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**Information Item No. 3**  
**Environment and Sustainability Standing Committee**  
**December 7, 2020**

**TO:** Chair and Members of the Environment and Sustainability Standing Committee

**SUBMITTED BY:** Original Signed  
Brad Anguish, P.Eng., Executive Director, Transportation and Public Works

Original Signed  
Jacques Dubé, Chief Administrative Officer

**DATE:** November 26, 2020

**SUBJECT:** Procurement of CO<sub>2</sub> Mineralized Concrete in Municipal Projects

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**INFORMATION REPORT**

**ORIGIN**

At the September 5, 2019, Environment and Sustainability Standing Committee meeting, Councillor Cleary moved: "That the Environment & Sustainability Standing Committee request a staff report on the environmental and financial benefits and costs of the procurement of CO<sub>2</sub> mineralized concrete in municipal projects."

**LEGISLATIVE AUTHORITY**

*Halifax Regional Municipality Charter, R.S.N.S. 2008, c. 39:*

**Purposes of Municipality**

**7A** The purposes of the Municipality are to (a) provide good government; (b) provide services, facilities and other things that, in the opinion of the Council, are necessary or desirable for all or part of the Municipality; and (c) develop and maintain safe and viable communities.

**Municipal expenditures**

**79A (1)** Subject to subsections (2) to (4), the Municipality may only spend money for municipal purposes if (a) the expenditure is included in the Municipality's operating budget or capital budget or is otherwise authorized by the Municipality;

Administrative Order 2020-004ADM, Procurement Administrative Order:

## Social Procurement

21. (2) In each call for bids the Procurement Section and the Department responsible for the purchase shall consider including evaluation criteria and/or contract requirements that aim to achieve social value or social impacts such as: (e) environmental benefits.

## BACKGROUND

The Halifax Regional Municipality (HRM) owns and maintains approximately 970 kilometers of sidewalk, over 10,000 pedestrian ramps, 2,200 kilometers of curb, 106 bridges and hundreds of retaining walls, predominantly constructed using Portland or hydraulic cement concrete (concrete). In addition, several buildings, transit facilities and park facilities are also constructed using concrete. Each year HRM makes significant investments in its concrete infrastructure. In 2019, the work associated with the Capital Program, involved placing approximately 12,000 cubic meters of concrete.

On September 5, 2019, the Dartmouth based clean technology company, CarbonCure Technologies Inc. (CarbonCure), provided an informational presentation to the Environment and Sustainability Standing Committee. The presentation included an overview of the technology and some of the environmental benefits. The technology is based on the concept of "CO<sub>2</sub> Mineralization". The CarbonCure technology involves injecting waste CO<sub>2</sub> into fresh concrete as it is mixed, where it reacts with calcium ions from cement to form a nano-sized mineral, Calcium Carbonate (CaCO<sub>3</sub>), which becomes embedded in the concrete. As a result, this can improve the environmental footprint of concrete by reducing approximately 12 kg of CO<sub>2</sub> per cubic meter of concrete.

Similar to the work performed in 2017 to assess HRM's current practice regarding pavements and asphalt related infrastructure (Pavements and Materials Technology Review), HRM has initiated a review of their current concrete operations. Given the yearly investment in concrete infrastructure, HRM has solicited the aid of a third-party consultant to perform a Concrete Technology Review. RFP 20-308, Concrete Technology Review, closed on October 23, 2020. The purpose of the Concrete Technology Review is to review and evaluate current state of practice and identify any potential issues with HRM's concrete operations, including the potential for specifying the use of CO<sub>2</sub> Mineralized Concrete in Municipal projects.

## DISCUSSION

Using CO<sub>2</sub> mineralized concrete in the construction of new or rehabilitation of existing municipal projects, will be supportive of the unanimously passed climate action plan, HalifACT: Acting on Climate Together.<sup>1</sup> HalifACT outlines 46 actions that must be completed by both the municipality and community in order to achieve net-zero emissions by 2050 over 2016 levels. Included in these 46 actions is a commitment of net-zero municipal operations by 2030, which was specifically endorsed by Halifax Regional Council on June 23, 2020.<sup>2</sup> This target includes converting the existing corporate fleet to zero emitting alternatives, performing deep energy retrofits on all existing corporate buildings and ensuring that all new corporate buildings are built to a net-zero emission standard. Net-zero emissions refers to the end state where we reduce emissions as low as possible using existing tools and technologies and then offset the remaining using carbon capture techniques and purchased carbon offsets. One proven carbon capture technique is CO<sub>2</sub> mineralized concrete. The carbon capture realized when employing this technology for new municipal infrastructure like sidewalks and bridges can be used to offset the remaining emissions of new and existing corporate buildings. Pending the specific end application of the CO<sub>2</sub> mineralized concrete, eCO<sub>2</sub> sequestration amounts are estimated at 12 kg/m<sup>3</sup>.<sup>3</sup> To put this into perspective, using CO<sub>2</sub> mineralized concrete for the 12,000 m<sup>3</sup> of concrete required by the Municipality under the 2019 Capital Program would sequester 144 tonnes of eCO<sub>2</sub>. This would be equivalent to the annual offset of a 170 kW of solar electric system. The specific emission reduction potential will be outlined in the forthcoming Concrete Technology Review.

