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CHATTANOOGA-HAMILTON COUNTY AIR POLLUTION CONTROL BUREAU

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Applicable Certificates:

0090-30500899-02C	Kiln Burnoff
0090-30500899-23C	Plating Shop with Associated Exhaust
0090-30500899-36C	Two (2) Butvar Spray Hoods
0090-30500899-37C	Chemical Milling Exhaust
0090-30500899-38C	Lab Exhaust System - Mezzanine
0090-30500899-46C	Lab Hoods and Associated Equipment
0090-30500899-47C	Room Exhaust, Lab Room, Kiln Exhaust, Screen Printing Exhaust
0090-30500899-65C	Despatch Oven
0090-30500899-66C	Solvent Spray Treating Unit #5
0090-30500899-67C	Acid Storage Room
0090-30500888-68C	Caustic Storage Room
0090-30500899-69C	Nickel Furnace Exhaust, Five (5) Furnaces
0090-30500899-70C	Nickel Furnace Room Exhausts
0090-30500899-71C	Nickel Furnace Exhaust, Four (4) Furnaces
0090-30500899-72C	Ball Mills Area Exhaust Fan
0090-30500899-73C	Ball Mills (7 Units) with Baghouse
0090-30500899-74C	Tape Casters (2 Identical Units) with Fume Oxidizer
0090-30500899-75C	Tape Caster Area Exhaust Fan
0090-30500899-76C	GCA Vacuum Furnace
0090-30500899-77C	Deltech Furnace
0090-30500899-78C	AT & T Furnace
0090-30500899-79C	Interamics Astro Furnace
0090-30500899-80C	Golden Astro Furnace
0090-30500899-81C	Camco Furnace
0090-30500899-82C	AT&T Lab Tube Furnace

Purpose

On April 4, 1994, an inspection was made at Coors Electronic Package Company (CEPC) for the purpose of renewing the annual certificates of operation.

Process Description

CEPC produces circuit pieces which are multi-layered ceramic sheets plated with tungsten, nickel, and gold. Pre-fired ceramic tape is cut into strips, a circuit pattern is printed onto the tape with tungsten paste, the pattern stamped, and the layers pressed together. The layered tape is plated with metal and then fired. After firing, the circuits are broken apart, tested, and sent to consumers.

The process begins by mixing alumina powders with toluene and methyl isobutyl ketone (MIBK) in seven (7) ball mills to produce a paste-like material. A baghouse is used to control emissions from the ball mills and a fume oxidizer controls organic vapors from the tape casters. The ball mill room as well as the tape casting room is equipped with room exhausters to remove vapors.

The ceramic material is then manufactured in the tape casters where the greenware is heated, rolled, and cut into strips. Using tungsten and alpha terpineol paste, a circuit pattern is printed on the ceramic tape through screen patterns. The paste is produced in a lab vented by an exhaust system. The screen pattern is produced by photo-etching a metallic plate by using hydrochloric and ferric chloride solutions. The printed ceramic tape is stamped so that after it is fired, the individual circuits can be separated. After the tape is stamped, the layers of the circuit are pressed together forming the completed circuit design ready to be plated. The circuits are plated by dipping the circuit into a cleaning solution, a nickel plating bath, a water rinse, into hydrochloric acid and nitric acid baths, rinsed again in water, dipped into the gold plating solution, and finally rinsed in water.

The plated unfired circuits are then fired in a staged kiln to a final temperature of about 1600°F. The fired circuit plates are then broken apart, the surface edges smoothed, inspected, and shipped to consumers.

Findings

0090-30500899-02C Kiln Burnoff

There are three kilns which are fired electrically. Each of the kilns are equipped with kiln burnoffs which are used to burn any organic materials and hydrogen gas produced from the firing of ceramic tape. Water and carbon dioxide are the only emissions from the kiln burnoffs if the burnoffs are operated properly. Only two (2) of the three (3) kilns are fired at any one time. Only one (1) kiln was in normal operation on the date of the inspection. There were no visible emissions nor odors observed from this source during the inspection.

This source is subject to Section 4-41, 2.4 (NO_x), Rule 3 (visible emissions), Rule 10 (process emissions), Rule 12 (odor), Rule 13.1 (SO_2), and Rule 26.3 (RACT - particulate emissions from ceramics plants).

Rule 10 limits particulate emissions, for the process weight of 6.0 lbs/hr to 0.1 lbs/hr. Estimated actual particulate emissions, the combustion products of natural gas and solvents, are 0.08 lbs/hr (0.006 gr/dscf).

Rule 2.4 limits NO_x emissions to 0.132 lbs/hr (300 ppm). The estimated actual NO_x emissions are 0.044 lbs/hr (99.6 ppm).

Rule 13.1 limits SO_2 emissions to 0.306 lbs/hr (500 ppm). The estimated actual SO_2 emissions are 0.0002 lbs/hr (0.3 ppm).

The estimated VOC emissions from this process are 0.4 lbs/hr. Because of the combustion of hydrogen (an offgas of the process), the organics are assumed to be completely destroyed by the high offgas flame temperature of 3880°F. Thus no odor should come from the kilns.

The kilns were determined to be in compliance with Rule 2.4, Rule 3, Rule 10, Rule 12, Rule 13.1, and Rule 26.3.

0090-30500899-23C Plating Shop with Associated Exhaust

The four main lines associated with the plating shop are the NAPCO line, the PIN line, the SELREX line, and the AURON line. The AURON line is the only electroless plating operation. The remaining plating lines are electrolytic processes.

The plating exhaust system exhausts plating baths, kept at 145°F (62°C), containing 1% palladium chloride; 15% aluminum fluoride; 12% potassium hydroxide; aqueous nickel sulfate; potassium-gold-cyanide; 50% Hydrochloric Acid (HCl); less than 1% hydrazine monohydrate; and nitric acid (HNO_3). Emissions from all but the HCl and HNO_3 solutions will be less than 0.001 lbs/hr as the other chemicals are crystalline when not in solution and have low concentrations and very low vapor pressures. The total HCl emissions for the six plating baths will vary from 1.203 lbs/hr to 5.284 lbs/hr over an average work week (see correspondence dated May 20, 1991). The melting points of palladium chloride ($PdCl_2$), aluminum fluoride ($AlFl_3$) and potassium-hydroxide (KOH) are 501°C, 1291°C, and 360°C respectively. Nickel sulfate ($NiSO_46H_2O$) loses $6H_2O$ @ 103°C and potassium-gold-cyanide ($KAu(CN)_2$) has no free cyanide as it is bound in the compound.

