Guide to the Code of Practice for the BC Concrete and Concrete Products Industry

Version 6
August 2010

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DISCLAIMER

Although this guidance document is intended to be as comprehensive as possible, its overall purpose is to provide a broad overview of the Ministry of Environment's requirements with respect to waste and waste discharges that may result from the activities and operations of the concrete and concrete products industry.

This guidance document does not replace or affect the actual legislative requirements.

For more detailed information, it is recommended that individuals refer directly to the following legislation and regulations:

Environmental Management Act (S.B.C. 2003, c. 53);

Waste Discharge Regulation (B.C. Reg 320/2004);

Sewerage System Regulation (B.C. Reg. 326/2004); and

Code of Practice for the Concrete and Concrete Products Industry.

If there is any conflict between this document, the *Environmental Management Act* or any other act *or* regulation, the Acts and regulations take precedence.

1 INTRODUCTION

1.1 Authority

On November 1, 2007, the *Code of Practice for the Concrete and Concrete Products Industry* was enacted. It has been effective since March 1, 2008.

Compliance with the *Code Practice for the Concrete and Concrete Products Industry* provides an authorisation to discharge waste from industrial operations in the concrete industry sector and has replaced the need for individual permits.

The code was made pursuant to the *Environmental Management Act*, S.B.C. 2003, c. 53, s. 22 and the *Waste Discharge Regulation*, B.C. Reg. 320/2004, s. 4 and s. 11.

1.2 Purpose

This guidance document has been prepared to provide ready-mixed concrete plant managers and employees with information to assist them in operating their facility in accordance with the terms and conditions of the *Code Practice for the Concrete and Concrete Products Industry* (the Code of Practice).

This document outlines environmental management practices that are practical for the ready-mixed concrete industry with the intention of minimizing or reducing the potential impacts that may result from day-to-day plant operations.

Ready-mixed concrete producers may also use this information when preparing specifications for constructing a new establishment or for the expansion and upgrade of an existing establishment.

In comparison with other primary manufacturing facilities or activities, ready-mixed concrete plant operations do not generally pose a significant threat to the environment. This does not preclude the importance of environmental awareness by the plant manager or employees.

It is important to recognize at all times that ready-mixed concrete plant activities and operations), without proper controls and mitigation measures, can result in adverse affects that may impact, either singularly or in combination, the key components of the environment:

- air, land and water, both organic and inorganic matter;
- all living organisms; and
- all interacting natural systems for these components.

Some facilities, depending on location and volume of ready-mixed concretes produced, may require greater control and management of onsite environmental issues. Prevailing wind conditions or different land uses adjacent to the plant site may result in more rigorous or modified dust suppression activities.

The presence of open water or watercourses (natural or man-made) near the site, should result in more stringent controls for process water or storm water drainage from the property, especially for potable water sources or watercourses containing fish or fish habitat.

High volume or specialized production may introduce specific waste management concerns for handling return concrete. Protection of groundwater in the vicinity of concrete plants is also an important consideration. These are just a few examples provided in demonstrating the challenges of environmental management.

Pollution Prevention involves the use of processes, practices, materials, products or energy that avoids or minimizes the creation of pollutants and waste or environmental disturbance, and reduces risk to human health or the environment. Pollution Prevention principles should be considered when developing the environmental management program components for the ready-mixed concrete plant and the plant site.

Basic environmental management should consider the following components:

- confirming all environmental aspects associated with establishment activities and operations for ready-mixed concrete production or delivery;
- identifying the potential environmental impacts that may result during all phases of ready-mixed concrete production or delivery; and
- using mitigation measures, best management practices and available technologies, to reduce, reuse or recycle waste materials or eliminate potential environmental impacts.

1.3 Definitions and Interpretation

For application and interpretation purposes, the Code of Practice provides the specific definitions for the ready-mix concrete plant, its activities and operations:

- "**concrete and concrete products industry**" means establishments, except home-based businesses, educational facilities and establishments of hobbyists or artisans, engaged in manufacturing ready-mix concrete or concrete products;
- "**establishment**" means an establishment in the concrete and concrete products industry (i.e., the facility or facilities producing concrete or ready-mix concrete);
- "**establishment premises**" means, in relation to an establishment, any land, building or premises in or on which the establishment engages in manufacturing ready-mix concrete or concrete products, including any areas in or on which activities related to that manufacturing, such as selling, displaying, storing or packaging, take place (i.e., the property and infrastructure used to contain the facility or facilities producing concrete or ready–mix concrete);

- "**establishment runoff**" means runoff, whether from rainfall, snow or snowmelt, at or from establishment premises (i.e., any surface runoff being discharged offsite from the property or infrastructure used to contain the facility or facilities producing concrete or ready–mix concrete);
- "**groundwater**" The definition for "groundwater" has the same meaning as in the *Municipal Sewage Regulation*, B.C. Reg. 129/99. It means subsurface water at or below a water table in fully saturated geologic materials and formations;
- "**process water**" means, in relation to an establishment, any water-based discharge produced in the course of manufacturing concrete products or read-mix concrete at establishment premises, including such discharge resulting from the use of water in:
    - Dust suppression at establishment premises, or
    - Cleaning establishment premises or any vehicle or other facility of the establishment,

  but does not include domestic sewage, as defined in the Sewerage System Regulation (i.e., any water coming into contact with the facility or facilities producing concrete or ready-mix concrete or any water coming into contact with sludge or waste concrete);
- "**surface water**". The definition for "surface water" has the same meaning as in the Sewerage System Regulation, B.C. reg. 326/2004. It means a natural watercourse or source of fresh water, whether usually containing water or not, and includes

