227.36	2.96	195.05	2.50	319.03	809.02	898.08	3.44	4.82	249.61	457.13	No Data	-0.05	0.51	7.49	1.13	404.72	9.84	17.67	0.00	5420.89	285.64	100.24
08-Dec-18 01:00:00	08-Dec-18 02:00:00	239.20	3.05	185.09	2.50	316.41	810.38	897.93	3.78	4.81	255.86	447.02	No Data	-0.06	0.51	7.47	1.14	408.26	9.80	17.40	0.00	5420.42	285.62	100.36
08-Dec-18 02:00:00	08-Dec-18 03:00:00	226.46	3.13	165.68	2.50	315.25	809.51	897.86	4.18	4.67	262.11	449.40	No Data	-0.05	0.51	7.43	1.14	411.71	9.78	18.07	0.00	5421.44	285.64	100.24
08-Dec-18 03:00:00	08-Dec-18 04:00:00	216.10	3.22	161.63	2.50	313.52	806.71	897.96	4.23	4.42	269.32	447.55	No Data	-0.05	0.51	7.41	1.15	404.59	9.63	18.29	0.00	5421.46	285.65	100.19
08-Dec-18 04:00:00	08-Dec-18 05:00:00	212.50	3.30	160.95	2.50	311.26	804.74	897.39	4.11	4.07	282.67	462.58	No Data	-0.04	0.50	7.41	1.13	395.88	9.61	18.66	0.00	5421.92	285.59	100.47
08-Dec-18 05:00:00	08-Dec-18 06:00:00	218.62	3.39	161.35	2.50	309.63	804.34	898.39	10.82	4.03	297.11	459.16	No Data	-0.04	0.48	7.37	1.13	396.98	9.75	18.56	0.00	5422.03	285.64	100.17
08-Dec-18 06:00:00	08-Dec-18 07:00:00	168.65	13.24	125.16	2.48	307.73	803.98	897.81	15.17	4.10	311.56	465.92	No Data	-0.04	0.48	7.36	1.13	398.21	9.82	18.41	0.00	5421.89	285.66	100.20
08-Dec-18 07:00:00	08-Dec-18 08:00:00	208.89	2.72	161.85	2.46	306.49	804.30	898.07	3.75	4.08	326.00	470.07	No Data	-0.04	0.48	7.36	1.14	392.28	9.91	18.45	0.00	5422.16	285.63	100.43
08-Dec-18 08:00:00	08-Dec-18 09:00:00	120.95	2.70	113.31	2.44	306.42	805.65	898.27	3.57	4.02	340.44	487.82	No Data	-0.04	0.49	7.36	1.15	390.13	9.96	18.38	0.00	5422.13	285.70	100.49
08-Dec-18 09:00:00	08-Dec-18 10:00:00	144.26	2.67	133.24	2.43	305.06	807.02	898.65	2.97	4.22	354.89	462.63	No Data	-0.04	0.49	7.33	1.15	391.37	10.07	18.00	0.00	5421.56	285.63	100.37
08-Dec-18 10:00:00	08-Dec-18 11:00:00	165.79	2.65	162.85	2.41	303.83	808.57	898.29	2.53	4.61	365.69	459.58	No Data	-0.05	0.51	7.46	1.14	391.67	9.81	17.44	0.00	5420.54	285.66	100.11
08-Dec-18 11:00:00	08-Dec-18 12:00:00	164.11	2.63	153.24	2.40	300.74	810.41	898.11	2.72	4.66	367.39	459.96	No Data	-0.05	0.51	7.65	1.16	395.91	9.59	17.24	0.00	5419.89	285.62	100.42
