~~ONTARIO~~ PROVINCIAL

INITIATIVE

October 6, 2021

CONCRETE ONTARIO

Athena Sustainable Materials Institute

CONCRETE Build for life™

Presenters

DO NOT CONTACT

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Director of Technical Services,
Concrete Ontario

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Bart Kanters, P.Eng., MBA

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Sustainability Consultant, Athena

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Housekeeping

- Approximately a 45-minute webinar with Q & A at the end
- All participants are muted
- Questions? Use the GoToWebinar ‘Questions’ Pane
- Webinar will be recorded and posted on the Concrete Ontario website along with a PDF copy of the presentation.
  - https://www.rmcao.org/publications/webinar-presentations/
- Follow-up email will be sent tomorrow to all participants and absentees

Agenda

1. What are EPDs and where is the industry heading?
2. Why should ready-mix producers participate in the Ontario EPD initiative?
3. What is the timeline of the initiative and how will the updated report look?
4. What exactly is required from members by Athena to put together the updated report?

What are EPDs?

- An Environmental Product Declaration (EPD) is a communication document that quantifies environmental impact data from manufacturing a product
- Very similar to a nutrition label you commonly see on every day grocery items

Nutrition Facts

Serving Size 1 bar (40 grams)
Servings per Container 5

Amount Per Serving	
Calories 180	Calories from fat 80
	% Daily Value*
Total Fat 9g	**13%**
Saturated Fat 2g	**10%**
Trans Fat 0g	
Cholesterol 15mg	**5%**
Sodium 130mg	**5%**
Total Carbohydrate 23g	**8%**
Dietary Fiber 2g	**10%**
Sugars 8g	
Protein 2g	

Vitamin A 0% • Vitamin C 0%
Calcium 2% • Iron 4%

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower dependding on your calorie needs.

ENVIRONMENTAL IMPACTS

Declared Product:

35MPA 12.5MM 6-9% SCC
Compressive strength: 35 MPa at 56 days

Declared Unit: 1 m^3 of concrete

Global Warming Potential (kg CO_2-eq)	**247**
Ozone Depletion Potential (kg CFC-11-eq)	**1.39E-5**
Acidification Potential (kg SO_2-eq)	**1.38**
Eutrophication Potential (kg N-eq)	**0.19**
Photochemical Ozone Creation Potential (kg O_3-eq)	**25.1**
Abiotic Depletion, non-fossil (kg Sb-eq)	**5.19E-6**
Abiotic Depletion, fossil (MJ)	**421**
Total Waste Disposed (kg)	**0.34**
Consumption of Freshwater (m^3)	**3.89**

Product Components: admixture (ASTM C494), natural aggregate (ASTM C33), slag cement (ASTM C989), portland limestone cement (ASTM 595), batch water (ASTM C1602), admixture (ASTM C260)

What are EPDs?

CRMCA Member Industry-Wide EPD Report expires on January 6, 2022

- Used by Owners, Architects and Consulting Engineers to determine the impact that concrete has in terms of CO_2 to their structures
- Aim is to achieve low carbon concrete and in turn net-zero structures

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What are EPDs?

Table 6. Summary Results (A1-A3): 0-25 MPa ready mixed concrete product, per cubic meter