  (a) a lake, river, creek, spring, ravine, stream, swamp, gulch and brook, and

  (b) a ditch into which a natural watercourse or source of fresh water has been diverted,

  but does not include ground water or water in a culvert that is constructed to prevent the contamination of a watercourse by domestic sewage or effluent;
- "**sludge**" means sand, gravel or cement deposits that accumulate in a settling pond or settling basin (i.e., any cementitious materials, silt, sand and gravel or any combination thereof) ;
- "**waste concrete**" means, in relation to an establishment, any sludge or concrete or both, which are produced in the operations of the establishment but are not used, recycled or reused in the manufacture of concrete products or ready-mix concrete or for any other purpose.

Silo emissions as described in the Code of Practice and "**process water**" as defined are prescribed as waste for the purposes of paragraph (g) of the definition of "waste" in the *Environmental Management Act* (S.B.C. 2003, c. 53).

1.4 Code of Practice and Regulations

Any waste discharges resulting from concrete, concrete products or ready-mixed concrete production that can be discharged from the facility are subject to the regulations.

The WMA was replaced by the *Environmental Management Act* (EMA) in July 2004, which provided for a Code of Practice registration as an alternative to a permit.

The *Waste Discharge Regulation* (WDR) under the EMA specifies that concrete or ready-mix concrete operations can be exempt from a permit requirement if the facility is registered under and complies with the Code of Practice.

In November 2007, the Code of Practice became law. The effective date of the Code of Practice is March 1 2008. Existing establishments (facilities or plant sites) may continue to operate under existing permits. However, any changes to the establishment that require a major amendment (i.e., any amendment that does not fit the criteria as per Section 14(4)(b) of the *Environmental Management Act*) would result in cancellation of the permit and the need to register and comply with the Code of Practice. Any new establishments must register and comply with the code in order to be authorized in order to discharge waste.

1.5 Other Regulations

Fisheries and Oceans Canada (DFO) is the federal government department responsible for the administration and enforcement of the Fisheries Act (1985) and its regulations.

Subsection 36(3) of the Fisheries Act prohibits the deposit of any deleterious substances that will adversely affect fish into waters frequented by fish or under conditions that will cause the deleterious substance to enter the waters frequented by fish (i.e., via storm drains or ditches). It is not necessary under Subsection 36(3) for the substance to cause actual harm, only that it has the potential to cause harm.

Any water, slurry or solids with an elevated pH level (greater than 9.0 Relative Units) has the potential to be considered as “deleterious substances” under Subsection 36 (3) of the Fisheries Act. DFO has wide-ranging investigative powers to enforce the Fisheries Act. Successful prosecutions of Fisheries Act violations may result in severe maximum penalties for a summary conviction or by indictment.

In summary, any wastewater and waterborne solid wastes resulting from ready-mixed concrete production that can be released or discharged from the facility (plant site) premises could be subject to the regulatory provisions of the federal Fisheries Act.

In some areas, wastewater can be discharged to a sanitary sewer. Larger municipalities may have sewerage bylaws that regulate the volume and quality of discharge into the sanitary sewers. The municipality representatives responsible for local waterworks and sewerage

infrastructure should be consulted concerning applicable guidelines for wastewater and effluent discharges or releases in the area where the facility is located.

2 REGISTRATION REQUIRED

2.1 Code of Practice Requirement

For the purposes of an exemption in relation to the Code of Practice, a person who operates a facility must register with a director under section 4 of the *Waste Discharge Regulation* (B.C. Reg. 320/2004). Applications are available from the Ministry website.

2.2 Permit or Registration Required

Any wastewater or waterborne solid wastes resulting from concrete, concrete products or ready-mixed concrete production that can be discharged from the establishment or from ready-mixed truck operations is subject to the Act and regulations. Until July 2004, the provincial *Waste Management Act* (WMA) prohibited introduction of waste into the environment in such a manner or quantity as to cause pollution and required permits for discharges to air and water of concrete and ready-mixed concrete wastes in BC.

3 DUST CONTROL

3.1 Code of Practice Objective

A person operating an establishment:

- must take measures to control dust produced in the operation of the establishment, including any dust produced at the establishment premises by traffic, storage activities or the handling of materials; and
- must ensure that such dust does not cause pollution.

3.1.1 Emissions and Controls in Metro Vancouver

The *Environmental Management Act* (EMA) delegates responsibilities for managing air quality in the Metro Vancouver area. Under this delegation, Metro Vancouver is responsible for monitoring air quality in the region, controlling industrial, commercial and some residential emissions, and creating and carrying out an Air Quality Management Plan. Metro Vancouver uses a system of permits and regulations to help manage the major sources of business and industrial emissions and restrict these contaminants. Metro Vancouver staff also monitor permitted and regulated emission sources, and enforce air emission limits. Concrete and concrete products facilities within the Metro Vancouver area are subject to Metro Vancouver Bylaws 1082, 1083 and 1084, as well as the code.