08-Dec-18 12:00:00	08-Dec-18 13:00:00	165.83	2.60	192.40	2.40	298.33	811.83	897.86	2.96	4.77	368.66	453.38	No Data	-0.07	0.52	7.88	1.15	392.43	9.56	17.25	0.00	5419.61	285.62	100.29
08-Dec-18 13:00:00	08-Dec-18 14:00:00	162.99	2.58	209.25	2.40	295.64	811.78	898.10	3.43	4.77	369.93	446.17	137.07	-0.07	0.54	7.88	1.15	400.53	9.41	16.62	0.00	5418.61	285.60	100.07
08-Dec-18 14:00:00	08-Dec-18 15:00:00	166.94	2.56	210.72	2.40	294.23	811.60	898.03	3.28	4.54	371.55	458.27	135.21	-0.06	0.51	7.85	1.15	404.66	9.48	17.19	0.00	5419.76	285.67	100.41
08-Dec-18 15:00:00	08-Dec-18 16:00:00	162.58	2.57	211.46	2.40	292.29	811.43	897.55	3.21	4.56	386.10	445.58	133.14	-0.06	0.52	7.84	1.16	402.00	9.41	16.98	0.00	5419.43	285.63	100.26
08-Dec-18 16:00:00	08-Dec-18 17:00:00	162.84	2.58	234.09	2.40	290.95	811.26	898.36	12.10	4.44	407.11	447.41	130.64	-0.06	0.53	7.94	1.16	399.03	9.56	17.17	0.00	5419.82	285.63	100.50
08-Dec-18 17:00:00	08-Dec-18 18:00:00	170.36	2.60	256.86	2.40	290.03	811.08	898.48	20.14	4.75	428.12	468.20	118.44	-0.07	0.52	7.97	1.16	409.43	9.86	16.51	0.00	5412.36	285.29	100.23
08-Dec-18 18:00:00	08-Dec-18 19:00:00	157.10	2.61	325.49	2.40	292.04	812.00	898.73	20.19	4.98	449.14	469.28	125.23	-0.07	0.54	8.06	1.15	412.43	10.03	15.99	0.00	5405.93	284.93	100.02
08-Dec-18 19:00:00	08-Dec-18 20:00:00	169.04	2.62	231.24	2.40	302.02	814.39	897.91	3.49	5.14	523.57	446.58	132.38	-0.07	0.53	8.01	1.16	408.58	9.92	15.91	0.00	5406.86	284.99	99.99
08-Dec-18 20:00:00	08-Dec-18 21:00:00	163.79	2.64	232.49	2.40	310.23	815.87	898.18	2.43	5.05	521.97	454.74	133.14	-0.06	0.53	8.04	1.15	405.16	9.90	15.75	0.00	5415.27	285.38	99.96
08-Dec-18 21:00:00	08-Dec-18 22:00:00	232.83	2.98	212.08	2.40	317.87	815.12	897.95	2.63	4.92	526.51	450.50	131.74	-0.06	0.52	8.03	1.15	404.50	9.97	15.78	0.00	5418.54	285.69	100.55
08-Dec-18 22:00:00	08-Dec-18 23:00:00	226.40	3.52	225.75	2.41	325.54	814.28	897.94	2.44	5.11	529.20	454.73	132.95	-0.06	0.53	8.02	1.14	405.71	9.96	15.51	0.00	5418.19	285.63	100.27
08-Dec-18 23:00:00	09-Dec-18 00:00:00	227.10	3.55	223.85	2.41	336.15	813.44	897.83	2.43	4.94	531.89	451.27	132.66	-0.06	0.53	8.04	1.15	403.67	10.01	15.68	0.00	5418.46	285.67	100.60