Indicator/LCI Metric	GWP	ODP	AP	EP	POCP	PEC	NRE	RE	NRM	RM	CBW	CWW	TW	CHW	CNHW
Unit (equivalent)	kg CO2	kg CFC-11	kg SO2	kg N	kg O3	MJ	MJ	MJ	kg	kg	m3	m3	m3	kg	kg
Minimum	214.41	3.19E-06	1.03	0.11	18.68	2161.11	1982.19	165.21	2279.41	5.12	0.16	0.14	0.87	0.85	8.89
Maximum	327.33	4.88E-06	1.45	0.15	26.46	2823.85	2582.06	241.79	2527.16	7.68	0.16	0.14	1.08	0.88	8.99
#1-25 GU with air 0-14% FA/SC	327.33	4.16E-06	1.45	0.15	26.46	2823.85	2582.06	241.79	2463.80	7.68	0.16	0.14	1.08	0.86	8.99
#2-25 GU without air 0-14% FA/SC	313.45	4.03E-06	1.39	0.14	25.57	2727.29	2496.32	230.97	2527.16	7.30	0.16	0.14	1.06	0.86	8.98
#3-25 Industry Average Benchmark	304.52	4.19E-06	1.38	0.14	25.15	2678.60	2454.90	223.70	2414.43	7.06	0.16	0.14	1.03	0.86	8.97
#4-25 GU with air 15-29% FA	295.20	3.82E-06	1.32	0.13	24.27	2587.19	2370.43	216.76	2391.48	6.82	0.16	0.14	1.01	0.86	8.96
#5-25 GUL with air 15-29% FA	266.72	3.61E-06	1.18	0.12	21.10	2464.10	2250.69	213.41	2380.01	6.87	0.16	0.14	0.98	0.86	8.96
#6-25 GU without air 15-29% FA	283.03	3.70E-06	1.27	0.13	23.49	2503.26	2295.99	207.27	2459.05	6.49	0.16	0.14	1.00	0.86	8.95
#7-25 GUL without air 15-29% FA	256.05	3.51E-06	1.14	0.12	20.49	2386.61	2182.52	204.09	2447.82	6.54	0.16	0.14	0.97	0.86	8.95
#8-25 GU with air 30-40% FA	260.47	3.45E-06	1.18	0.12	21.90	2331.35	2141.65	189.70	2313.30	5.90	0.16	0.14	0.95	0.86	8.93
#9-25 GUL with air 30-40% FA	236.07	3.27E-06	1.06	0.11	19.19	2225.97	2039.14	186.83	2303.95	5.94	0.16	0.14	0.92	0.86	8.93
#10-25 GU without air 30-40% FA	250.14	3.36E-06	1.14	0.11	21.25	2261.07	2079.43	181.64	2385.41	5.61	0.16	0.14	0.94	0.85	8.91
#11-25 GUL without air 30-40% FA	227.03	3.19E-06	1.03	0.11	18.68	2161.11	1982.19	178.92	2375.79	5.65	0.16	0.14	0.91	0.85	8.91
#12-25 GU with air 25-34% SC	267.59	4.67E-06	1.32	0.14	23.41	2477.80	2283.85	193.95	2337.50	6.03	0.16	0.14	0.95	0.88	8.92
#13-25 GUL with air 25-34% SC	243.41	4.50E-06	1.20	0.13	20.72	2373.36	2182.26	191.11	2328.25	6.08	0.16	0.14	0.92	0.88	8.92
#14-25 GU without air 25-34% SC	256.89	4.51E-06	1.27	0.13	22.68	2399.76	2214.09	185.67	2408.34	5.74	0.16	0.14	0.94	0.88	8.91
#15-25 GUL without air 25-34% SC	233.98	4.35E-06	1.16	0.12	20.13	2300.69	2117.72	182.97	2398.80	5.78	0.16	0.14	0.91	0.88	8.91
#16-25 GU with air 35-50% SC	243.70	4.88E-06	1.26	0.13	22.18	2339.38	2164.56	174.81	2286.98	5.38	0.16	0.14	0.90	0.88	8.90
#17-25 GUL with air 35-50% SC	222.75	4.72E-06	1.16	0.13	19.86	2248.97	2076.61	172.35	2279.41	5.41	0.16	0.14	0.87	0.88	8.90
#18-25 GU without air 35-50% SC	234.27	4.71E-06	1.22	0.13	21.52	2268.74	2101.20	167.55	2360.81	5.12	0.16	0.14	0.89	0.88	8.89
#19-25 GUL without air 35-50% SC	214.41	4.56E-06	1.12	0.12	19.31	2182.89	2017.67	165.21	2352.55	5.15	0.16	0.14	0.87	0.88	8.89

What are EPDs?

Issues with the CRMCA Member Industry-Wide EPD Report

- National averages are not very useful
  - Too many averaged inputs which cause the data to become irrelevant
- Regional averages and even plant specific values is where the industry is heading

Where is the industry heading?

- Embodied Carbon of **Materials**
  - Extraction and manufacturing
- Embodied Carbon of **Buildings**
  - Materials + transportation, construction
  - (sometimes) end of life carbon impacts

i.e. "upfront" carbon

Where is the industry heading?

Working in Partnership with the NRC:

- Development of Regional Industry Average EPDs
- Creation of simple calculators to allow for quick and accurate carbon evaluations
- Supporting innovation and performance specifications

Federal Government Specifications:

- Specification of PLC
- Minimum 20% SCM if PLC isn't available
- Industry Average EPD until April 1, 2023
- Facility Specific Type III EPD after April 1, 2023
- Maximizing GWP reduction is a design requirement

Where is the industry heading?

