1.0 Purpose

- The purpose of Ardent's Cadmium Safety Program is to protect both our employees and the environment from cadmium contamination from our operations. The intent of our program is to be in full, continuous compliance with OSHA Standard 29 CFR 1910.1027, 29 CFR 1956.1127 and all other local, State, and Federal requirements for our industry.

- The program shall be available and provided to affected employees and/or their representatives for examination and copying upon request.

2.0 Scope

- This Cadmium Safety Program and Policy is intended for support of and use by company operations both in business units and project operations. This is a hazard recognition and education focused program and does not imply that any training associated with this program certifies or qualifies any Ardent employee to analyze worksites for Cadmium, measure Cadmium levels or determine safe exposure levels.

3.0 Regulatory References

- This Cadmium Safety Program is primarily intended to satisfy the following regulatory requirements:

4.0 Policy

- **Stop the Work Immediately** - Upon discovery or suspicion of Cadmium being present on a jobsite, Ardent employees are to stop the work immediately and inform their supervisor.

- **Do Not Handle Cadmium Products** - It is Ardent policy that employees shall not knowingly handle Cadmium or products containing Cadmium without reviewing MSDS information and taking appropriate protective measures.

- **Do Not Dispose of Cadmium** - It is Ardent policy that employees shall not participate in the disposal of Cadmium or products containing Cadmium.

- **Contact a Competent Individual** - It is Ardent policy to contact a competent individual upon discovery of Cadmium being present.
- **Avoid Exposure** – It is Ardent policy to train employees with general knowledge and guidelines enabling them to protect themselves and others from unnecessary Cadmium exposure.

- **Hazard Identification & Control** – All employees assigned to job-sites where exposure to Cadmium may be possible shall participate in the identification, evaluation, and control of Cadmium hazards.

- **Exposure Limits** – 29 CFR 1910.1027 indicates the permissible exposure limit (PEL) of five micrograms of cadmium per cubic meter of air (5 ug/m$^3$), averaged over an 8-hour work-day. This is the highest level of cadmium in air to which you may be permissibly exposed over an 8-hour workday. Since it is an 8-hour average it permits short exposures above the PEL so long as for each 8-hour work day your average exposure does not exceed the PEL. The action level for Cadmium is 2.5 micrograms per cubic meter of air (2.5 ug/m$^3$) averaged over an 8-hour period and triggers use of personal protective equipment, employee monitoring, medical surveillance, hazard communication, regulated work areas, and record-keeping.

- **Exposure Monitoring** – Medical surveillance shall be limited to that required for long-term exposure above the action-level.

### 5.0 Responsibilities

5.1. **Management will implement, maintain & monitor effectiveness of:**

- Entire cadmium safety program, including semi-annual revisions and updates to reflect the status of the program
- Engineering & administrative controls for cadmium exposure
- Employee training and awareness
- Medical surveillance program
- Respiratory protection program
- Cadmium disposal program
- Housekeeping program
- Protective clothing issue, storage, and disposal
5.2. Supervisors will:

- Provide effective and continuous control of all cadmium operations
- Immediately inform management of any deficiencies in engineering or administrative controls
- Conduct routine assigned inspections and monitoring
- Immediately correct any deviation from operational safety requirements
- Provide immediate on-the-spot training for any employee who shows lack of knowledge or application of required operational cadmium safety requirements
- Ensure all employees are properly trained before commencing any operation that may contribute to cadmium exposure

5.3. Employees will:

- Follow all operational and cadmium safety procedures
- Seek immediate supervisor guidance to resolve questions
- Conduct operations in accordance with Ardent provided training
- Immediately report to a supervisor any deficiency in engineering or administrative controls
- Properly use, store, and dispose of issued and assigned personal protective clothing.
- Maintain change and shower areas neat and orderly

6.0 Process, Control & Technical Information

The following information that describes facility specific information concerning processes and controls are maintained as an addendum to this written program:

6.1. Description of each operation in which cadmium is emitted; e.g. machinery used, material processed, controls in place, crew size, employee job responsibilities, operating procedures, and maintenance practices.
6.2. Description of the specific means used to achieve compliance, including engineering plans and studies used to determine methods selected for controlling exposure to cadmium.

6.3. Report of the technology considered in meeting the permissible exposure limit;

6.4. Air monitoring data which documents the source of cadmium emissions;

6.5. A detailed schedule for implementation of this program, including documentation such as copies of purchase orders for equipment, construction contracts, etc.