09-Dec-18 00:00:00	09-Dec-18 01:00:00	222.08	3.51	218.84	2.41	347.19	812.60	898.15	2.47	4.92	554.54	451.67	131.41	-0.06	0.53	8.05	1.14	407.83	9.90	15.84	0.00	5418.50	285.64	100.25
09-Dec-18 01:00:00	09-Dec-18 02:00:00	223.46	3.48	237.51	2.41	358.61	811.75	898.02	2.69	5.00	551.13	433.99	131.07	-0.06	0.52	8.04	1.14	410.19	9.79	15.79	0.00	5418.24	285.62	100.21
09-Dec-18 02:00:00	09-Dec-18 03:00:00	222.43	3.45	216.59	2.41	370.04	810.91	898.28	13.97	5.01	539.69	431.36	128.87	-0.06	0.51	8.00	1.14	400.03	9.70	15.69	0.00	5418.07	285.65	100.22
09-Dec-18 03:00:00	09-Dec-18 04:00:00	210.87	3.42	232.50	2.41	380.48	809.56	898.49	20.16	4.94	528.29	440.31	130.24	-0.06	0.52	8.03	1.13	395.54	9.91	15.61	0.00	5417.87	285.68	100.39
09-Dec-18 04:00:00	09-Dec-18 05:00:00	211.73	3.38	234.70	2.41	390.12	808.87	897.44	9.52	5.14	561.89	436.01	128.79	-0.06	0.51	7.94	1.11	395.76	10.21	15.31	0.00	5378.87	283.31	99.62
09-Dec-18 05:00:00	09-Dec-18 06:00:00	236.73	3.34	247.78	2.41	399.56	813.62	898.20	2.16	4.95	633.07	432.24	129.03	-0.06	0.50	7.96	1.12	395.22	10.15	15.62	0.00	5411.47	285.28	100.13
09-Dec-18 06:00:00	09-Dec-18 07:00:00	167.97	13.35	179.51	2.41	406.32	814.23	897.15	2.79	4.98	610.24	429.77	127.80	-0.06	0.53	7.93	1.13	395.35	9.85	15.84	0.00	5418.54	285.64	100.21
09-Dec-18 07:00:00	09-Dec-18 08:00:00	213.15	3.12	239.14	2.41	411.65	812.77	898.45	2.75	4.83	587.40	434.18	126.69	-0.06	0.52	7.98	1.13	396.29	9.79	16.23	0.00	5418.85	285.66	100.30
09-Dec-18 08:00:00	09-Dec-18 09:00:00	215.24	3.16	256.04	2.41	415.64	811.76	898.08	7.24	5.05	567.03	441.23	127.13	-0.06	0.53	7.99	1.15	393.38	9.87	15.81	0.00	5418.38	285.69	100.30
09-Dec-18 09:00:00	09-Dec-18 10:00:00	204.09	3.20	275.40	2.41	419.76	812.15	897.52	20.14	4.89	564.29	447.75	131.55	-0.06	0.53	7.97	1.14	394.65	9.97	15.81	0.00	5414.81	285.37	100.42
09-Dec-18 10:00:00	09-Dec-18 11:00:00	219.26	3.24	255.79	2.40	430.46	812.16	898.21	9.46	5.03	594.35	449.47	134.34	-0.07	0.51	7.94	1.14	394.10	9.96	16.01	0.00	5394.97	284.29	99.77
09-Dec-18 11:00:00	09-Dec-18 12:00:00	204.16	3.27	300.79	2.39	445.15	814.51	897.99	1.62	5.02	853.14	450.44	135.82	-0.07	0.53	7.98	1.14	397.39	10.03	15.88	0.00	5405.92	284.97	100.00