Specifications - Northeast Scarborough Community Recreation Center

7. CONCRETE PROPERTIES:

GENERAL (AREAS NOT INCLUDING PARKING)

ELEMENT	COMPRESSIVE STRENGTH (MPa) 28 DAYS U.N.O.	EXPOSURE CLASS	GWP
FOOTINGS	30 MPa (56 DAYS)	N	256
SLAB ON GRADE INTERIOR)	25 MPa	N	234
SLAB ON GRADE (EXTERIOR)	32 MPa	C-2	278
RETAINING/ FOUNDATION WALLS	35 MPa	F-2	329
SHEAR WALLS	35 MPa	N/F-2	CLASS N: 285 CLASS F-2: 329
OTHER WALLS	35 MPa	N/F-2	CLASS N: 285 CLASS F-2: 329
POOL WALLS AND POOL SLAB-ON-GRADE	SEE S200 FOR STRENGTH, EXP. CLASS AND ADD'L REQUIREMENTS		329
COLUMNS	SEE SCHEDULE (56 DAYS)	N/F-2	CLASS N: 285 CLASS F-2: 329
TOPPING ON STEEL DECK	25 MPa	N	234
MECHANICAL HOUSEKEEPING PADS	20 MPa	N	234
SLABS, BEAMS, AND SLAB BANDS	SEE PLANS	N	285

NOTE:
1. USE F-2 EXPOSURE FOR EXTERIOR CONCRETE ELEMENTS. USE N EXPOSURE FOR INTERIOR CONCRETE, OR ELEMENTS PROTECTED BY A MEMBRANE.
2. "GWP" DENOTES GLOBAL WARMING POTENTIAL, DETERMINED IN ACCORDANCE WITH THE CANADIAN READY MIXED CONCRETE ASSOCIATION'S ENVIRONMENTAL PRODUCT DECLARATION.

Concerns:

- Units on GWP? Typically kg/CO_2 per m^3
- Absolute values
  - Seasonal mix designs not discussed
  - Delays to project?
  - Not a % reduction
- Do values make sense? TBD with Ontario Industry Average EPD initiative

Where is the industry heading?

Specifications - Northeast Scarborough Community Recreation Center

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#12-25 GU with air 25-34% SC	267.59
#13-25 GUL with air 25-34% SC	243.41
#14-25 GU without air 25-34% SC	256.89
#15-25 GUL without air 25-34% SC	233.98
#16-25 GU with air 35-50% SC	243.70
#17-25 GUL with air 35-50% SC	222.75
#18-25 GU without air 35-50% SC	234.27
#19-25 GUL without air 35-50% SC	214.41

Updated report overview

Picking region relevant mix designs:

- GU & GUL for each mix design
- 5 SCM replacement levels
- Regions select SCM:
  - Slag
    - 0 - 14% (mix designs @ 0%)
    - 15 – 24% (mix designs @ 15%)
    - 25 – 34% (mix designs at 25%)
    - 35 + (mix designs at 35%)
    - **50 + (mix designs at 50%) - requested**

- 20MPa Concrete with air
- 20MPa Concrete without air
- 25MPa Concrete without air
- 25MPa Concrete without air & 0.55 w/cm (N-CF)
- 30MPa Concrete with air
- 30MPa Concrete without air
- 32MPa Concrete with air & 0.45 w/cm (C-2)
- 35MPa Concrete with air & 0.40 w/cm (C-1)
- 35MPa Concrete without air
- 40MPa Concrete without air
- 40MPa Concrete with air
- 45MPa Concrete without air
- 45MPa Concrete with air
- 50MPa Concrete with air
- 50MPa Concrete without air
- 55MPa Concrete without air
- 60MPa Concrete without air
- 70MPa Concrete without air ??