CEPC has equipped the room which houses this source with detection devices able to sense HCL and cyanide emissions at concentrations as low as 5 ppm. This source was in operation and found to be in compliance with the Ordinance.

This source is subject to Section 4-41, Rule 3 (visible emissions), Rule 10 (process emissions), Rule 12 (odor), and Rule 26.3 (RACT - particulate emissions from ceramic plants). Allowable particulate emissions for the process weight of 48 lbs/hr, as limited by Rule 10 and Rule 26.3 are 0.36 lbs/hr and 0.020 gr/dscf, respectively. According to EPA document, Locating and Estimating Air Emissions from Sources of Nickel (EPA - 450/4-84-007f March 1984) metallic emissions from electroplating operations are considered very low to nonexistent. Metallic compound emissions, such as gold cyanide, are estimated as 0.10

lbs/hr (0.002 gr/dscf). The total HCl emissions emitted from the six plating baths are estimated to be 5.284 lbs/hr. Caustic emissions are estimated as 0.05 lbs/hr of NaOH and 0.36 lbs/hr of hydrazine. VOC emissions are estimated at 2.03 lbs/hr (acetone and perchloroethylene). Freon 113 emissions are 1.5 lbs/hr. Freon 113 is an exempt VOC by definition [see Title 40 Code of Federal Regulations Part 51, Appendix S (July 1, 1991)].

Previous SCREEN modeling of the total plating emissions (9.34 lbs/hr) combined into one stack due to the close proximity of the exhausts, resulted in a maximum one-hour concentration of 0.70 mg/m^3 at a distance of 151 meters from the source. Comparison of the SCREEN modeling results to perchloroethylene [the chemical with the lowest odor threshold (4.7 ppm) and TLV-TWA (50 ppm) of the chemicals emitted in any significant quantity], yielded a modeled concentration of 0.07 ppm or 0.14% of the TLV-TWA and 1.49% of the odor threshold for perchloroethylene. Using the same stack parameters and comparing the results to a 5 mg/m^3 TLV-TWA for metallic cyanide yielded a maximum one-hour concentration of 0.22 lbs/hr (0.0011 mg/m^3). The maximum one-hour concentration for HCl and HNO_3 are 4.06×10^{-4} ppm and 2.55×10^{-4} ppm, respectively. This compares to 0.008% of the TLV-TWA of 5 ppm and 0.004% of the odor threshold of 10 ppm for HCl, and 0.013% of the TLV-TWA of 2.0 ppm and 0.002% of the odor threshold of 10 ppm for HNO_3. Emissions from the plating exhausts should cause no odor or adverse health effects.

The plating exhausts were determined to be in compliance with Rule 3, Rule 10, Rule 12, and Rule 26.3.

0090-30500899-36C Two (2) Butvar Spray Hoods

Each individual layer of tape is conveyed through the spray hoods and coated with butvar, which is a type of glue used to cement the layers of ceramic together. The butvar solution contains approximately 39% xylene; 39% toluene; 10% acetone; 10% ethanol; less than 1% oleic acid; and 1% butvar (organic binder) and dye. All but the organic binder and dye are VOC's. One Butvar spray booth was idle during this inspection. The blowers used to evacuate the spray hoods were in good working order.

This source is subject to Section 4-41, Rule 3 (visible emissions), Rule 10 (process emissions), Rule 12 (odor), and Rule 26.3 (RACT - particulate emissions from ceramic plants). Allowable particulate emissions as limited by Rule 10 based on a process weight of 104.6 lbs/hr, and Rule 26.3, are 0.58 lbs/hr and 0.020 gr/dscf, respectively. Estimated actual particulate emissions from the process are 0.0054 lbs/hr (0.007 gr/dscf).

Previous SCREEN modeling of the VOC emissions (4.66 lbs/hr) primarily xylene and toluene, resulted in a one-hour maximum concentration of 0.468 mg/m^3 (0.124 ppm for toluene) at a distance of 57 meters from the source. Xylene has the lowest

odor threshold, 0.47 ppm, of the organics emitted and xylene and toluene have the lowest TLV-TWAs, 100 ppm. The maximum concentrations predicted are 26% of the lowest odor threshold and 0.1% of the lowest TLV-TWA.

This source was determined to be in compliance with Rule 3, Rule 10, Rule 12, and Rule 26.3.

0090-30500899-37C Chemical Milling Exhaust

The chemical milling process involves three etching machines. The machines utilize either an HCl solution or a Ferric Chloride ($FeCl_3$) solution for etching. The HCl and $FeCl_3$ vapors exhausted from each machine are ducted into one duct and carried to the outside. A sodium hydroxide (NaOH) wash is used to neutralize the etching acids. No etching machine was in operation on the date of the inspection.

This source is subject to Section 4-41, Rule 3 (visible emissions), Rule 10 (process emissions), Rule 12 (odor), and Rule 26.3 (RACT - ceramic plants). Allowable particulate emissions as limited by Rule 10 based on a process weight of 10 lbs/hr, and Rule 26.3, are 0.12 lbs/hr and 0.020 gr/dscf, respectively. Actual particulate emissions from the process are estimated at less than 0.01 lbs/hr (0.001 gr/dscf) as the metal removed from the etched material during the milling process remains in the etching solution.

Previous SCREEN modeling of the HCl vapors, emitted at a rate of 0.244 lbs/hr, resulted in a maximum one-hour concentration of 0.076 mg/m^3 (0.052 ppm) at a distance of 45 meters from the source. The modeled concentration is 0.72% of the TLV-TWA of 5 ppm and 0.36% of the odor threshold of 10 ppm.