09-Dec-18 12:00:00	09-Dec-18 13:00:00	214.56	3.31	292.33	2.38	462.41	815.25	898.79	1.76	5.19	661.02	457.52	131.78	-0.07	0.53	7.96	1.14	400.79	9.99	15.44	0.00	5406.32	284.94	99.71
09-Dec-18 13:00:00	09-Dec-18 14:00:00	206.39	3.35	277.60	2.36	479.78	815.79	897.07	1.77	5.01	877.12	468.93	133.94	-0.06	0.51	7.94	1.14	397.24	9.93	15.61	0.00	5335.15	283.69	99.68
09-Dec-18 14:00:00	09-Dec-18 15:00:00	227.91	3.38	227.73	2.35	495.22	816.34	899.26	2.45	4.84	649.95	469.39	135.15	-0.07	0.52	7.99	1.15	399.75	9.65	15.62	0.00	5443.53	293.39	103.21
09-Dec-18 15:00:00	09-Dec-18 16:00:00	228.34	3.36	200.62	2.34	508.98	816.12	897.05	2.95	4.90	641.90	462.76	137.26	-0.08	0.53	7.92	1.12	394.90	9.53	15.81	0.00	5324.13	285.69	100.39
09-Dec-18 16:00:00	09-Dec-18 17:00:00	220.99	3.35	170.28	2.33	520.14	814.81	897.80	2.90	4.48	633.84	467.25	144.12	-0.07	0.51	7.98	1.10	388.60	9.63	16.16	0.00	5384.63	296.89	104.13
09-Dec-18 17:00:00	09-Dec-18 18:00:00	194.34	3.33	194.80	2.31	528.03	813.57	897.37	2.50	4.47	638.08	463.91	152.10	-0.06	0.52	8.00	1.08	395.19	9.69	16.20	0.00	5397.19	297.69	104.62
09-Dec-18 18:00:00	09-Dec-18 19:00:00	202.74	3.31	187.66	2.31	533.56	812.65	898.36	2.39	4.62	625.15	472.76	155.80	-0.06	0.53	8.02	1.05	399.73	9.67	16.20	0.00	5413.61	297.89	104.51
09-Dec-18 19:00:00	09-Dec-18 20:00:00	203.91	3.30	170.72	2.32	538.61	811.78	898.03	2.61	4.47	614.82	455.83	150.52	-0.07	0.52	8.04	1.06	402.04	9.75	16.43	0.00	5419.21	298.25	104.66
09-Dec-18 20:00:00	09-Dec-18 21:00:00	202.67	3.28	146.08	2.34	541.20	810.89	897.60	12.42	4.46	636.13	446.58	150.92	-0.06	0.52	8.02	1.03	404.17	9.71	16.75	0.00	5419.61	298.18	104.87
09-Dec-18 21:00:00	09-Dec-18 22:00:00	207.23	3.26	153.35	2.35	543.34	808.67	897.74	20.02	4.39	652.07	457.35	147.73	-0.06	0.51	8.13	1.02	401.59	9.83	16.88	0.00	5417.56	298.08	104.59
09-Dec-18 22:00:00	09-Dec-18 23:00:00	201.45	3.28	167.35	2.36	546.08	805.54	898.46	9.91	4.37	668.05	470.26	143.14	-0.08	0.53	8.09	1.02	397.54	9.99	16.72	0.00	5419.85	298.24	104.68
09-Dec-18 23:00:00	10-Dec-18 00:00:00	207.23	3.36	158.35	2.37	550.37	809.74	897.73	2.46	4.31	675.38	458.80	141.00	-0.07	0.51	7.77	1.02	399.60	10.13	16.82	0.00	5420.30	298.21	104.62