3.2 Activities and Operations

Ready-mixed concrete plants and yards generate and disperse varying amounts of dust during routine operations based on the facility's location and local climatic conditions. Depending on the location and potential receptors in the area, concerns may be raised about the extent and intensity of facility dust emissions.

Dust can be generated from a number of locations within the facility and premises:

- Delivery of cement powder and fly ash releases during silo loading;
- Delivery and stockpiling of aggregates;
- Transfer points when handling raw materials;
- Loading and drawing down aggregate bins;
- Aggregate and cement weighing;
- Truck mixer loading and charging; and
- Equipment and vehicle traffic.

Additional dust sources resulting from the facility are engine exhaust emissions from fixed or mobile equipment and boiler emissions.

Dust dispelled or removed through a vent, flue, chimney or stack from the facility or premises, including either mobile or fixed equipment, are typically defined as a “point source” emission. An example of a point source emission for dust is the vented exhaust from a silo baghouse.

Dust released from the exposed surfaces of features and structures around the facility or plants site, that are not reasonably controlled using a vent, flue, chimney or stack, are typically defined as a “fugitive source” emission. An example of a fugitive source emission for dust would be the observed dust plume from an aggregate stockpile or dust from equipment or vehicle traffic within the plant site.

3.3 Pollution Prevention

The ready-mixed concrete plant’s air quality management program should address the following objectives:

- Identify all sources for dust emissions that are released into the atmosphere from the facility and plant site property by activities and operations;
- Collect airborne particulates from point source dust emissions through air filtration mechanisms where practical; and
- Suppress the airborne particles from fugitive source dust emissions generated from the plant and plant site property.

It is important for any air quality management program to also consider local climatic conditions for the plant site, with consideration for prevailing wind directions, average daily temperatures and seasonal precipitation.

3.3.1 Batch Plant Operations

The proper handling or transfer of aggregates and other raw materials into or within the batch plant can help minimize and eliminate batch plant dust emissions. Some options for minimizing dust emissions from batch plant operations:

- Fine tune the batching sequence to deliver a smooth, controlled flow of raw materials into the plant mixer;
- Consider covers or partial enclosures for elevated conveyors into plant;
- Enclose or shield aggregate storage areas and transfer points; and
- For new batch plant construction, consider batch plant location in an area with minimum exposure to prevailing winds.

3.3.2 Aggregate Storage and Operations

Changing the storage or handling practices used for aggregates and any other raw materials around the plant site can help minimize and eliminate plant site fugitive dust emissions. Some options for minimizing dust emissions from batch plant operations:

- Consider higher moisture content in aggregates;
- Partial enclosures or below grade pads for aggregate stockpile areas;
- Minimize exposed surface area of aggregate stockpiles;
- Minimize number of transfer points for raw materials;
- Minimize drop heights for conveyor or hoppers;
- Consider fencing property boundaries using 2-metre high solid fence (i.e., concrete block, wood plank or chain link with PVC plastic inserts or liners); and
- For new batch plant construction, consider batch plant location in an area with minimum exposure to prevailing winds.

3.3.3 High Traffic Areas

Some options are provided for minimizing dust emissions from plant site traffic:

- Consider paving or hard surfacing of high traffic areas around plant site and yard;
- Keep paved or hard surfaced areas clean from dust;
- Regular dust suppression using water or chemical dust suppressants; and
- For new batch plant construction, consider batch plant location in an area with minimum exposure to prevailing winds.

3.4 Pollution Controls

3.4.1 Dust Suppression

Small water droplets, produced by water sprinklers or water spray bars, are an effective dust suppression measure. The dust particles cling to the small water droplets, preventing the dust particles from becoming airborne.

Some options are provided for dust suppression:

- Using a water spray bar or spray ring to rinse down the charge hopper at the truck mixer load point;
- Using a water truck with spray bars for wetting down plant yard surfaces and roadways; and
- Wetting down aggregate stockpiles using water spray bars or sprinklers.

Some options for dust suppression would also require coordination with water management for the plant site property:

- Using spray bars for dust suppression at aggregate transfer points (e.g., at the end of the conveyor belt charging the aggregate bins); or

- Installing a soaker hose or spray bar at the plant yard entrance for mixer truck or aggregate haul truck wheel wash.

3.4.2 Dust Collection

Dust collection systems provide another option to prevent the release of dust emissions from the facility (e.g., central vacuum collector system and baghouse with individual fabric bags or cartridge filters). See Section 4.0.

3.4.3 Engine Exhaust Systems

Engine exhaust systems for all fixed and mobile equipment or vehicles in use at the plant site provide multiple point source emissions. As mixer trucks wait in the yard, it is important to minimize the amount of engine idling time to reduce exhaust emissions and save fuel. Maintaining correct engine-operating temperatures also helps in reducing exhaust emissions and prolongs equipment and vehicle life.

A regular preventive maintenance program will keep equipment and vehicle engines running at optimal performance. Equipment and vehicle pollution control devices should also be inspected during regular intervals in conjunction with preventative maintenance inspections.