The chemical milling process was determined to be in compliance with Rule 3, Rule 10, Rule 12, and Rule 26.3.

0090-30500899-38C Lab Exhaust System - Mezzanine

The lab exhaust system is used to vent vapors of terpineol which are produced when mixing terpineol, tungsten, and ceramic into a paste. A thin layer of paste is used as an insulating medium between the layers of the ceramic tape. Acetone vapors are also exhausted when cleaning the mixing equipment. The lab exhaust system was not being used but appeared to be in good condition.

This source is subject to Section 4-41, Rule 12 (odor).

Previous SCREEN modeling of the terpineol emissions of 0.005 lbs/hr resulted in a maximum one-hour concentration of 3.71×10^{-4} (1.90×10^{-5} ppm) at a distance of 92 meters from the source. The odor threshold of terpineol is 0.35 ppm. No TLV-TWA

is listed for terpineol. The modeled concentration should present no odor or adverse health effects. The lab exhaust was determined to be in compliance with Rule 12.

0090-30500899-46C Lab Hoods and Associated Equipment

The six (6) lab hoods are used to exhaust fumes when testing ceramic parts in various stages of completion. Tests of physical and electrical quality are performed. One lab hood is located in the quality control lab, another lab hood in the ball mill and tape casting area, two hoods are located in the nickel furnace room area, and two hoods are located in the grinding and sand blasting department. Hydrochloric acid and hydrogen sulfide are emitted from the lab hoods. The lab hoods were not in operation but appeared to be in good condition.

This source is subject to Section 4-41, Rule 3 (visible emissions), Rule 10 (process emissions), Rule 12 (odor), and Rule 26.3 (RACT - ceramic plants). Allowable particulate emissions as limited by Rule 10 based on a process weight of 4 lbs/hr, and Rule 26.3, are 0.06 lbs/hr and 0.020 gr/dscf, respectively. Estimated actual particulate emissions are estimated to be 0.01 lbs/hr (0.001 gr/dscf) which consists primarily of a small amount of smoke from solder tests. Estimated actual emissions from other tests performed in the hoods consists of 0.023 lbs/hr for H_2S, 0.008 lbs/hr for HCl, and 0.05 lbs/hr for perfluorinated liquids.

Previous SCREEN modeling yielded a maximum one hour HCl concentration of 1.4×10^{-3} mg/m^3 (0.0009 ppm) at a distance of 61 meters from the source. Modeled H_2S emissions resulted in a maximum one-hour concentration of 4.0×10^{-3} mg/m^3 (0.003 ppm) at a distance of 61 meters from the source. Modeled perflourinated emissions yielded a maximum concentration of 2.3×10^{-3} mg/m^3 (0.0003 ppm) at a distance of 196 meters. The modeled emissions are 0.009% of the odor threshold concentration of 10 ppm and 0.02% of the TLV-TWA concentration of 5 ppm for HCl, 63.8% of the odor threshold concentration of 0.0047 ppm and 0.021% of the TLV-TWA concentration of 10 ppm for H_2S, and 0.30% of the TLV-TWA concentration of 0.1 ppm for perfluorinated liquids. No odor thresholds are listed for the perchlorinated liquids.

The lab exhausts were determined to be in compliance with Rule 3, Rule 10, Rule 12, and Rule 26.3.

0090-30500899-47C Room Exhaust, Lab Room, Kiln Exhaust, Screen Printing Exhaust

The room and screen printing exhausts remove acetone, toluene, and terpineol vapors generated in the kiln room. Acetone vapors generated from the lab room and the kiln are also removed. The lab room is a separate enclosure inside the kiln room. All the equipment was in good condition and in normal

operation.

This source is subject to Section 4-41, Rule 2.4 (NO_2), Rule 3 (visible emissions), Rule 10 (process emissions), Rule 12 (odor), Rule 13.1 (SO_x), and Rule 26.3 (RACT - ceramic plants). No visible emissions or odor were detected coming from the kiln, lab, or solder dip exhaust.

Allowable particulate emissions as limited by Rule 10 based on a process weight of 92 lbs/hr, and Rule 26.3, are 0.53 lbs/hr and 0.020 gr/dscf, respectively. Estimated actual particulate emissions, primarily from the solder dip and kiln, are less than 0.01 lbs/hr (0.001 gr/dscf).

Allowable SO_2 emissions, as limited by Rule 13.1, are 0.624 lbs/hr (500 ppm). Actual SO_2 emissions, as estimated coming from the kiln exhausts, are 0.00062 lbs/hr (0.497 ppm).

Allowable NO_2 emissions, as limited by Rule 2.4, are 0.269 lbs/hr (300 ppm) and actual NO_2 emissions, as estimated coming from the kiln exhaust while burning natural gas, are 0.21 lbs/hr (234 ppm).

Organic compounds emitted from the lab, screen printing, and solder dip are VOC's (toluene, acetone, terpineol, and glycerine) at a combined rate of 0.5 lbs/hr.

Previous Screen modeling resulted in a maximum one-hour concentration of 0.107 mg/m^3 at a distance of 55 meters from the source. The modeling concentration yielded a maximum concentration of 0.028 ppm for toluene (the organic compound with the lowest TLV-TWA concentration of 100 ppm), and 0.009 ppm for terpineol (the organic with the lowest odor threshold concentration of 0.35 ppm).

The kiln, labs, and solder dip exhausts were determined to be in compliance with Rule 2.4, Rule 3, Rule 10, Rule 12, Rule 13, and Rule 26.3.

0090-30500899-65C Despatch Oven

The despatch oven is used to dry the unfired ceramic circuits after the circuit design coating has been applied and before the circuit is punched. Vapors of polyvinyl butyral and polyalkaline glycol (used as a plasticizer) are produced from the drying of the ceramic. The oven is located in the same room as the kiln. The despatch oven was in good condition and was in normal operation.

This source is subject to Section 4-41, Rule 2.4 (NO_2), Rule 3 (visible emissions), Rule 10 (process emissions), Rule 13.1 (SO_2), and Rule 26.3 (RACT-ceramic plant).