Appendix G. Daily Logs

St. Marys Cement – Bowmanville Plant
Alternative Fuels Demonstration Daily Log
ECA 1255-7QVJ2N

Date	Source of Fuel Received	Amount of Fuel Received	Daily Inspection Notes	CARs Issued	Name
9/25/18	Durham Disposal	~ 15,500 kg	Demonstration material received for fuel feed system testing		
9/26/18			Fuel feed system testing complete. ~15,500 kg used.		
9/30/18			Atox down at 3:20am due to recirculation elevator damage. Projected atox restart at 10am		Schultz
9/30/18			Kiln inlet temperature probe is not working. The electrical team is looking into the problem.		Urbina
9/30/18			Baseline day 1 Alternative fuel trial starts at 12:06 pm.		Urbina
9/30/18			Metals and SVOC test end at 4:25 pm. PM 10 starts at 4:39 pm.		Urbina
9/30/18			PM 10 and Baseline day 1 Alternative fuel trial finished at 18:43 pm		Urbina

10/01/18	Durham Disposal	16.5 tonnes	Demonstration material comes onsite. It is rejected as it was out of spec, and returned to Durham Disposal.		Urbina
10/01/18			Baseline day 2 Alternative fuel trial starts at 8:57 am		Urbina
10/01/18			PM on the blasting pump happened between 8:50 am and 10:50 am. This took out the Kiln inlet O2 analyzer out of place for the period of the PM.		Urbina
10/01/18			Metals and SVOC test complete at 13:21 pm. PM 10 started at 1:59 pm.		Urbina
10/01/18			PM 10 and Baseline day 2 Alternative fuel trial finished at 4:10 pm		Urbina
10/01/18			Kiln inlet temperature probe is back in service at 7:13 pm		Urbina
10/02/18			Baseline day 3 Alternative fuel trial starts at 8:08 am		Urbina
10/02/18			Metals and SVOC test complete at 12:41 pm. PM 10 started at 1:18 pm.		Urbina
10/02/18			Kiln inlet oxygen probe goes on unscheduled maintenance at 2:30 pm. Leak in the air inlet sample line.		Urbina

10/02/18	Durham Disposal	12.59 tonnes 18.49 tonnes	Two loads of demonstration fuel were received onsite.12.59 and 18.49 tonnes.		Urbina
10/02/18			PM 10 and Baseline day 3 Alternative fuel trial finished at 3:30 pm		Urbina
10/02/18			Kiln inlet oxygen probe goes back to service at 6:08 pm.		Urbina
10/03/18			Technical difficulties running the alternative fuel system. Trouble shooting all day. Minimal quantity of alternative fuel used. Fuel came from Durham disposal.		Urbina
10/03/18	Durham Disposal	15.19 tonnes	Load of demonstration material is received onsite.15.19 tonnes		Urbina
10/03/18			Loads of demonstration fuel were not running through the system as expected.		Urbina
10/03/18			Consumed less than 5 tonnes of material. A big portion of the measured feed had to be pulled out of the process due to plugins.		Urbina
10/04/18			Alternative fuel system is still troubleshooting. An air canon was installed to break blockages at the bin before the calciner. Adjustments will be made to the fuel blend.		Urbina

10/04/18			It was decided to continue with the LCF test and do after the demonstration fuel test		Urbina
10/04/18			All load of demonstration material were returned to Durham Disposal to be able to use the trucks to transport the LCF material the next day.		Urbina
10/04/18	Durham Disposal	-45.97 Tonnes (returned loads, less small amounts of fuel used on October 3 and 4) 2 for reblending 1 for disposal	Three loads of demonstration material rejected out of spec (15.19+12.29+18.49)tonnes). No inventory left onsite by end of day.		Urbina
10/04/18			Less than 1 tonne of demonstration material was consumed.		Urbina
10/05/18	U-Pak	22.08 tonnes and 10.79 tonnes	Get two loads of LCF from Upak		Urbina
10/05/18			LCF test day 1 starts at 8:44 am, process is stable. Fuel coming from Upak.		Urbina
10/05/18			LCF test paused at 8:47 am due to process problems.		Urbina
10/05/18			LCF test day 1 restarted at 9:32 am, process is stable. Fuel coming from Upak.		Urbina

10/05/18			Atox went down at 12:29pm and stack test got paused at 12:49 pm		Urbina
10/05/18			Atox went back at 12:50 pm and stack testing continued at 12:58 pm		Urbina
10/05/18			LCF test day 1 finished at 2:03 pm. 37 tonnes of material consumed, this includes some residual material left from demonstration material in the system.		Urbina
10/05/18			No unusual emissions were observed that day.		Urbina
10/09/18	U-Pak	18.56 tonnes 19.36 tonnes	Get two loads of LCF from Upak		Urbina
10/09/18			LCF test 2 started at 9:25 am, process is stable. Fuel coming from Upak.		Urbina
10/09/18			Kiln inlet temperature probe went on PM at 1:40 pm to 2:36 pm.		Urbina
10/09/18	U-Pak	21.97 tonnes	Get a load of LCF from Upak		Urbina
10/09/18			LCF test 2 finished at1:51 pm.		Urbina
10/09/18			LCF test 3 started at 2:36 pm, process is stable. Fuel coming from Upak.		Urbina