6.6. Records of Employee Training and Notifications

6.7. Specific work practice program and controls for each operation involving cadmium exposure

6.8. Administrative control schedule

6.9. All other relevant information

7.0 Hazards

- Cadmium is a toxic metal commonly found in both manufacturing and construction workplaces. In its elemental form, cadmium is either a blue-white metal or a grayish-white powder found in lead, copper, and zinc sulfide ores. Due to its low permissible exposure limit (PEL), overexposures may occur even in situations where only trace quantities of cadmium are found.

- Cadmium is found in some industrial paints and may represent a hazard when sprayed. Operations involving removal of cadmium paints by scraping or abrasive blasting may also pose a significant hazard. Cadmium emits a characteristic brown fume (CdO) upon heating, which is relatively non-irritating, and thus does not alarm the exposed individual.

- A primary use of cadmium is as an anti-corrosive. It may be found in anti-fouling or anti-rust paints and is sometimes electroplated onto steel, nuts, bolts, and rivets. Cadmium may also serve as an electrode component in alkaline batteries and may be used in alloys, silver solders and welding. Welding on cadmium-containing
alloys or working with silver solders containing cadmium can unsuspectingly cause acute illness.

- A documented, written emergency action plan shall be in place to address emergency situations involving substantial releases of cadmium.

7.1. Short-term (acute) effects of overexposure to cadmium

- Metal fume fever may result from acute exposure with flu-like symptoms of weakness, fever, headache, chills, sweating and muscular pain. Acute pulmonary edema usually develops within 24 hours and reaches a maximum by three days. If death from asphyxia does not occur, symptoms may resolve within a week.

7.2. Long-term (chronic) effective of overexposure to cadmium

- The most serious consequence of chronic cadmium poisoning is cancer (lung and prostate). The first observed chronic effect is generally kidney damage, manifested by excretion of excessive (low molecular weight) protein in the urine. Cadmium also is believed to cause pulmonary emphysema and bone disease (osteomalacia and osteoporosis). Cadmium exposure may also cause anemia, teeth discoloration and loss of smell (anosmia).

7.3. Reporting Signs and Symptoms of Health Problems.

- You should immediately notify your supervisor if you develop signs or symptoms associated with cadmium poisoning or if you desire medical advice concerning the effects of current or past exposure to cadmium. You should also notify your supervisor if you have difficulty breathing during a respirator fit test or while wearing a respirator. In each of these cases Ardent will make available to you appropriate medical examinations or consultations. These must be provided at no cost to you and at a reasonable time and place.
8.0 Monitoring

8.1. Initial determination.

- Ardent has made an initial determination that cadmium work areas and exposure levels vary by client facility and project. Ardent will conduct subsequent "initial determinations" in the event of changes to hazard control methods or project operational processes that affect employee or environmental exposure. Initial determinations are conducted to determine if any employee may be exposed to cadmium at or above the action level of 2.5 micrograms per cubic meter of air (2.5 ug/m³) averaged over an 8-hour period.

- Where a determination is made that no employee is exposed to airborne concentrations of cadmium at or above the action level, Ardent shall maintain a written record. The record shall include quantitative sampling data, date of determination, location within the worksite, and the name and social security number of each employee monitored.

8.2. Monitoring requirements

- Monitoring and analysis methods shall have an accuracy (to a confidence level of 95%) of not less than plus or minus 20 percent for airborne concentrations of cadmium equal to or greater than 30 ug/m³.

- Where a determination shows the possibility of any employee exposure at or above the action level, Ardent shall conduct monitoring which is representative of the exposure for each employee in the workplace or process area who is exposed to cadmium.

- For the purposes of monitoring requirements, employee exposure is that exposure which would occur if the employee were not using a respirator.

- Monitoring and sample collection shall cover full shift (for at least 7 continuous hours) personal samples including at least one sample for each shift for each job classification in each work area.

- Full shift personal samples must be representative of the monitored employee’s regular, daily exposure to cadmium.
8.3. Monitoring Frequency

8.3.1. At or Above Action Level and Below PEL. Systematic monitoring shall take place every 6 months after the initial determination or subsequent monitoring reveals employee exposure to be at or above the action level but below the permissible exposure limit. This monitoring (6-month frequency) will continue until at least two consecutive measurements, taken at least 7 days apart, are below the action level.

8.3.2. Above PEL. If the initial monitoring reveals that employee exposure is above the permissible exposure limit Ardent will repeat monitoring quarterly. Quarterly monitoring will continue until at least two consecutive measurements, taken at least 7 days apart, are below the PEL but at or above the action level.