<sup>1</sup> HalifACT 2050: Acting on Climate Together [https://www.halifax.ca/sites/default/files/documents/about-the-city/energy-environment/HRM\\_HaliFACT\\_vlssued%20with%20Foreword.pdf](https://www.halifax.ca/sites/default/files/documents/about-the-city/energy-environment/HRM_HaliFACT_vlssued%20with%20Foreword.pdf)

<sup>1</sup> <https://www.halifax.ca/sites/default/files/documents/city-hall/regional-council/200623rc-mins.pdf>

<sup>1</sup> <https://www.halifax.ca/sites/default/files/documents/city-hall/standing-committees/190905essc1031pres.pdf>

Successfully using this technology in municipal projects will be supportive of the longer term HalifACT action: Include embodied carbon in new construction standards for buildings. Embodied carbon can be quantified as the carbon emissions produced when construction materials are produced, transported and assembled as well as those produced through building maintenance, repairs and decommissioning. Most embodied carbon emissions come from the initial construction phases so encouraging the use of innovative, carbon reducing construction materials like that of CO<sub>2</sub> mineralized concrete will help position the municipality as a leader in low carbon construction.

The majority of the concrete (>90%), utilized in municipal projects, is utilized for exterior applications such as sidewalks, curb and bridges. Long term durability of the concrete is of great importance given that the anticipated service life of this infrastructure is 50 years or greater.

CO<sub>2</sub> mineralized concrete is a relatively new technology and there are limited long term studies on exposed concrete utilized in climates similar to that of Halifax. With the importance of long-term durability, having a third-party review current practice and potential changes to HRM operations is important. A reduction in anticipated service life in concrete infrastructure would likely negate any long-term environmental benefits. The Concrete Technology Review is scheduled to be completed in August of 2021 and will consist of, but not be limited to, the following:

- a. Evaluation of current state of practice;
- b. Identify effective and ineffective areas of HRM current practice;
- c. Review of current concrete specifications, including quality management for cold/warm weather concreting;
- d. Review of concrete design details located in the Municipal Design Guidelines with specific attention to expansion joints, joint sealants, pedestrian ramps and concrete located under pavers;
- e. Review of concrete maintenance practices including repair procedures and repair materials/products;
- f. Review of rehabilitation strategies for concrete infrastructure (streets, curb, sidewalk, etc.);
- g. Review current practice for precast concrete design and quality assurance;
- h. Review quality assurance procedures for cast-in-place concrete;
- i. Review quality concerns regarding spalling of newly placed curb and sidewalk;
- j. Review of infrastructure currently affected by Alkali Silica Reactivity (ASR) and providing recommendations on strategies that could potentially extend the service life of these assets (predominantly concrete curb and gutter);
- k. Help understand how ASR will influence asset service life and what factors can accelerate deterioration;
- l. Review current practice concerning sustainability;**
- m. Review the environmental and financial impacts of CO<sub>2</sub> mineralized concrete in municipal projects, including an assessment of the potential influence on long-term durability of exposed concrete.**

In addition to the items listed above, jurisdictional scans will be completed to see how other jurisdictions are utilizing CO<sub>2</sub> mineralized concrete or if other sustainability initiatives have been adopted. Also, HRM Project Planning and Design staff will work with HRM Procurement and the third-party consultant to confirm the potential impacts on the competitive bid process.

Once the Concrete Technology Review has been completed, HRM staff will review the recommendations/feedback provided by the third-party consultant and will return with an update to the Environment and Sustainability Standing Committee. It is anticipated that staff will return with an update prior to end of Q4, 2021/22.

<sup>1</sup> HalifACT 2050: Acting on Climate Together [https://www.halifax.ca/sites/default/files/documents/about-the-city/energy-environment/HRM\\_HaliFACT\\_vlssued%20with%20Foreword.pdf](https://www.halifax.ca/sites/default/files/documents/about-the-city/energy-environment/HRM_HaliFACT_vlssued%20with%20Foreword.pdf)

<sup>1</sup> <https://www.halifax.ca/sites/default/files/documents/city-hall/regional-council/200623rc-mins.pdf>

<sup>1</sup> <https://www.halifax.ca/sites/default/files/documents/city-hall/standing-committees/190905essc1031pres.pdf>

### **FINANCIAL IMPLICATIONS**

There are no financial risks to HRM at this point in time. Future financial impacts will be assessed as part of the Concrete Technology Review.

### **COMMUNITY ENGAGEMENT**

There is no requirement for community engagement at this time.

### **ATTACHMENTS**

N/A

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A copy of this report can be obtained online at [halifax.ca](http://halifax.ca) or by contacting the Office of the Municipal Clerk at 902.490.4210.

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<sup>1</sup> HalifACT 2050: Acting on Climate Together [https://www.halifax.ca/sites/default/files/documents/about-the-city/energy-environment/HRM\\_HaliFACT\\_vlssued%20with%20Foreword.pdf](https://www.halifax.ca/sites/default/files/documents/about-the-city/energy-environment/HRM_HaliFACT_vlssued%20with%20Foreword.pdf)

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