10/09/18			LCF test 3 finished at 6:54 pm. 48 tonnes of material was consumed during the day.		Urbina
10/09/18			No unusual emissions were observed that day		Urbina
10/10/18	Durham Disposal		Ramp up alternative fuels - demonstration at 9:24 am and stopped at 9:54 am, the ATOX went down.		Urbina
10/10/18		18.69 tonnes 14.46 tonnes 16.11 tonnes 17.36 tonnes	Got 4 loads of demonstration fuel from Durham Disposal		Urbina
10/10/18			Demonstration trial begins at 11:53 am. Fuel coming from Durham Disposal.		Urbina
10/10/18			Demonstration trial paused at 2: 40 pm, piece of wood jams the system. The Alt fuel system stopped at 1:56 pm. Test will continue tomorrow. 15 tonnes of material were consumed. 51.62 tonnes of material left onsite.		Urbina
10/10/18			No unusual emissions were observed that day		Urbina
10/11/18			Demonstration trial 1 continues at 4:47 pm. Most of the day was spent cleaning the line and troubleshooting.		Urbina

10/11/18			Demonstration trial 1 finishes at 6:18 pm. 16.96 tonnes of material were consumed. 34.66 tonnes of material left in onsite.		Urbina
10/11/18			No unusual emissions were observed that day		Urbina
10/12/18			Demonstration trial 2 starts at 8:48 am.		Urbina
10/12/18	Durham Disposal	20.70 tonnes	Got 1 loads of demonstration fuel from Durham Disposal		
10/12/18			Demonstration trial 2 finishes at 13:13 pm. 21.73 tonnes of material consumed		Urbina
10/12/18			Demonstration trial 3 starts at 13:57 pm.		Urbina
10/12/18			Demonstration trial 3 finishes at 18:20 pm. 18.46 tonnes of material were consumed.		Urbina
10/12/18			No unusual emissions were observed that day		Urbina
10/12/18		-15.17 tonnes (disposal)	All remaining demonstration material was disposed.		Urbina

St. Marys Cement – Bowmanville Plant
Alternative Fuels Demonstration Daily Log
ECA 1255-7QVJ2N

Date	Source of Fuel Received	Amount of Fuel Received	Daily Inspection Notes	CARs Issued	Name
Nov 19	U-Pak	~ 21.5 tonnes	Receive trailer with Fuel Blend 2 for testing of fuel feed equipment.		
Nov 20			Use ~ 21.5 tonnes of Fuel Blend 2 to test performance of fuel feed equipment.		
Dec 3, 12:00 pm	U-Pak	24.35 tonnes	Receive trailer with test material, 24.35 tonnes		Urbina
Dec 3, 1:15 pm	U-Pak	21.02 tonnes	Receive trailer with test material, 21.02 tonnes		Urbina
Dec 3, 8:00 pm			No demonstration material consumed. Inventory onsite 45.37 tonnes		Urbina
Dec 4, 7:30 am			Equipment is frozen, alt fuel trial start time delayed.		Urbina
Dec 4, 8:00 am			Main belt would not start. Frozen airlines for air-ride (minimum pressure)		Schultz
Dec 4, 10:30 am			Belt still frozen – heaters ordered for inlet fans to main belt. Reviewed situation with BCX, RWDI and UPak		Schultz

Dec 4, 11:30 am			Heaters arrived on site		Schultz
Dec 4, 12:30 pm			System running		Schultz
Dec 4, 12:50 pm			10tph of Alt Fuel. THC analyzer not reading in Foxboro		Schultz
Dec 4, 1:03 pm			Alternative fuel demonstration test day 1 started, 12 t/h		Urbina
Dec 4, 2:15 pm			6-3-931 drag chain tripped multiple times due to contaminated materials		Schultz
Dec 4, 2:30 pm			Drag chain tripped, alt fuel test paused.		Urbina
Dec 4, 3:30 pm			System running stable		Schultz
Dec 4, 3:34 pm			Alternative fuel demonstration test restarted		Urbina
Dec 4, 6:00 pm	U-Pak	26.50 tonnes	Receive trailer with test material, 26.5 tonnes		Urbina
Dec 4, 6:30 pm			Alternative fuel demonstration test day 1 finished		Urbina
Dec 4, 8:00 pm	U-Pak	18.56 tonnes 24.62 tonnes	Receive trailers with test material 18.56 tonnes and 24.62 tonnes		Urbina
Dec 4, 8:00 pm			Material consumed 68 tonnes. Inventory on site 47 tonnes		Urbina
Dec 4, 8:00 pm			CEM air emissions look as normal operation. Data analysis will be done by		Urbina