8.3.3. Additional monitoring. Whenever there has been a production, process, control, or personnel change which may result in new or additional exposure to cadmium, or whenever any other reason to suspect a change which may result in new or additional exposures to cadmium, additional monitoring will be conducted.

8.3.4. Employee Notification of Monitoring Results.

- Within 5 working days after the receipt of monitoring results, each employee will be notified in writing of the results which represent that employee's exposure.
- Whenever the results indicate that the representative employee exposure, without regard to respirators, exceeds the permissible exposure limit, the written notice will include a statement that the permissible exposure limit was exceeded, and a description of the corrective action taken or to be taken to reduce exposure to or below the permissible exposure limit.

8.3.5. Observation of monitoring

- Ardent provides affected employees or their designated representatives an opportunity to observe any monitoring of employee exposure to cadmium.
8.3.6. **Observation procedures.**

- Whenever observation of the monitoring of employee exposure to cadmium requires entry into an area where the use of respirators, protective clothing or equipment is required, Ardent will provide the observer with and assure the use of respirators, clothing and equipment required, and will require the observer to comply with all other applicable safety and health procedures.

- Without interfering with the monitoring, observers are entitled to:
  - Receive an explanation of the measurement procedures
  - Observe all steps related to the monitoring of cadmium performed at the place of exposure
  - Record the results obtained or receive copies of the results when returned by the laboratory

9.0 **Engineering Controls**

- Where any employee is exposed to cadmium above the permissible exposure limit for more than 30 days per year, Ardent will implement feasible engineering and work practice controls (including administrative controls) to reduce and maintain employee exposure to cadmium. Wherever the engineering and work practice controls which can be instituted are not sufficient to reduce employee exposure to or below the permissible exposure limit, Ardent will still use them to reduce exposures to the lowest feasible level and shall supplement them using respiratory protection.

- Where any employee is exposed to cadmium above the permissible exposure limit, but for 30 days or less per year, Ardent will implement engineering controls to reduce exposures to 200 ug/m (3), but thereafter may implement any combination of engineering, work practice (including administrative controls), and respiratory controls to reduce and maintain employee exposure to cadmium to or below 50 ug/m (3).
9.1. Mechanical ventilation

- When ventilation is used to control exposure, measurements which demonstrate the effectiveness of the system in controlling exposure, such as capture velocity, duct velocity, or static pressure shall be made at least every 3 months. Measurements of the system's effectiveness in controlling exposure shall be made within 5 days of any change in production, process, or control which might result in a change in employee exposure to cadmium.

9.2. Recirculation of Air

- If air from exhaust ventilation is recirculated into the workplace, the system must include:
  - A high efficiency filter with reliable back-up filter; and
  - Controls to monitor the concentration of cadmium in the return air and to bypass the recirculation system automatically if it fails are installed, operating, and maintained.

10.0 Administrative Controls

- If administrative controls are used as a means of reducing employees TWA exposure to cadmium, Ardent shall establish and implement a job rotation schedule which includes:
  - Name or identification number of each affected employee
  - Duration and exposure levels at each job or work station where each affected employee is located
  - Other information which may be useful in assessing the reliability of administrative controls to reduce exposure to cadmium
  - Administrative control information and records will be maintained as an addendum to this written program

11.0 Personal Protective Equipment

11.1. Respirators

- When respirators are used to supplement engineering and work practice controls to comply with the PEL and all other requirements have been met, employee exposure, for determining compliance with the PEL, may be at the level provided by the protection factor of the respirator for those
periods the respirator is worn. Those periods may be averaged with exposure levels during periods when respirators are not worn to determine the employee's daily TWA exposure. The respiratory protection program will be conducted in accordance with 29 CFR 1910.134 (b) through (d) (except (d)(1)(iii)), and (f) through (m). Ardent will provide a NIOSH certified powered air-purifying respirator (PAPR) when an employee chooses to use this type of respirator and such a respirator provides adequate protection to the employee.

11.2. **Respirators must be used during:**

- Periods necessary to install or implement engineering or work-practice controls.
- Work operations for which engineering, and work-practice controls are not sufficient to reduce employee exposures to or below the permissible exposure limit.
- Periods when an employee requests a respirator

11.3. **Protective Clothing & Equipment**

- If an employee is exposed to cadmium above the PEL, without regard to the use of respirators or where the possibility of skin or eye irritation exists, Ardent will provide at no cost to the employee appropriate protective work clothing and equipment such as, but not limited to:
  - Coveralls or similar full-body work clothing;
  - Gloves, hats, and shoes or disposable shoe coverlets; and
  - Face shields, vented goggles, or other appropriate protective equipment

11.4. **Cleaning and replacement** - Ardent will:

- Provide the protective clothing in a clean and dry condition at least weekly, and daily to employees whose exposure levels without regard to a respirator are over 200 ug/m (3) of cadmium as an 8-hour TWA.
- Provide for the cleaning, laundering, or disposal of protective clothing and equipment
- Repair or replace required protective clothing and equipment as needed to maintain their effectiveness.
• assure that all protective clothing is removed at the completion of a work shift only in change rooms provided for that purpose.