3.4.4 Boilers

Emissions from facility boiler operations must not cause pollution. For optimal emissions, ensure that the boiler is operated in accordance with the manufacturer's specifications. When using fuel oil, ensure that its composition complies with applicable regulations for sulphur content. Total emissions are lower for boilers that use natural gas instead of fuel oil.

4 AUTHORIZED DISCHARGE: SILO EMISSIONS AND AIR QUALITY

4.1 Code of Practice Objective

If there is a silo at or on an establishment premises, a person operating the establishment:

- must implement a particulate control system for collection, control and suppression of emission discharged to the air from the silo, and
- must ensure that those silo emissions do not cause pollution;

The opacity of silo emissions discharged to the air must not exceed 10% averaged over 6 consecutive minutes. The operator must ensure that the particulate control system is inspected at least once a month to verify that it is in good working order.

4.1.1 Air Emissions in the Metro Vancouver area

Concrete and concrete products facilities within the Metro Vancouver area are subject to Metro Vancouver Bylaws 1082, 1083 and 1084, as well as the code. (see Section 3.1.1).

4.2 Pollution Controls

4.2.1 Baghouses

A baghouse contains a series of fabric bags or cartridge filters that capture the dust for disposal. In most cases, the collected dust can be recycled, eliminating the need for disposal. It is important that plant personnel have easy access to the baghouse for inspection and maintenance on a regularly scheduled basis.

Some best management practices for ensuring proper baghouse operation:

- Pulse air, agitation mechanisms should be checked regularly;
- Fabric bags should be of correct size and fitted properly;
- Bags and cartridges must be inspected at regular intervals;
- Replace any damaged or torn fabric bags observed during inspections;
- The silo pop valve should be checked regularly; and
- Keep written records of all inspections and maintenance.

4.2.2 Vacuum Collector Systems

Vacuum collector systems may be considered where dust emissions control at the facility is a significant issue. Vacuum collector systems have suction shrouds for major point source emissions (i.e., at the truck mixer load point or at the cement weigh hopper) and the dust is pulled by the vacuum flow to a baghouse for collection. Individual fabric bags or cartridge filters can be installed at vents on top of cement and fly ash silos to capture dust that is generated as the silos are being filled or drawn down.

5 DISPOSAL OF WASTE CONCRETE

5.1 Code of Practice Objective

A person operating an establishment must ensure that waste concrete is not disposed of in a manner that causes pollution.

5.2 Activities and Operations

A ready-mixed concrete plant facility must consider how waste concrete is managed without adversely affecting the environment.

Waste concrete can result in solid wastes and waste by-products:

- Concrete in a hardened or semi-hardened state;
- Reclaimed aggregate generated by a mechanical reclaimer;
- Slurry (or sludge) generated by a mechanical reclaimer; and
- Slurry, process water and wastewater from settling pond systems

There are a number of recommended solid materials management practices that plant managers could employ at the establishment premises to reduce the amount of waste by-products that must be disposed. Some options used for managing returned concrete:

- Re–using returned concrete before it has set;
- Producing pre-cast products;
- Discharging to a mechanical reclaimer;
- Using admixtures to stabilize concrete for later use; and
- Discharging at designated site for disposal or aggregate reclaim.

5.3 Pollution Prevention

5.3.1 Re-using Returned Concrete

Where operational and quality control restraints allow, incorporate the returned concrete into succeeding batches. This process must be closely monitored. There are many variables that can affect the success of this procedure, such as the strength, age, volume and temperature of the returned concrete and the size of the succeeding batch of concrete.

5.3.2 Producing Pre-cast Concrete Products

Having pre-cast forms and moulds on the establishment premises for interlocking blocks, highway barriers, curbs, etc. is a widespread industry option for handling returned concrete. An interlocking block form may use up to one cubic meter of returned concrete. Pre-cast products can then be used onsite or sold to customers.

5.3.3 Concrete Stabilization Using Admixtures

Hydration stabilization admixtures (HSA) will retard or suspend the hydration process of the cementitious portion of concrete, allowing rinse water and returned concrete to be reused for subsequent concrete batches as determined by facility operations.

The stabilization period of returned plastic concrete can be extended to 72 hours or longer, but this requires experience and familiarity with computer-assisted technology. Admixture suppliers can advise plant managers on HSA use and application.

HSA may have the potential limitations for concrete recycling:

- Dosage rate can be affected by several factors;
- Plant manager, batcher and mixer truck drivers require training on HSA use;
- Heavier concrete build-up can be harder to clean from mixer drums and fins; and
- Returned concrete treated with HSA may not always conform to new or required concrete specifications.

5.3.4 Mechanical Reclaimer Use

There are several mechanical reclaimer systems available to the ready-mixed concrete producer. Most systems separate the aggregates from the slurry (sludge), allowing the components to be individually recycled.

Reclaimed aggregates can be reused in fresh concrete, used as clean fill material or as a road base material. The slurry (sludge) generated by reclaiming systems is reusable only where operational, specification and concrete quality restraints will allow.

Using a mechanical reclaimer system may have the following limitations:

- Capital costs for acquiring a reclaimer system;
- Operating costs for dedicated site employee and training;
- Seasonal operations where temperatures are at or below freezing; and
- Appropriate slurry monitoring procedures are required for chemical and physical characteristics that may affect concrete qualities.