Allowable particulate emissions as limited by Rule 10 for a

process weight of 14.4 lbs/hr including gas burned, and Rule 26.3, are 0.15 lbs/hr and 0.020 gr/dscf, respectively. Estimated actual particulate emissions are 0.5 lbs/hr (0.015 gr/dscf).

The oven is fired with natural gas and produces NO_2 emissions of 0.85 lbs/hr (99.6 ppm) and SO_2 emissions of 0.004 lbs/hr (0.3 ppm). Allowable NO_2 emissions (Rule 2.4) and SO_2 emissions (Rule 13.1) are 300 ppm (2.57 lbs/hr) and 500 ppm (5.96 lbs/hr), respectively.

Estimated actual organic emissions from a mixture of polyvinyl butyral and polyalkaline glycol are 0.72 lbs/hr uncontrolled.

Previous SCREEN modeling composed mainly of glycol emissions, resulted in a maximum one-hour concentration of 0.029 mg/m^3 (0.02 ppm for the glycol) at a distance of 87 meters from the source. Glycols have a TLV-TWA concentration of 5 ppm to 100 ppm and an odor threshold concentration of 25 ppm and greater. The modeled concentration is 0.33% of the TLV-TWA and 0.07% of the odor threshold.

The despatch oven was determined to be in compliance with Rule 2.4, Rule 3, Rule 10, Rule 12, Rule 13, and Rule 26.3.

0090-30500899-66C Solvent Spray Treating Unit #5

The solvent spray treating unit #5 is used for cleaning the metal sheets before they enter the chemical etching process. Bio-T a non-chlorinated cleaner/degreaser is used for this purpose. The vapor emissions from this source are vented directly to the outside.

Bio-T consists of Terpene and non-ionic surfactants. Terpene ($C_{10}H_{16}$) is an unsaturated hydrocarbon which occurs in most essential oils and oleoresins of plants. The constituents of the non-ionic surfactants is proprietary information, but a representative from the manufacturer stated that 100% of the non-ionic surfactants are organic. Based on the Material Safety Data Sheet Bio-T does not contain any hazardous components as defined by the Occupational Safety and Health Administration. Bio-T is listed on the FDA (Food and Drug Administration) list of substances which are edible. Because Bio-T contains no hazardous ingredients, no harmful effects are expected from the use of this product.

0090-30500899-67C Acid Storage Room

The storage room, formed from the partitioning of a large basement room, is exhausted to prevent potentially harmful accumulation of vapors due to possible rupture or other accidental releases from the storage drums. Normal emissions from the room will be less than 0.1 lbs/hr.

This source stores four (4) chemicals used by CEPC. They consist of hydrogen chloride (HCl), ferric chloride ($FeCl_3$), nitric acid and sulfuric acid. Hydrochloric acid comprises the majority of emissions emitted from this source as it is the chemical stored in the largest quantity. HCl has a vapor pressure, for the 38% HCl technical grade, of 1.52 atmospheres (1155 mmHg) at 20°C. Ferric Chloride ($FeCl_3$) is an iron salt, a solid in aqueous solution, with a vapor pressure 1 mmHg at 194°C. Nitric acid has a vapor pressure of 62 mmHg at 20°C, and sulfuric acid has a vapor pressure of 1 mmHg at 145.8°C. There were no strong odors present or any spillage observed. The exhaust fan ventilation system was working properly on the date of the inspection.

This source is subject to Section 4-41, Rule 12 (odor) and Rule 17 (process gaseous emissions).

Previous SCREEN modeling for the gaseous emissions of 0.1 lbs/hr resulted in a maximum one-hour average concentration of 0.013 mg/m^3 (0.003 ppm) at a distance of 117 meters from the source. Sulfuric acid, which has the lowest TLV-TWA of the four acids of 1.0 mg/m^3 (0.25 ppm) and the TLV-TWA's of ferric chloride, HCl, and nitric acid (HNO_3) are 1.0 mg/m^3 (0.15 ppm), 7.0 mg/m^3 (5 ppm), and 5.0 mg/m^3 (2 ppm), respectively. The odor recognition threshold of HCl, the only acid for which odor information was available and the most volatile of the four acids, is 10 ppm. The SCREEN model indicated a maximum one-hour average concentration of 1.2% of the TLV-TWA of the chemical with the lowest TLV-TWA, sulfuric acid. The modeled concentration is 0.03% of the odor recognition threshold (10 ppm) for hydrochloric acid.

The acid room exhaust was determined to be in compliance with Rule 12 and equipment has been determined to be reasonable and proper and in compliance with Rule 17.

0090-30500899-68C Caustic Storage Room

The storage room, formed from the partitioning of a large basement room, is exhausted to prevent potentially harmful accumulation of vapors due to possible rupture or other accidental releases from the storage drums. Normal emissions from the room will be less than 0.1 lbs/hr.

Sodium hydroxide, a solid at room temperature, is brought to the plant in 55 gallon drums of aqueous solution. Ammonium hydroxide is a liquid at room temperature and is brought to the plant in 55 gallon drums of 50% NH_4OH solutions with 25% ammonia. Potassium hydroxide and hydrazine monohydrate are also stored here. Hydrazine Monohydrate is stored in doubly sealed containers to prevent any possible spillage. Total emissions from the source are less than 0.1 lbs/hr and the primary emissions from the four (4) chemicals will be ammonia evolved from the ammonium hydroxide drums. Ammonia, a gas at room

temperature, has an odor detection threshold of 47 ppm. There were no strong odors present or any spillage observed. The exhaust fan ventilation system was working properly on the date of the inspection.

This source is subject to Section 4-41, Rule 12 (odor) and Rule 17 (process gaseous emissions).

Using a total emissions of 0.1 lbs/hr, a previous SCREEN model resulted in a maximum one-hour concentration of 0.012 mg/m^3 (0.008 ppm) at a distance of 117 meters from the source. Potassium hydroxide has the lowest TLV-TWA of 2 mg/m^3 (0.872 ppm) of sodium hydroxide, ammonium hydroxide, and hydrazine monohydrate. The concentration is 0.9% of the TLV-TWA of the chemical with the lowest TLV-TWA, potassium hydroxide.