• Assure that contaminated protective clothing which is to be cleaned, laundered, or disposed of, is placed in a closed container in the change-room which prevents dispersion of cadmium outside the container.

• Inform in writing any person who cleans or launders protective clothing or equipment of the potentially harmful effects of exposure to cadmium.

• Assure that the containers of contaminated protective clothing and equipment required by paragraph (g)(2)(v) are labeled as follows: CAUTION: CLOTHING CONTAMINATED WITH CADMIUM. DO NOT REMOVE DUST BY BLOWING OR SHAKING. DISPOSE OF CADMIUM CONTAMINATED WASH WATER IN ACCORDANCE WITH APPLICABLE LOCAL, STATE, OR FEDERAL REGULATIONS.

• Prohibit the removal of cadmium from protective clothing or equipment by blowing, shaking, or any other means which disperses cadmium into the air.

12.0 Housekeeping

• All surfaces shall be maintained as free as practicable of accumulations of cadmium.

• Floors and other surfaces where cadmium accumulates may not be cleaned using compressed air.

• Shoveling, dry or wet sweeping, and brushing may be used only where vacuuming or other equally effective methods have been tried and found not to be effective.

• Where vacuuming methods are used, the vacuums shall be used and emptied in a manner which minimizes the reentry of cadmium into the workplace.
13.0 Hygiene Facilities & Practices

The following requirements pertain to all areas where employees are exposed to cadmium above the PEL, without regard to the use of respirators:

- No storage or consumption of food or beverages
- No tobacco product storage or use
- No cosmetics stored or used
- No personal clothing or articles, except in authorized change areas

13.1. Change rooms

- Clean change rooms are provided for employees who work in areas where their airborne exposure to cadmium is above the PEL. Change rooms are equipped with separate storage facilities for protective work clothing and equipment and for street clothes which prevent cross-contamination. Employees who are required to shower after work shifts are not allowed to leave the workplace wearing any clothing or equipment worn during the work shift.

13.2. Showers

- Employees who work in areas where their airborne exposure to cadmium is above the PEL must shower at the end of each work shift.

13.3. Lunchrooms

- Separate lunchroom facilities are provided for employees who work in areas where their airborne exposure to cadmium is above the PEL. These facilities are temperature controlled, have positive pressure and filtered air supply, and are readily accessible to employees. All affected employees must wash their hands and face prior to eating, drinking, smoking, or applying cosmetics in the lunchroom area. Employees may not enter lunchroom facilities with protective work clothing or equipment unless vacuuming, down draft booth, or other cleaning method has removed surface cadmium dust.

13.4. Lavatories.

- An adequate number of separate lavatory facilities are maintained for employees who work in cadmium-controlled process areas.
14.0 Signs

- Proper signs will be posted at the entrance and exits to all cadmium hazard areas. No other signs or statements may appear on or near any cadmium hazard sign which contradicts or detracts from the meaning of the required sign. All cadmium hazard signs will be kept illuminated and cleaned as necessary so that the legend is readily visible. The signs will contain the following or other appropriate wording/warning:

  - WARNING
  - CADMIUM WORK AREA
  - POISON
  - NO SMOKING OR EATING

15.0 Employee Training

- All affected employees will participate in Ardent Cadmium Safety Training program. All affected employees will be trained prior to the time of initial job assignment and at least annually.

15.1. Employee training will consist of:

- Specific OSHA requirements contained in:
  - 1910.1027 - OSHA Cadmium Standard
  - 1910.1027 App A - Substance Safety Data Sheet for Cadmium

- Specific nature of the operations which could result in exposure to cadmium above the action level

- Purpose, proper selection, fitting, use, and limitations of respirators;

- Purpose and a description of the medical surveillance program, and the medical removal protection program including information concerning the adverse health effects associated with excessive exposure to cadmium (with attention to the adverse reproductive effects on both males and females);

- Engineering controls and work practices associated with the employee's job assignment;

- Contents of Ardent compliance plan
• Instructions that chelating agents should not routinely be used to remove cadmium from their bodies and should not be used at all except under the direction of a licensed physician

• Materials pertaining to the Occupational Safety and Health Act

• A copy of the OSHA standard 1910.1027 and its appendices will be readily available to all affected employees.