Athena Sustainable Materials Institute

www.athenasmi.org

Canadian Concrete Industry EPD Development

James Salazar
Athena Sustainable Materials Institute
October 6, 2021

Agenda

1. Updated industry EPDs
2. Why participate
3. Timeline
4. Data requirements

Athena Institute - who we are, what we do

- A not-for-profit research organization established in 1997, with staff in Ottawa, Toronto, Vancouver and Pennsylvania.
- Work in partnership with forward-looking organizations focused on advancing a more sustainable built environment.
- Our core (common-good) program is supported through membership funds and grants.
- Fee for service consulting:
  - LCAs, PCRs and EPD services
  - LCA review & EPD verification
  - Life cycle policy analysis

Athena
Impact Estimator
for Buildings

www.athenasmi.org

https://calculatelca.com/

1. Updated industry EPDs
2. Why participate
3. Timeline
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Project Objectives

1. LCA per updated NSF PCR and incorporating current cement EPDs
2. Develop 7 Regional EPDs for up to 144 ready-mix concrete mix designs to be externally verified and registered with CRMCA's EPD Program Operator
3. Build out regionalized EPD calculator

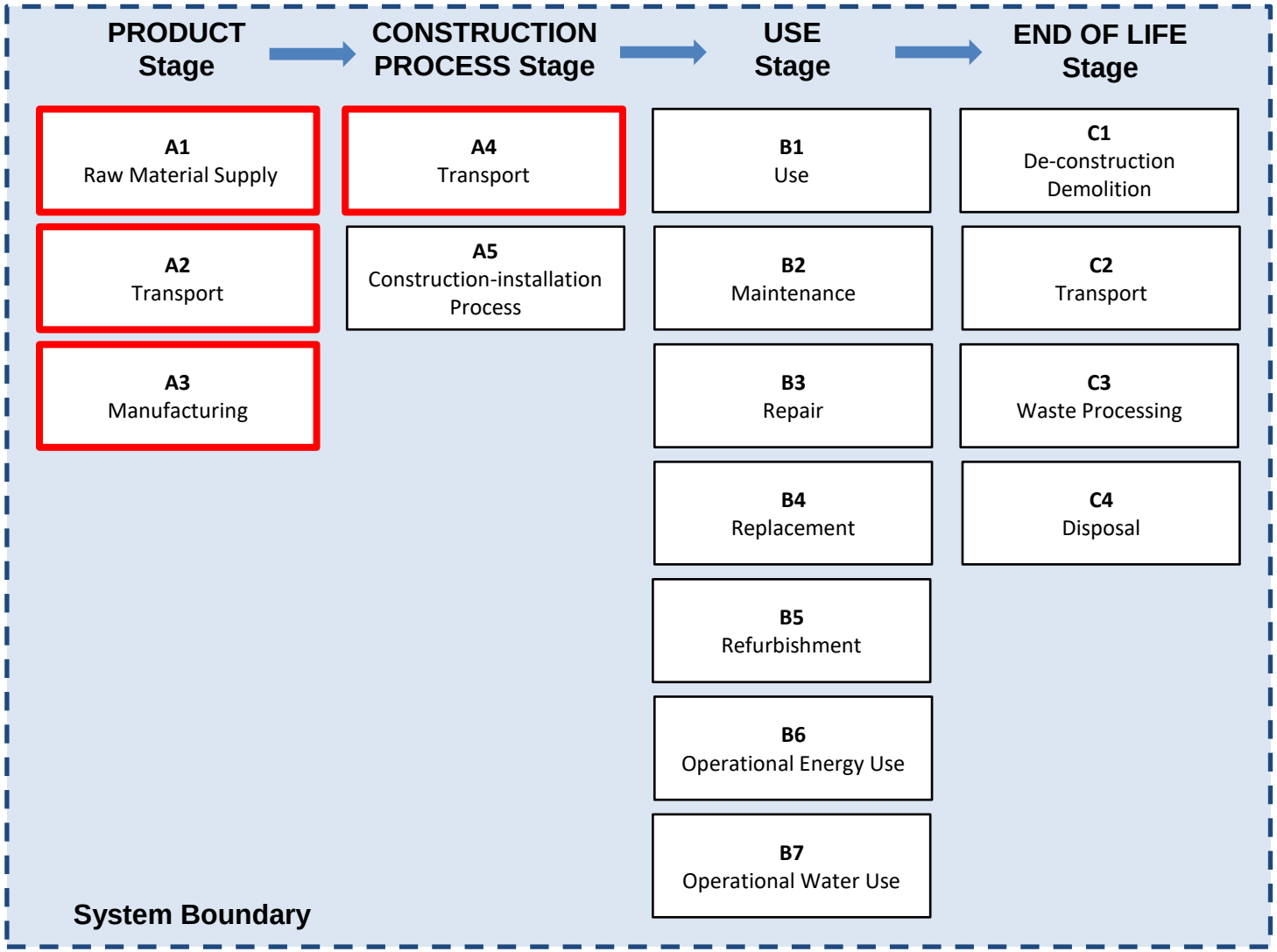
Provincial/Regional Breakdown

1. BC
2. Alberta
3. Saskatchewan
4. Manitoba
5. Ontario
6. Quebec
7. Atlantic Canada (PEI, NB, NS, NFLD)

Roles

- CRMCA is the commissioner of the LCA and EPD
  - Regional LCA TC to advise on the project
- EPD Program Operator - TBD (previously NSF)
  - Coordinates LCA review, EPD verification and registers the EPDs
  - Verify EPD Calculator
- Athena Institute – contracted to conduct LCA, prepare regional industry average EPDs (English & French)

EPD Scope - Cradle-to-Gate (A1 to A3)



Exclude Construction, Use and EOL Stages

Declared unit - cubic yard (m^3) of ready mixed concrete
B2B focus

A4 – transit mixing (power take-off energy study used to est. mixing)

Scope of LCA/EPD

- Raw Materials used (A1) – governed by mix designs
- Raw Materials Transport (A2) – to be collected from CRMCA members on a regional and plant by plant basis
- Manufacturing (A3) – 2020 inputs/outputs also to be collected from CRMCA member plants
- Fleet Energy Use (A4) – collected from CRMCA member plants

1. Updated industry EPDs
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Benefits of Participation

- Must have participated to benchmark against averages
- Ensures representation and promotion of high-quality industry data