5.4 Pollution Controls

5.4.1 Wash Water (Process Water) Collection System Discharge

Discharging smaller volumes of returned concrete into a wash water collection system is normally done as part of normal mixer drum washout after the returned concrete has been discharged using one or more of the previously described pollution prevention procedures.

Discharge into the wash water collection system is mainly composed of mixer drum washout water with a small amount of rock and sand. The wash water collection system must be periodically drained and the accumulated slurry (sludge) removed to an onsite storage and drainage facility with containment for drying.

Adequate slurry (sludge) containment is required and important to prevent infiltration of runoff from the drying slurry, possibly impacting site storm water runoff or local groundwater or surface water conditions.

5.4.2 Designated Site Discharge

Returned concrete, before hardening, can be placed in a designated area at the plant site with containment and allowed to harden. This concrete can then be broken up, crushed, screened and processed as a fill material under dry ground conditions or at a construction site with self-contained drainage.

There is a potential for elevated pH in any surface runoff that comes into contact with the crushed concrete fill material. This type of fill material has been used as a base coarse material in road construction, or it can be blended with virgin aggregates and used as coarse aggregate in concrete or asphalt provided it will meet required specifications.

5.4.3 Dry Reclaimed Solids Management

Onsite storage of dried slurry (sludge) creates an increasing liability, as this material will have to be handled sometime in the near or long term. Volumes of slurry (sludge) stored onsite should not be allowed to build up. Offsite disposal of dried slurry should occur in accordance with both local and provincial regulations, typically at a waste management facility approved by a provincial environmental ministry.

6 AUTHORIZED DISCHARGE: EFFLUENT AND GROUNDWATER QUALITY

6.1 Code of Practice Objective

A person operating an establishment must ensure that its process water and establishment runoff do not cause pollution of any groundwater. The soil conditions should be taken into consideration before any discharge to ground is contemplated, and if there is potential for pollution of groundwater, a treatment system should be put in place (e.g. infiltration basin with pH treatment, etc).

6.2 Activities and Operations

Any process water or waterborne solid wastes resulting from ready-mixed concrete production that can be discharged from the plant site to ground is subject to the Code of Practice and regulations (See Section 7.2 for procedures for process water management).

6.3 Pollution Prevention

It is common for process water to be recycled in some part of the facility operation rather than directly discharge to ground (see Section 7.3 for suggestions).

6.4 Pollution Controls

See Section 7.4 for suggestions.

7 AUTHORIZED DISCHARGE: EFFLUENT AND SURFACE AND MARINE WATER QUALITY

7.1 Code of Practice Objective

A person operating an establishment:

- must implement an effluent treatment system for the treatment of process water and establishment runoff discharged or flowing into surface water or marine water; and
- must ensure that such process water or establishment runoff,
  - has pH level of no less than 6.5 and no more than 9.0,
  - contains no more than 75 mg/L total suspended solids,
  - contains no more than 15 mg/L total extractable hydrocarbons, and
  - is not acutely lethal to fish;
- must ensure that the effluent treatment system is inspected at least once a month to verify that it is in good working order.

In respect of any process water or establishment runoff, acutely lethal to fish means that the process water or establishment runoff, at 100% concentration, kills more than 50% of the rainbow trout in a 96-hour LC50 rainbow trout bioassay.

7.2 Activities and Operations

Any process water or waterborne solid wastes resulting from ready-mixed concrete production that can be discharged from the plant site is subject to the Code of Practice and regulations. Procedures vary from each plant with respect to process water management. Ready-mixed concrete plants often have paved plant areas to collect process water and surface runoff from truck loading, truck wash off and mixer drum rinsing areas.

Some facilities provide for the collection of runoff or leaching from reclaimed solids storage and drying piles. Suspended solids are removed using settling basins. At most plant sites a primary settling basin will overflow to a secondary settling basin. Additional basins in series may be needed in order to adequately treat water prior to release to the environment. It is common for process water to be recycled in some part of the facility operation rather than direct discharge to rivers, lakes or the ocean.

Practices to control storm water runoff vary widely and are often determined by site constraints such as drainage, slope and access to storm sewer systems. At stationary plant sites the yard is usually paved (or hard-surfaced) and sloped to direct process water and storm water from these areas into the water collection basin. In more remote locations, it is common for the entire site to be unpaved, usually a compacted sand and gravel surface.

Segregating the storm water runoff between process areas and aggregate storage sites and vehicle parking lots helps to minimize the amount of storm water runoff that must be managed. Clean storm water can be discharged directly from the plant site if it meets the standards specified in the Code of Practice (see Section 7.1).

Any storm water coming into contact with process water or cementitious materials should be analyzed before discharge and recycled where possible. Regular monthly sampling and testing of surface runoff from the plant site property (the establishment premises) is required to determine if the facility is releasing any potential surface water contaminants.

Any water used in the concrete production process or water that comes into contact with cement, fresh concrete, sand and grit particles, as well as hydrocarbon sources can also be considered process water.

Process water normally results when fresh water or storm water comes into contact with or accumulating at the following plant site locations:

- Batch load-out areas and slump racks;
- Batch load-out areas and slump racks;
- Cement and SCM silos;
- Aggregate bins or stockpiles;
- Truck shop and designated service areas;
- Truck drum wash down and washout areas;
- Storm water runoff mixing with process water property; and
- Reclaimed solids (sludge/slurry) storage pile drainage.