### 16.0 Medical Surveillance

• Ardent has instituted a medical surveillance program for all employees who are or may be exposed above the action level for more than 30 days per year. This medical surveillance program and all medical examinations and procedures are performed by or under the supervision of a licensed physician. The program functions under the requirements of OSHA Standard 1910.1027. Elements of the program include:

#### 16.1. Biological monitoring

• Ardent will provide Initial blood sampling and analysis for blood cadmium levels (CdB) for all employees exposed to an air cadmium level at or above the Action Level (AL) for at least 1 day. Employees who are or may be exposed at or above the AL for more than 30 days in any consecutive 12 months, must be enrolled in a medical surveillance program, including CdB at least every 2 months for the first 6 months and every 6 months thereafter.

• Any employee with a CdB at or above 5 µg/dl shall have a CdB every two months until two consecutive samples are less than 4 µg/dl.

• Any employee with a CdB above 5 µg/dl shall receive a follow-up CdB within 2 weeks after the Ardent receives the results of the first test.

• All analysis of blood samples shall be conducted by a laboratory approved by OSHA.
16.2. **Employee notification**

- Ardent shall notify all employees, in writing, of their blood sampling results within 5 working days after receipt of the results.

16.3. **Medical examinations and consultations**

Ardent will provide a medical exam annually for all employees who had a CdB at or above 4 µg/dl during the preceding 12 months. A medical exam shall be provided to any employee who reports signs or symptoms related to cadmium poisoning, desires medical advice regarding the effects of cadmium exposure on the employee’s ability to produce a healthy child, is pregnant, or has difficulty breathing while wearing a respirator. A medical exam shall be provided as medically appropriate to any employee removed from his/her usual job involving exposure to cadmium. A medical exam shall include:

- Detailed work history, with attention to past cadmium exposure;
- History and physical exam, with attention to teeth, gums, hematologic, gastrointestinal, renal, cardiovascular, neurological systems, and pulmonary system if respirators are used;
- Blood pressure measurement;
- Blood sample and analysis including CdB, hemoglobin and hematocrit determinations, red cell indices, examination of peripheral smear morphology, blood urea nitrogen, serum creatinine;
- Urinalysis with microscopic examination; pregnancy or male fertility evaluation, if requested by the employee;
- Any other test deemed necessary by the physician.

16.4. **Medical removal protection**

- Ardent shall remove an employee from work involving exposure to cadmium at or above the AL on each occasion that a CdB and follow-up test is at or above 5 µg/dl. An employee who has been removed due to an elevated CdB can return to his/her former job after having two consecutive CdBs at or below 4 µg/dl.
- For those employees temporarily removed from their jobs involving cadmium exposure, a CdB must be provided every month during the removal period.
16.5. Medical removal protection benefits

- If the job continues, and the employee was removed, Ardent shall provide up to 18 months of MRP benefits on each occasion that an employee is removed from exposure to cadmium. MRP benefits means the normal earnings, seniority and other employment rights, and benefits, as though the employee had not been removed from the former job.

17.0 Recordkeeping

- All records relating to Ardent Cadmium Safety Program are to be maintained for at least 40 years or for the duration of employment plus 20 years, whichever is longer. The following records will be established and maintained:

17.1. Exposure monitoring

- Date(s), number, duration, location, and results of each of the samples taken, including a description of the sampling procedure used to determine representative employee exposure where applicable
- Description of the sampling and analytical methods used and evidence of their accuracy
- Type of respiratory protective devices worn, if any
- Name, social security number, and job classification of the employee monitored and of all other employees whose exposure the measurement is intended to represent
- Environmental variables that could affect the measurement of employee exposure

17.2. Medical surveillance

- The name, social security number, and description of the duties of the employee;
- A copy of the physician's written opinions;
- Results of any airborne exposure monitoring done for that employee and the representative exposure levels supplied to the physician
• Any employee medical complaints related to exposure to cadmium.

• A copy of the medical examination results including medical and work history

• A description of the laboratory procedures and a copy of any standards or guidelines used to interpret the test results or references to that information;

• A copy of the results of biological monitoring.

17.3. Medical removals

• Name and social security number of the employee;

• Date on each occasion that the employee was removed from current exposure to cadmium as well as the corresponding date on which the employee was returned to his or her former job status;

• Brief explanation of how each removal was or is being accomplished; and

• Statement with respect to each removal indicating whether the reason for the removal was an elevated blood cadmium level.