- Onboarding to do company-specific EPDs

Manage Mix Information

Show mixes for this plant.

Plant

Mckinney

Mix

McKinney Mix 24601

Show

Mix				Add
Ingredient	**Amount**	**Units**	**Supplier**	**Action**
Portland Cement	3,000	kg	Lehigh Hanson Materials Limited	Edit Delete
Crushed Coarse Aggregate	1,000	kg	Inland Aggregates Ltd.	Edit Delete
Crushed Fine Aggregate	1,000	kg	Fine Aggregates	Edit Delete
Water Reducing Retarding Admixture	1	kg	Admixture Supplier	Edit Delete
BatchWater	150	kg	N/A	Edit Delete

Updated: 10/6/2021 1:21:56 AM

Impact Summary			
Impact	**Units**	**Per yd^3**	**Per m^3**
Climate Change	kg CO2e	23535.92	30783.82
Ozone Depletion	kg CFC11e	6.80E-04	8.90E-04
Acidification	kg SO2e	58.19	76.11
Eutrophication	kg Ne	34.45	45.06
SFP (smog)	kg O3e	1143.19	1495.24

Calculated: 10/6/2021 1:21:57 AM

1. Updated industry EPDs
2. Why participate
3. Timeline
4. Data requirements

Project Schedule

Activity Tasks	Elapsed Time	Completion Date
1. Scope and plant directory development. Each regional association submits their plant directories, mix designs and benchmarks for inclusion in their EPD.	8 weeks	Oct 31/21
2. Collect and verify primary LCI survey data. Prepare statistical summary report.	8 weeks	Dec 31/21
3. Model industry average LCI data, secure secondary LCI data (e.g., plant specific GU/GUL cement data), and complete LCIA analysis.	8 weeks	Feb 28/22
4a. Prepare draft LCA report and circulate report to CRMCA LCA Technical Committee and EPD program operator for external review.	6 weeks	April 15/22
5. Complete peer review response, revise report and submit final LCA report.	4 weeks*	May 30/22
6. Regionalized EPD Results Calculator – to be pre-verified by EPD Program Operator. Project wrap-up web session with EPD Calculator Demo	4 weeks	June 30/22
Total Time	**40 weeks**	

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December 31 deadline for facility data

Agenda

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LCI Data Collection Questionnaire

- Data collection survey similar to that used for 2016 CRMCA study – streamlined to mix design inputs
- Web-interface to be used to collect data
- Key data collection element
  - RMC cement input to be collected on a cement plant basis
  - Large number of cement plants have EPDs & we will link to these EPDs – more supply-chain specific…

Contacts at Athena

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Hannah.Renaud@athenasmi.org

Athena Sustainable Materials Institute

Home Plant Survey Logout

Welcome Athena Concrete Co.