The primary objective of process water management is to minimize or eliminate the potential environmental impacts from the controlled or uncontrolled discharge of wastewater from the plant site property and mixer truck operations.

The following three-step approach has been used successfully at plant sites for process water management:

- Minimizing or isolating any standing water around the plant site;
- Collect, contain and control of produced waste or wastewater; and
- Test and analyse wastewater during treatment or before discharge.

The three-step approach is recommended even if the plant operator is not re-using treated process water in plant operations or discharging from the plant site property.

7.3 Pollution Prevention

It is common for process water to be recycled in some part of the facility operation rather than direct discharge to ground.

The following suggestions are provided for effective process water management:

- Minimize the need for exterior truck washing by controlling the dust losses from the plant and batch (tower) area during loading;
- Use recycled process water for truck washing when and where possible;
- Install flow control devices (metering or spring-loaded valves) on water hoses and limit allowable wash time or water volumes;
- Train employees to minimize water use, ensuring that they understand the importance of controls and the possible impact on the environment;
- Limit fresh water use to hot water production, batch water, truck-mounted tanks and, if necessary, truck exterior washing;
- Use recycled process water and storm water from paved process areas for mixer drum washout and where possible other applications (e.g., yard dust control, truck spray bars);
- Minimize process water volumes by controlling storm water runoff on the plant site property from mixing with effluent and wastewater sources resulting from concrete production;
- Control potential contaminant dispersal through good housekeeping and by minimizing vehicle traffic on plant site surfaces where potential contaminants may be present;
- Use recycled water for truck wash down and drum washout; reduce total volume by using multiple small volume rinses rather than single large volume rinse; and
- Using hydration stabilization admixtures (see Section 5.2).

7.4 Pollution Controls

7.4.1 Process Water Collection

The collection and containment of process water (and process water in contact with storm water runoff) is important for effective process water management.

The following suggestions are provided for effective collection procedures:

- The main areas for generating process water within the plant site (e.g., truck loading, wash racks, washout areas, sludge storage, etc.) should be paved or hard-surfaced where possible. Paving or hard-surfacing the entire plant site may not always be the

best solution if the producer does not have sufficient capacity to divert or collect surface runoff. Plant site production volumes, location and property area should be carefully evaluated before considering this option). Reducing the amount of impervious surfaces can be advantageous and this cuts down on the amount of runoff generated. The soil conditions and hydrogeology should also be taken into consideration. Certain soil types provide better removal of pollutants than others and the depth of unsaturated soil is also important.

- All paved or hard-surfaced areas should be curbed and/or graded to allow for effective capture and collection of process water mixed with storm water runoff. These waters can be directed to a washout pit, reclaim ponds or a designated wastewater collection basin and treatment system that use a hydrocarbon – water separator unit (filter, skimmer or trap).
- Equipment and vehicle traffic should be minimized through the areas where standing water or process water is present. Plant operators should design traffic flow around plant site and property recognizing drainage patterns and collecting basin locations. All equipment and vehicles should be properly maintained, preventing oil leaks and grease deposits outside of shop areas.
- Sufficient capacity must be provided for wastewater holding ponds/catch basins. Holding ponds or catch basins should be designed and constructed with an impermeable base to minimize subsurface leakage, except where an exfiltration process is used.
- If the walls of any containment structure breach, causing an instantaneous release of untreated process water or storm water mixed with process water, the plant operator is required to undertake appropriate spill response measures immediately to contain the breach and to collect, clean up and remediate the spill area.
- Any clean surface water that does not come in contact with wastewater should be directed away from wastewater collection areas.

7.4.2 Process Water Treatment

The objective for process water treatment is to allow for reduction of total suspended solids and pH levels, ensuring that the treated process water meets the discharge requirements of the Code of Practice (see Section 7.1).

Suspended solids reduction has been achieved by using a sloped concrete settling pond overflowing through a weir into a secondary or tertiary pond. If settling and sedimentation does not meet the required total suspended solids limit, a mechanical filter or filter press can also be used. An example of a mechanical filter is a 100 micron size in-line cloth filter through which discharge water is pumped. Cloth filters require cleaning on regular intervals to remain effective.

Coagulants and flocculants could also be used where very fine particles continue to remain in suspension. The coagulants or flocculants should be environmentally-friendly (non toxic / bio-degradable) or further treatment will be required to neutralize the coagulants or flocculants. The injection system for coagulants and flocculants require a mechanically engineered process and maintenance by a trained operator.

Any water or process water coming into contact with cement powder, concrete slurry or fresh concrete solids will become more alkaline and, in most cases, requires treatment for an elevated pH level (greater than 9.0 Relative Units). Any process water discharged to the environment must meet the pH range specified in the Code of Practice (see Section 7.1).

As part of treatment within a settling pond system, two dosage processes have been used successfully for reducing (or neutralizing) elevated pH levels:

- Mixing with a diluted acid solution by mechanical (gravity) drip; or
- Injecting carbon dioxide gas.

Both treatment processes involve engineered applications with measured dosages and require regular monitoring and maintenance programs to ensure proper treatment operation. Employee training is required to ensure the success of using either of these treatment systems.