The caustic room exhaust was determined to be in compliance with Rule 12 and the equipment has been determined to be reasonable and proper and in compliance with Rule 17.

0090-30500899-69C Nickel Furnace Exhaust, Five (5) Furnaces

Five small furnaces are used to fire the ceramic circuit boards and the furnaces are all ducted to a common stack. The furnaces are batch-charged and nitrogen gas is used to insure the heating chamber is oxygen deficient. The source is permitted as a minor source due to the low emissions of 0.7 lbs/day and 174 lbs/yr of iodine. One furnace was in operation during the inspection with no visible emissions observed.

This source is subject to Section 4-41, Rule 3 (visible emissions), Rule 10 (particulate emissions), Rule 12 (odor), and Section 4-8(e)(2)(b) [BACT]. The allowable particulate emissions rate of 0.05 lbs/hr was previously determined as BACT. The estimated actual particulate emissions are 0.029 lbs/hr.

A previous SCREEN model of the allowable particulate emissions of 0.05 lbs/hr for iodine, resulted in a maximum one-hour concentration of 0.0026 mg/m^3 at a distance of 79 meters from the source. The iodine concentration is 0.26% of the TLV-TWA concentration (1 mg/m^3) and should cause no odor or adverse health effects (no odor threshold data was available).

The furnace exhaust was determined to be in compliance with Rule 3, Rule 12, and Section 4-8(e)(2)(b).

0090-30500899-70C Nickel Furnace Room Exhausts

Three supply fans and four exhaust fans are used to thermostatically control the heat generated from the furnace room. The source is permitted as a minor source due to the low emissions of 0.05 lbs/day and 17.5 lbs/yr. The fans were in normal operation.

This source is subject to Section 4-41, Rule 3 (visible emissions), Rule 10 (process emissions), Rule 26.20 (visible emissions from buildings), and Section 4-8(e)(2)(b). The allowable particulate emissions rate of 0.01 lbs/hr was previously determined as BACT. Actual particulate emissions are 0.002 lbs/hr (0.0002 gr/dscf). Due to the low particulate emissions from the source, the furnace room exhausts should be considered as BACT.

Previous SCREEN modeling of the allowable particulate emissions of 0.01 lbs/hr from the four (4) exhausts, results in a maximum one-hour concentration of 4.69×10^{-4} mg/m^3 at a distance of 42 meters from the source.

The furnace room exhaust system was determined to be in compliance with Rule 3, Rule 10, and Section 4-8(e)(2)(b).

0090-30500899-71C Nickel Furnace Exhaust, Four (4) Furnaces

Four nickel furnaces which are identical to the five nickel furnaces of certificate -69C are also used in the production of ceramic circuit boards. The heating chambers of these four furnaces are heated electrically and purged of all oxygen by injection of gaseous nitrogen. The presence of the nitrogen insures that oxidization of the ceramic boards does not take place. The source is permitted as a minor source as potential controlled emissions are 0.7 lbs/day and 174 lbs/yr of iodine. The four furnaces associated with this source were idle during the inspection but appeared to be in good condition.

This source is subject to Section 4-41, Rule 3 (visible emissions), Rule 10 (process emissions), Rule 12 (odor), and Section 4-8(e)(2)(b). The allowable particulate emissions rate of 0.05 lbs/hr was previously determined as BACT. Actual particulate emissions are 0.029 lbs/hr (0.0009 gr/dscf).

Previous SCREEN modeling of the emissions resulted in a maximum one-hour concentration of 1.42×10^{-3} mg/m^3 (0.00014 ppm) of iodine at a distance of 81 meters from the source. Iodine has a TLV-TWA of 0.1 ppm. No odor or adverse health effects should result from the emissions. Due to the small amount of particulate, iodine, and ammonia emissions, the equipment of the process was previously determined as BACT.

The four furnaces were determined to be in compliance with Rule 3, Rule 10, Rule 12, and Section 4-8(e)(2)(b).

0090-30500899-72C Ball Mills Area Exhaust Fan

An exhaust fan is used to remove fumes from the ball mill area while the solvent mixture is loaded into the ball mills for mixing. The fumes from the pouring operation originates from a mixture of organics labeled as Mastermix which consists of a plasticizer, toluene and methyl isobutyl ketone (MIBK) at a

combined rate of 0.093 lbs/hr. Due to the low emission rate of 2.23 lbs/day and 814.68 lbs/yr, the equipment is permitted as a minor source. The exhaust fan was operating on the date of the inspection. Because the ball mills area was idle during the inspection, no odors were present.

This source is subject to Section 4-41, Rule 12 (odor) and Rule 25.3 (VOC standards for new sources). Allowable VOC emissions, as limited by Rule 25.3 are 0.1 lbs/hr. Estimated actual VOC emissions are 0.093 lbs/hr.

A previous SCREEN model of the allowable VOC emissions of 0.10 lbs/hr consisting of 50% toluene and 50% MIBK, resulted in a maximum one-hour concentration of 5.45×10^{-3} mg/m^3 (0.0014 ppm) at a distance of 180 meters from the source. Comparison of the modeled concentration to MIBK the chemical with the lowest TLV-TWA concentration of 50 ppm and the chemical with the lowest odor threshold limit of 0.68 ppm, yielded a VOC emission rate that was 0.003% of the TLV-TWA concentration and 0.21% of the odor threshold limit. Therefore, the VOC emissions from this source should cause no adverse health effects. Rule 25.3 requires the source to utilize BACT which limits this source to an allowable VOC emissions rate of 0.1 lbs/hr.

The ball mill exhaust fan was determined to be in compliance with Rule 12 and Rule 25.3.

0090-30500899-73C Ball Mills (7 Units) with Baghouse

Seven (7) ball mills are used to grind and then mix the alumina (aluminum oxide), toluene and MIBK for casting into tape. Once the alumina is ground and before the organics are added, the exhaust from the ball mill to the baghouse is closed and additional emissions from the ball mill dissipate into the room and are exhausted by the room exhauster (-72C). The seven ball mills were idle during the inspection. The baghouse was also idle but appeared to be in good condition.