Welcome to the Facility Data Portal for the Canadian Ready-Mix Concrete EPD Study

1. Click here to add supplier information for your plants.
2. Click here to view your plant directory.
3. Click here to complete your plant surveys.

You have completed **1** plant survey(s) out of the **5** required.

You have added **0** supplier(s) for plant **Edmonton** .
You have added **2** supplier(s) for plant **Calgary** .
You have added **2** supplier(s) for plant **Simcoe**.
You have added **0** supplier(s) for plant **Toronto Downtown**.
You have added **0** supplier(s) for plant **Toronto Airport**.

 Build: 20210920.0810 You are logged in as **James.Salazar@mailinator.com!**

Plant List

Athena Concrete Co.

Division	Plant Name	City	Province	Plant Type	Uses SCMs	Plant Size	Selected For Study	Survey Status
Alberta	Edmonton	Edmonton	Alberta	Transit Mix	Yes	Medium	Yes	-
Alberta	Calgary	Calgary	Alberta	Central Mix	Yes	Small	Yes	Completed 10/5/2021
Ontario	Simcoe	Simcoe	Ontario	Central Mix	No	Small	Yes	-
Ontario	Toronto Downtown	Toronto	Ontario	Transit Mix	No	Medium	Yes	-
Ontario	Toronto Airport	Toronto	Ontario	Transit Mix	Yes	Large	Yes	-

 Build: 20210920.0810 You are logged in as **James.Salazar@mailinator.com!**

Add Supplier Information

Add supplier information for this plant.

Material Type

Cement

Supplier

Lafarge Canada Inc - Exshaw GU

Amount Unit of Measure

tonne

Annual amount purchased (tonne)

1000

Supplier Distance Units

km

One Way Distances From Source.

Truck Distance (km)

Rail Distance (km)

Suppliers for Toronto Airport

Name	Type	Amount	Truck	Rail	Ocean	Barge	Action
Lafarge Canada Inc - Bath GU	Cement	100000 tonne	50 km	0 km	0 km	0 km	delete edit
Lafarge Canada Inc - Bath GUL	Cement	70000 tonne	50 km	0 km	0 km	0 km	delete edit
Crushed Coarse Aggregate	Aggregate	5000000 tonne	21 km	0 km	0 km	0 km	delete edit
Natural Fine Aggregate	Aggregate	5000000 tonne	17 km	0 km	0 km	0 km	delete edit
Accelerating Admixture - Chlorides	Admixture	40 tonne	100 km	0 km	0 km	0 km	delete edit

5 supplier(s).

Survey Completion

Toronto Airport

General

Reporting Period

Start Date	01/01/2020
End Date	12/31/2020

Plant Information

Concrete Production

Total Ready-mixed Concrete Production in 2020		m3
Batch Waste		%

Survey Completion

Purchased Energy

Purchased Electricity - Used at Plant		kWh
Purchased Electricity From Green Grid		kWh
Site Generated Renewable Electricity (solar, wind) - Used at Plant		kWh
Site Generated Bio Based Electricity (wood waste) - Used at Plant		kWh
Site Generated Renewable Electricity (solar, wind) - Sold		kWh
Site Generated Bio Based Electricity (wood waste) - Sold		kWh
Natural Gas - Used at Plant		m3
Secondary Fuels - Liquid		l
Secondary Fuels - Solid		tonne
Fuel Oil - Used at Plant		l
Diesel - Used at Plant		l
Gasoline - Used at Plant		l
LPG (Liquified Propane Gas) - Used at Plant		l
Diesel - Used in Fleet		l
Natural Gas - Used in Fleet		m3

Survey Completion

Annual Plant Consumables

Road Dust Control Chemicals (e.g. chlorides)		l
Oil and Lubricants		l
Grease		l

Water Use

Total Water Use		l
Percentage of Batch Water That Is Recycled Wash Water		%

Waste Generated

Hazardous Solid Waste		l
Non-Hazardous Solid Waste		l

Survey Completion

Air Emissions (if tracked)

Particulates, PM-2.5		kg
Particulates, PM-10		kg
Particulates, total		kg
Lead		kg
Hg		kg
CO		kg
NOx		kg
SOx		kg
VOC		kg

Water Emissions (if tracked)

Total Suspended Solids		kg
Total Dissolved Solids		kg
Biological Oxygen Demand (BOD)		kg
Chemical Oxygen Demand (COD)		kg

Questions?

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