8 MONTHLY EFFLUENT AND SAMPLING ANALYSIS

8.1 Code of Practice Objective

A person operating an establishment must ensure that its process water and establishment runoff is sampled and analyzed at least once a month as prescribed.

The sampling must be performed using:

- The procedures described in the *British Columbia Field Sampling Manual*, as amended from time to time; or
- Alternate procedures approved by a director.

The analysis must be performed using:

- The procedures described in the *British Columbia Environmental Laboratory Manual*, as amended from time to time; or
- Alternate procedures approved by a director.

A record of the sampling and analysis must be made and it must include all of the following information:

- The name of the person performing the sampling and analysis;
- The name of the person making the record;
- The date of the sampling and analysis;
- The date on which the record was made;
- The procedures used in performing the sampling and analysis, as the case may be;
- The results of the analysis with references to the standards described in the Code of Practice (see Section 7.1).

8.2 Records Management

To comply with the Code of Practice, a person operating the facility must set up procedures for the management and control of records. These procedures would apply to all completed documents and records, which must be maintained in retrievable condition in order to demonstrate continued compliance with the Code of Practice (see Section 11.0).

9 SYSTEM INSPECTION RECORDS

9.1 Code of Practice Objective

The person operating an establishment must ensure that a record is made for every inspection made in accordance with Code of Practice (see section 3.1 and 6.1).

The record of inspection must include all of the following information:

- The name of the person performing the inspection;
- The date of the inspection;
- The date on which the record is made;
- The procedures used in performing the inspection; and
- The results of that inspection.

9.2 Records Management

To comply with the Code of Practice, a person operating the facility must set up procedures for the management and control of records. These procedures would apply to all completed documents and records, which must be maintained in retrievable condition in order to demonstrate continued compliance with the Code of Practice (see Section 11.0).

10 SYSTEM FAILURES

10.1 Code of Practice Objective

If the particulate control system or effluent treatment system of an establishment become inoperative for any reason, a person operating an establishment must immediately:

- Take remedial action to eliminate or, if that is not possible, minimize harm to the environment;
- Notify a director, whether in person or by phone, fax or other electronic means;
- Take and comply with remedial action that may be required by the director; and
- Take action to make the system operative again.

10.2 Preparedness and Response for System Failures

A person operating a facility will establish a procedure for response if the particulate control system or effluent treatment system of an establishment becomes inoperative for any reason. At a minimum, the operator will establish a process or procedure:

- Assessing the potential for system failures;
- Preventing system failures;
- Responding to system failures;
- Reducing the harm to the environment from system failures; and
- Testing response plans for system failures.

11 KEEPING AND PROVIDING ESTABLISHMENT RECORDS

11.1 Code of Practice Objective

A person operating an establishment must ensure that a record made under Section 8 or 9 is kept at the establishment premises for a period of not less than 5 years from the date the record is made.

The operator must immediately provide to a director or an officer, on request, a record required to be kept as prescribed under the Code of Practice.

11.2 Records Management

To comply with the Code of Practice, a person operating the facility must set up procedures for the management and control of records. These procedures would apply to all completed documents and records, which must be maintained in a retrievable condition in order to demonstrate continued compliance with the Code of Practice.

The facility operator will ensure that the following documentation and records are maintained at the establishment premises:

- Records of inspections, observations, and measurements (e.g., inspections and sampling and discharge monitoring results).
- Records shall be maintained in a manner in accordance with the Code of Practice. Records must be kept at the establishment premises for a period of not less than 5 years from the date the record is made.

For more information on the code of practice that addresses discharges to the environment from the concrete and concrete products industry under provisions of the Environmental Management Act (EMA) and the Waste Discharge Regulation (WDR), see Appendix A or visit the BC Government's Ministry of Environment's website at
www.env.gov.bc.ca/epd/industrial/regs/codes/concrete/index.htm

APPENDIX A

CODE OF PRACTICE FOR THE CONCRETE AND CONCRETE PRODUCTS INDUSTRY

Definitions and interpretation

1 (1) In this Code:

"Act" means the *Environmental Management Act*;

"British Columbia Environmental Laboratory Manual" means the *British Columbia Environmental Laboratory Manual: 2007 -- For the Analysis of Wastewater, Sediment, Biological Materials and Discrete Ambient Air Samples*, published by the minister;

"British Columbia Field Sampling Manual" means the *British Columbia Field Sampling Manual: 2003 -- For Continuous Monitoring and the Collection of Air, Air-Emission, Water, Wastewater, Soil, Sediment and Biological Samples*, published by the minister;

"concrete and concrete products industry" has the same meaning as in Schedule 2 of the Waste Discharge Regulation;

"establishment" means an establishment in the concrete and concrete products industry;

"establishment premises" means, in relation to an establishment, any land, building or premises in or on which the establishment engages in manufacturing ready-mix concrete or concrete products, including any areas in or on which activities related to that manufacturing, such as selling, displaying, storing or packaging, take place;

"establishment runoff" means runoff, whether from rainfall, snow or snowmelt, at or from establishment premises;

"groundwater" has the same meaning as in the Municipal Sewage Regulation, B.C. Reg. 129/99;