This source is subject to Section 4-41, Rule 3 (visible emissions), Rule 10 (process emissions), and Section 4-8 (e)(2)(b) [BACT]. Actual particulate emissions, based on engineering estimates and 99.6% control efficiency, are 0.24 lbs/hr (0.008 gr/dscf). Allowable particulate emissions of 0.5 lbs/hr were previously determined to be BACT.

The Ball Mills (7 Units) was determined to be in compliance with Section 4-8 (e)(2)(b), Section 4-41, Rule 3, and Rule 10.

0090-30500899-74C Tape Casters (2 Identical Yokoyama Units; 1 Smaller Interamics Unit) with Fume Oxidizer

Only two (2) of the three (3) tape casters are used at any point in time to produce ceramic tape. The alumina and solvent mixture is heated to above 120°F while being rolled into a sheet

about 1/8 inch thick. De-Air machines remove air from the tape mixture to prevent bubbles. All of the tape casting operations are controlled by a fume oxidizer. Since the tape casting operation is performed in a "clean" room, no particulate emissions should result from the tape casting operation. Only one of the Yokoyama tape casters was in operation on the date of the inspection with no visible emissions observed coming from the fume oxidizer.

On September 15-18, 1989, the fume oxidizer controlling the VOC emissions from the tape caster was stack tested. During the time of the stack test the two Yokoyama Units were in operation. The results from the test revealed that the actual VOC emissions of the 50% toluene and 50% MIBK composition was 1.67 lbs/hr combined. The BACT limitation of 0.75 lbs/hr for this source is based upon 80 lbs/hr process weight. Data from the stack test showed the actual VOC emission to be 0.64 lbs/hr per 80 lbs process weight. The maximum eight-hour concentration for toluene and MIBK are less than the TLV-TWA concentration.

The Interamics tape caster operates with a process weight rate of 40 lbs/hr. In comparison, each Yokoyama tape caster operates with a process weight rate of 104 lbs/hr. Because the process weight rate associated with the Interamics tape caster is less than the process weight rates of either of two Yokoyama tape casters, the VOC emissions emitted by the Interamics tape caster will also be less. Since CEPC will only operate two tape casters at any given time, the VOC emissions were separated into two groups - 1) the VOC emissions emitted by the operation of the two Yokoyama tape casters (Scenario I), and 2) the VOC emissions emitted by the operation of one Yokoyama tape caster and the Interamics tape caster (Scenario II).

This source is subject to Section 4-41, Rule 17 (odor) and Rule 25.3 (VOC standards for new sources). The Allowable VOC emissions limitations for Scenario I has been previously determined to be 0.75 lbs/hr per 80 pounds of process weight rate which when taking into consideration the process weight rate of 104 lbs/hr for each of the Yokoyama tape casters yields an allowable VOC emission rate of 0.975 lbs/hr per tape caster. This VOC emissions limitation was previously designated as BACT [Section 4-41, Rule 25.3].

The allowable VOC emissions limitations for Scenario II was previously designated as BACT (Section 4-41, Rule 25.3). Because the solvent mixture which is incorporated with the alumina powders is a fairly constant proportioned mix, the VOC emissions emitted from the tape can be assumed to be directly proportional to the process weight of the material. Based on this fact and through use of linear interpolation the BACT VOC limitation of 0.75 lbs/hr per 80 pounds of process weight for the two Yokoyama tape casters was previously used to determine the appropriate BACT VOC limitation of 0.375 lbs/hr per 40 pounds of process weight for the Interamics tape casting machine.

A SCREEN model was previously performed using the allowable VOC emissions of 1.95 lbs/hr for toluene and MIBK emitted by the two Yokoyama tape casting machines. Comparing the results of the modeling with MIBK (the pollutant with the lowest TLV-TWA of 205 mg/m^3) yielded a maximum one-hour concentration of 6.57×10^{-2} mg/m^3 (0.01604 ppm) at a distance of 168 meters from the source. This concentration corresponds to a maximum eight-hour concentration of 4.59×10^{-2} mg/m^3 (0.01123 ppm). Evaluating the eight-hour concentration with the TWA odor threshold and TLV-TWA for MIBK revealed the eight-hour concentration to be 1.65% of the odor threshold (0.68 ppm) and 0.02% of the TLV-TWA (50 ppm). Based on the allowable VOC emissions rate of 1.95 lbs/hr, the SCREEN model yielded an annual average concentration of 2.50×10^{-3} mg/m^3. This annual average is equivalent to 0.51% of the TLV-TWA/420. At the modeled concentration, no odor or adverse health effects should result from this source.

A SCREEN model was also previously performed for the VOC's emitted by the Interamics tape caster. Modeling was based on an allowable emission rate of 0.375 lbs/hr for MEK and anhydrous alcohol emitted by this source. Comparing the modeling results to MEK (the pollutant with the lowest TLV-TWA of 590 mg/m^3) yielded a maximum one-hour concentration of 6.92×10^{-3} mg/m^3 (0.0024 ppm) at a distance of 100 meters from the source. This concentration corresponds to a maximum eight-hour concentration of 4.84×10^{-3} mg/m^3 (0.0016 ppm). Evaluating the eight-hour concentration with the TWA odor threshold and TLV-TWA for MEK revealed the eight-hour concentration to be 0.03% of the odor threshold (5.4 ppm) and 0.0008% of the TLV-TWA (200 ppm). Based on the allowable VOC emissions rate of 0.375 lbs/hr, the SCREEN model yielded an annual average concentration of 2.63×10^{-4} mg/m^3. This annual average is equivalent to 0.02% of the TLV-TWA/420. At the modeled concentration, no odor or adverse health effects should result from this source.

Toluene, MIBK, and MEK are listed on EPA's list of 189 hazardous air pollutants to be regulated under Title 3 of the New Clean Air Act Amendments.

The tape casters with fume oxidizer were determined to be in compliance with Section 4-41, Rule 12, and Rule 25.3.