			consultant when lab results come back.		
Dec 5, 7:30 am			Alt fuel trailers on-site and ready		Schultz
Dec 5, 8:55 am			System up to 8tph and ramping up		Schultz
Dec 5, 9:05 am			Alternative fuel demonstration test day 2 started, 12 t/h		Urbina
Dec 5, 10:05 am			Trailer #1 material froze. Switched to Trailer #2 and ran tractor hydraulics to Trailer #1 to break frozen lumps by using a faster speed. Switched back to Trailer #1 and ran empty. This switching resulted in the multi-flex bin level dropping low which required the overall alternative fuel rate to be reduced for a short period to prevent the system shutting down.		Schultz
Dec 5, 10:30 am			Test material in trailer frozen. Had to switch ECO docks and loose the frozen material		Urbina
Dec 5, 11:00 am	U-Pak	25.99 tonnes	Receive trailer with test material 25.99 tonnes		Urbina
Dec 5, 1:30 pm			Alternative fuel demonstration test day 2 finished		Urbina

Dec 5, 1:30 pm	U-Pak	17.16 tonnes	Receive trailer with material, 17.16 tonnes		Urbina
Dec 5, 5:00 pm	U-Pak	23.58 tonnes	Receive trailer with material, 23.58 tonnes		Urbina
Dec 5, 8:00 pm			Material consumed 62 tonnes. Inventory on site 52 tonnes		Urbina
Dec 5, 8:00 pm			CEM air emissions look as normal operation. Data analysis will be done by consultant when lab results come back.		Urbina
Dec 6, 7:30 am			Alt fuel trailers on site and ready		Schultz
Dec 6, 8:45 am			Started system at 2tph and confirmed that BCX and RWDI were ready to go		Schultz
Dec 6, 9:02 am			Running stable at 12tph		Schultz
Dec 6, 9:25 am			First drag chain tripped on overload, removed a piece of rubber belting (contamination) that had wrapped around the tail sprocket. Restarted system		Schultz
Dec 6, 10:00 am	U-Pak	17.72 tonnes	Receive trailer with material, 17.72 tonnes		Urbina
Dec 6, 10:10 am			Second drag chain tripped on chain-tension-right		Schultz

Dec 6, 11:17 am			Alternative fuel demonstration test day 3 started		Urbina
Dec 6, 12:00 pm			Kiln tower had high pressures and kiln had dusty conditions due to multiple start/stops of alternative fuel		Schultz
Dec 6, 13:20 pm			Testing paused due to 6-3-931 stopping on high load caused by oversize piece of 2”x4” lumber. When the alt fuel was taken off the kiln pushed as the CCR Operator did not increase calciner fuel quickly enough. Jackhammer required to remove 2”x4”		Schultz
Dec 6, 1:20 pm			Drag chain down. Test paused.		Urbina
Dec 6, 3:40 pm	U-Pak	16.07 tonnes	Receive trailer with test material 16.07 tonnes		Urbina
Dec 6, 4:19 pm			Alternative fuel test restarted		Urbina
Dec 6, 4:49 pm			Problems with the system, test paused.		Urbina
Dec 6, 4:49 pm			System stopped due to 931 drag chain tension		Schultz
Dec 6, 5:33 pm			Alternative fuel test restarted		Urbina