"process water" means, in relation to an establishment, any water-based discharge produced in the course of manufacturing concrete products or ready-mix concrete at establishment premises, including such discharge resulting from the use of water in

(a) dust suppression at establishment premises, or

(b) cleaning establishment premises or any vehicle or other facility of the establishment,

but does not include domestic sewage, as defined in the Sewerage System Regulation;

"publish" includes posting on a publicly accessible website maintained by the minister;

"Sewerage System Regulation" means the Sewerage System Regulation, B.C. Reg. 326/2004;

"sludge" means sand, gravel or cement deposits that accumulate in a settling pond or settling basin;

"surface water" has the same meaning as in the Sewerage System Regulation;

"waste concrete" means, in relation to an establishment, any sludge or concrete or both, which are produced in the operations of the establishment but are not used, recycled or reused in the manufacture of concrete products or ready-mix concrete or for any other purpose;

"Waste Discharge Regulation" means the Waste Discharge Regulation, B.C. Reg. 320/2004.

(2) The following are prescribed as waste for the purposes of paragraph (g) of the definition of "waste" in the Act:

(a) process water;

(b) silo emissions described in section 4 of this code;

Registration required

2 A person must register with a director under section 4 of the Waste Discharge Regulation for the purposes of an exemption in relation to this code.

Dust control

3 A person operating an establishment

(a) must take measures to control dust produced in the operation of the establishment, including any dust produced at the establishment premises by traffic, storage activities or the handling of materials, and

(b) must ensure that such dust does not cause pollution.

Authorized discharge: silo emissions and air quality

4 (1) If there is a silo at or on establishment premises, a person operating the establishment

(a) must implement a particulate control system for the collection, control and suppression of emissions discharged to the air from the silo, and

(b) must ensure that those silo emissions do not cause pollution.

(2) The opacity of silo emissions discharged to the air must not exceed 10% averaged over 6 consecutive minutes.

(3) The operator under subsection (1) must ensure that the particulate control system is inspected at least once a month to verify that it is in good working order.

Disposal of waste concrete

5 A person operating an establishment must ensure that waste concrete is not disposed of in a manner that causes pollution.

Authorized discharge: effluent and groundwater quality

6 (1) Process water of an establishment must not be discharged to the ground except in accordance with subsection (2).

(2) A person operating an establishment must ensure that its process water and establishment runoff do not cause pollution of any groundwater.

Authorized discharge: effluent and surface and marine water quality

7 (1) Process water of an establishment must not be discharged into surface water or marine water except in accordance with this section.

(2) A person operating an establishment

(a) must implement an effluent treatment system for the treatment of process water and establishment runoff discharged or flowing into surface water or marine water, and

(b) must ensure that such process water or establishment runoff

(i) has a pH level of no less than 6.5 and no more than 9,

(ii) contains no more than 75 mg/L total suspended solids,

(iii) contains no more than 15 mg/L total extractable hydrocarbons, and

(iv) is not acutely lethal to fish.

(3) The operator under subsection (2) must ensure that the effluent treatment system is inspected at least once a month to verify that it is in good working order.

(4) For the purposes of subsection (2) (b) (iv), **"acutely lethal to fish"**, in respect of any process water or establishment runoff, means that the process water or establishment runoff, at 100% concentration, kills more than 50% of the rainbow trout in a 96-hour LC50 rainbow trout bioassay.

Monthly effluent sampling and analysis

8 (1) A person operating an establishment must ensure that its process water and establishment runoff is sampled and analyzed at least once a month and in accordance with this section.

(2) The sampling must be performed using

(a) the procedures described in the British Columbia Field Sampling Manual, as amended from time to time, or

(b) alternate procedures approved by a director.

(3) The analysis must be performed using

(a) the procedures described in the British Columbia Environmental Laboratory Manual, as amended from time to time, or

(b) alternate procedures approved by a director.

(4) A record of the sampling and analysis must be made and it must include all of the following information:

(a) the name of the person performing the sampling and analysis;

(b) the name of the person making the record;

(c) the date of the sampling and the analysis;

(d) the date on which the record is made;

(e) the procedures used in performing the sampling or analysis, as the case may be;

(f) the results of the analysis with reference to the standards described in section 7 (2) (b) (i) to (iii).

System inspection records

9 (1) A person operating an establishment must ensure that a record is made for every inspection under section 4 (3) or 7 (3).

(2) The record of inspection must include all of the following information:

(a) the name of the person performing the inspection;

(b) the date of the inspection;

(c) the date on which the record is made;

(d) the procedures used in performing the inspection;

(e) the results of that inspection.

System failures

10 If the particulate control system or effluent treatment system of an establishment become inoperative for any reason, a person operating the establishment must immediately

(a) take remedial action to eliminate or, if that is not possible, minimize, harm to the environment,

(b) notify a director, whether in person or by phone, fax or other electronic means,

(c) take and comply with remedial action that may be required by the director, and

(d) take action to make the system operative again.

Keeping and providing establishment records

11 (1) A person operating an establishment must ensure that a record made under section 8 *[monthly effluent sampling and analysis]* or 9 *[system inspection records]* is kept at the establishment premises for a period of not less than 5 years from the date the record is made.

(2) The operator must immediately provide to a director or an officer, on request, a record required to be kept under subsection (1).