0090-30500899-75C Tape Caster Area Exhaust Fan

Toluene and MIBK fumes generated by the tape casting process, due to potential leakage upon hookup and equipment cleanup, are vented to prevent build-up of the fumes. The process, which is uncontrolled, is permitted as a minor source due to the level of emissions, 1.58 lbs/day, and 577 lbs/yr of the combined toluene and MIBK. The exhaust fan was in operation during the inspection but there were no toluene or MIBK fumes being generated as the loading of alumina and solvent mixture into the tape casters was not being performed.

This source is subject to Section 4-41, Rule 12 (odor) and

Rule 25.3 (VOC standards for new sources). The estimated VOC source emissions from this source are 0.033 lbs/hr for toluene and MIBK, respectively. The allowable VOC emissions from this source are subject to compliance with minor source status. Therefore, the allowable VOC emission rates from this source are 1.58 lbs/day and 578 lbs/year of toluene and MIBK combined. The allowable hourly VOC emission rate of 0.1 lbs/hr is considered BACT in accordance with Rule 25.3.

A SCREEN model of the allowable emissions rate of 0.10 lbs/hr for toluene and MIBK combined was previously performed. The modeling resulted in a maximum one-hour concentration of 0.014 mg/m^3 at a distance of 109 meters from the source. This concentration corresponds to 0.0034 ppm for MIBK or 0.50% of the odor threshold (0.68 ppm) and 0.007% of the TLV-TWA (50 ppm). At the modeled concentration, no odor or adverse health effects should result from the source.

The tape caster room exhaust was determined to be in compliance with Rule 12, and Rule 25.3.

0090-30500899-76C GCA Vacuum Furnace

The GCA vacuum furnace is used (on a small scale) to fire experimental ceramic blanks. The fired pieces of ceramic are then analyzed and if the results are positive, adjustments of the recipes are made to the Ball Mills and Tape Casting operations.

The vacuum furnace is electrically heated to a temperature of 3002 °F. Varying concentrations of nitrogen and hydrogen gas are introduced into the chamber in order to insure that the ceramic blanks are hermetically sealed. The organic emissions driven off from the ceramic blanks along with the nitrogen and hydrogen gases are vented vertically to a hood above the furnace. A natural gas flame is introduced into the stack gas with an auto ignition temperature of 1065°F to insure that the hydrogen gas inside the furnace stack is burned completely. Each firing cycle duration ranges from 20 to 30 hours.

The emissions from this source are directed into the exhaust stack of the Camco Furnace (-81C). This source was idle during the inspection and the equipment appeared to be in good condition.

This source is subject to Section 4-8(e)(2)(b), Section 4-41, Rule 13 (regulation of sulfur oxides), and Rule 25.3(2) (standards for new sources).

Estimated actual particulate, VOC, SO_x, and NO_x emissions are 0.001 lbs/hr, 0.058 lbs/hr, 0.0001 lbs/hr, and 0.0103 lbs/hr, respectively. Allowable particulate emissions were previously limited to 0.001 lbs/hr based on BACT [Section 4-8 (e)(2)(b)]. The VOC emissions are limited to 0.1458 lbs/hr based on BACT [Section 4-41, Rule 25.3 (2)]. Allowable SO_x emissions are limited to 0.4336 lbs/hr based on Section 4-41, Rule 13.2. The

NO_x emissions from the combustion of the natural gas flare associated with this source are not limited by any section of the Ordinance.

Previous SCREEN modeling of the allowable VOC emissions rate of 0.1458 lbs/hr (primarily methyl isobutyl ketone (MIBK) and toluene), resulted in a maximum one-hour concentration of 0.06474 mg/m^3 (0.017 ppm for toluene) at a distance of 60 meters from the source. MIBK has the lowest odor threshold, 0.68 ppm, of the organics emitted and the lowest TLV-TWA's, 50 ppm. The maximum concentrations predicted are 6.7% of the lowest odor threshold and 0.02% of the lowest TLV-TWA. It is conservatively assumed that none of the VOC's are destroyed in the furnace or the gas flame.

The vacuum furnace was determined to be in compliance with Section 4-8 (e)(2)(b), Section 4-41, Rule 8, Rule 13, and Rule 25.3.

0090-30500899-77C Deltech Furnace

This source is used to fire experimental pieces of greenware in order to verify the non shrinking effectiveness of the solvent mixtures. This furnace is of the air fire furnace type, meaning that either air or nitrogen can be injected into the firing chamber. The organics given off by the firing of the greenware are composed of 4.8% Methyl Isobutyl Ketone (MIBK) or Methyl Ethyl Ketone (MEK), 14% Toluene, 1% Synasol, and 1% Isopropanol, of 5% total composition. The binder used in the process is 9.0% Polyvinyl Butyral or Acryloid B-7 MEK Resin. The plasticizing constituents are made up of 0.5% Diisodecyl Glutarate (DIDG), 2.6% Plasticizer 2072 (Stepan), and 3.9% Santicizer 160, for a total of 7.0% composition.

This source was in operation during the inspection with no visible emissions observed.

Based on the combined uncontrolled contaminant emissions of 0.019 lbs/hr of particulate matter and 0.023 lbs/hr of VOC's, and in conjunction with continuous operation, this source meets the minor source requirements (i.e. uncontrolled contaminant emissions are less than 10 lbs/day and 1000 lbs/year).

Allowable particulate emissions of 0.04 lbs/hr were previously determined to be BACT [Section 4-8 (e)(2)(b)]. Allowable VOC emissions of 0.047 lbs/hr were also previously determined to be BACT [Section 4-41, Rule 25.3(2)].