Dec 6, 6:08 pm			Alternative fuel demonstration test day 3 finished		Urbina
Dec 6, 8:00 pm			Material consumed 64 tonnes. Inventory on site 21 tonnes		Urbina
Dec 6, 8:00 pm			CEM air emissions look as normal operation. Data analysis will be done by consultant when lab results come back.		Urbina
Dec 7, 8:24 am			Alternative fuel demonstration Baseline 1 started		Urbina
Dec 7, 12:35 pm			Alternative fuel demonstration Baseline 1 Completed		Urbina
Dec 7, 1:30 pm			Alternative fuel demonstration Baseline 2 started		Urbina
Dec 7, 8:24 am			Alternative fuel demonstration Baseline 2 Completed		Urbina
Dec 7, 8:00 pm			CEM air emissions look as normal operation. Data analysis will be done by consultant when lab results come back.		Urbina
Dec 8, 7:57 am			Alternative fuel demonstration Baseline 3 started		Urbina
Dec 8, 12:29 pm			Alternative fuel demonstration Baseline 3 Completed		Urbina

Dec 8, 8:00 pm			CEM air emissions look as normal operation. Data analysis will be done by consultant when lab results come back.		Urbina
Dec 10, 8:00 pm			Consumed the 21 tonnes remaining of demonstration material		Urbina
Dec 10, 8:00 pm			CEM air emissions look as normal operation.		Urbina

Simtor Environmental Ltd.
113 WARREN ROAD
WHITBY, ONTARIO L1N 2C4
Tel: (905) 666-5533
G.S.T. #R137650453

18.67

348960

DATE Oct 10 20 18
NAME St Marys
TRUCK # 1016
WASTE/RECYCLABLE MATERIAL CODE # Test Material

5082 829535
demo

I CERTIFY THIS MATERIAL TO BE 100% NON-HAZARDOUS SOLID INDUSTRIAL WASTE

Simtor Environmental Ltd.
113 WARREN ROAD
WHITBY, ONTARIO L1N 2C4
Tel: (905) 666-5533
G.S.T. #R137650453

14.980
Oct10 AR

349015

DATE 20
NAME St. Marys
TRUCK # 1016
WASTE/RECYCLABLE MATERIAL CODE #

Test material
demo

I CERTIFY THIS MATERIAL TO BE 100% NON-HAZARDOUS SOLID INDUSTRIAL WASTE.

WEIGHER SIGNATURE

CUSTOMER / DRIVER SIGNATURE

Simtor Environmental Ltd.
113 WARREN ROAD
WHITBY, ONTARIO L1N 2C4
Tel: (905) 666-5533
G.S.T. #R137650453

20.700
AR

DATE Oct 12 20 18
NAME St Marys
TRUCK # 216
WASTE/RECYCLABLE MATERIAL CODE # fines

5240 kg
19290 kg

349133
demo

5460 kg
39770 kg

I CERTIFY THIS MATERIAL TO BE 100% NON-HAZARDOUS SOLID INDUSTRIAL WASTE

Valencia
WEIGHER SIGNATURE

CUSTOMER / DRIVER SIGNATURE

Simtor Environmental Ltd.
113 WARREN ROAD
WHITBY, ONTARIO L1N 2C4
Tel: (905) 666-5533
G.S.T. #R137650453

Oct10 16.110
AR

348996

DATE Oct 10 20 18
NAME St Marys
TRUCK # 1016
WASTE/RECYCLABLE MATERIAL CODE # ~~fines~~ Test Material

4950 kg
21560 kg
demo

I CERTIFY THIS MATERIAL TO BE 100% NON-HAZARDOUS SOLID INDUSTRIAL WASTE

Valencia
WEIGHER SIGNATURE

CUSTOMER / DRIVER SIGNATURE

Simtor Environmental Ltd.
113 WARREN ROAD
WHITBY, ONTARIO L1N 2C4
Tel: (905) 666-5533
G.S.T. #R137650453

demo
17.360
Oct10 AR

348975

DATE Oct 10 20 18
NAME St Marys
TRUCK # 1016
WASTE/RECYCLABLE MATERIAL CODE # fines

5300 kg
18780 kg

6010 kg
35430 kg

I CERTIFY THIS MATERIAL TO BE 100% NON-HAZARDOUS SOLID INDUSTRIAL WASTE

Valencia
WEIGHER SIGNATURE

CUSTOMER / DRIVER SIGNATURE