A SCREEN model was previously performed for the VOC's emitted by the Deltech Furnace. Modeling was based on an allowable emission rate of 0.047 lbs/hr for MIBK, MEK, Synasol, Isopropanol, and Toluene emitted by this source. Comparing the modeling results to MIBK (the pollutant with the lowest TLV-TWA of 205 mg/m^3) yielded a maximum one-hour concentration of 11.02×10^{-3} mg/m^3 (0.0027 ppm) at a distance of 79 meters from the

source. This concentration corresponds to a maximum eight-hour concentration of 7.71×10^{-3} mg/m^3 (0.0019 ppm). Evaluating the eight-hour concentration with the TWA odor threshold and TLV-TWA for MIBK revealed the eight-hour concentration to be 0.28% of the odor threshold (0.68 ppm) and 0.0038% of the TLV-TWA (50 ppm). Based on the allowable VOC emissions rate of 0.047 lbs/hr, the SCREEN model yielded an annual average concentration of 4.19×10^{-4} mg/m^3. This annual average is equivalent to 0.09% of the TLV-TWA/420. At the modeled concentration, no odor or adverse health effects should result from this source.

The Deltech furnace was determined to be in compliance with Section 4-8 (e)(2)(b), and Section 4-41, Rule 25.3.

0090-30500899-78C AT & T Furnace

CEPC makes a product called Spinell. CEPC manufactures the electronic packaging for the AT & T Company who mounts an electronic memory chip into the electronic package which is then distributed throughout consumer electronics. The AT & T Furnace is used to accomplish this task.

The organics given off by the firing of the green ware are composed of 4.8% Methyl Isobutyl Ketone (MIBK) or Methyl Ethyl Ketone (MEK), 14% Toluene, 1% Synasol (Ethanol), and 1% Isopropanol, of 5% total composition. The binder is made of either Polyvinyl Butyral, Acryloid B-7 MEK Resin, or Acryloid B-66 MEK. The binder ranges from 5.0% to 9.0% of the total green ware composition. The plasticizing constituents are made up of either a 0.4% Diisodecyl Glutarate (DIDG), and 2.6% Plasticizer 2072 (Stepan) composition or a 3.0% to 9.0% Santicizer 160 composition. The plasticizer ranges from 3.0% to 9.0% of the total green ware composition.

This source was not operating during this inspection. The equipment appeared to be in good condition.

Estimated actual particulate and VOC emissions were determined to be 0.048 lbs/hr and 0.341 lbs/hr, respectively. Allowable particulate emissions of 0.173 lbs/hr were previously determined to be BACT [Section 4-8 (e)(2)(b)]. Allowable VOC emissions of 0.513 lbs/hr were also previously determined to be subject to BACT [Section 4-41, Rule 25.3(2)].

A SCREEN model was previously performed for the VOC's emitted by the AT & T Furnace and can be referenced in the installation report dated October 30, 1991. Modeling was based on an allowable emission rate of 0.513 lbs/hr for MIBK, MEK, Ethanol, Isopropanol, and Toluene emitted by this source. The air dispersion modeling resulted in a maximum one-hour concentration of 0.095 mg/m^3 (0.0232 ppm for MIBK) at a distance of 62 meters from the source. This concentration also corresponds to an eight-hour concentration of 0.066 mg/m^3 (0.016 ppm for MIBK). Comparing this concentration to MIBK (the pollutant with the lowest TLV-TWA of 205 mg/m^3) yields an eight-

hour concentration that is 0.03% of the TLV-TWA for MIBK. Evaluating the one-hour concentration with the odor threshold for MIBK revealed the concentration to be 3.41% of the odor threshold of 0.68 ppm (2.784 mg/m^3). Based on the allowable VOC emissions rate of 0.51252 lbs/hr, the SCREEN model yielded an annual average concentration of 3.60×10^{-3} mg/m^3. This annual average is equivalent to 0.74% of the TLV-TWA/420.

The AT & T furnace was determined to be in compliance with Section 4-8 (e)(2)(b), and Section 4-41, Rule 25.3.

0090-30500899-79C Interamics Astro Furnace

The Interamics Astro Furnace is used for production of advanced package parts. These are ceramic board parts that require very low tolerances between the electronic leads incorporated into the ceramic board. This source is specifically used for refiring ceramic boards for flatness and brazing. This source is fired electrically, and uses an oxygen deficient atmosphere composed of 75% hydrogen and 25% nitrogen during firing.

Because this source is used for refiring of ceramic boards for flatness, any possible emissions have already been accounted for at the Kiln Burnoffs (Certificate -02C).

0090-30500899-80C Golden Astro Furnace

Advanced package parts are ceramic board parts that require very low tolerances between the electronic leads incorporated into the ceramic board. Because of these low tolerances the parts are difficult for CEPC to produce and thus are called "advanced package parts".

The function of the Golden Astro Furnace is to co-fire products for the advanced package group. The Golden Astro Furnace is fired electrically. A normal cycle will consist of a 24 hour cycle time. During the first 5 hours of firing all of the VOC's and evaporative substances will volatilize. During this "binder burnout" stage the temperature will gradually increase from approximately 20°C (68°F) to 900°C (1652°F). Over the next 7 hours the temperature will continue to increase from 900°C to 1350°C (2462°F). Once the temperature of 1350°C has been reached the temperature will be held constant for another 7 hours. This "soaking" stage insures that the binder located in the laminated layers between the green ware is removed. Once this has been completed the green ware is then cooled over a 5 hour period. All of the exhaust gases vented through the exhaust stack are ignited with a natural gas flare.

The binder for this source is made of either Polyvinyl Butyral, Acryloid B-7 MEK Resin, or Acryloid B-66 MEK 100% Resin. The binder will range from 7.0% to 9.0% of the total green ware composition. The plasticizing constituents will be made up of

either a 0.4% to 0.91% Diisodecyl Glutarate (DIDG), 2.61% to 6.09% Plasticizer 2072 (Stepan), and 0.0% Santicizer 160 composition or 0.0% Diisodecyl Glutarate (DIDG), 0.0% Plasticizer 2072 (Stepan), and 3.0% to 7.0% Santicizer 160 composition. The plasticizer will range from 3.0% to 7.0% of the total green ware composition. It is estimated that 5% of the organic constituents of the solvent mixture are lost when the green ware is fired into ceramic board inside of the Golden Astro Furnace. The green ware is composed of 4.8% Methyl Isobutyl Ketone (MIBK) or Methyl Ethyl Ketone (MEK), 14% Toluene, 1% Synasol (Ethanol), and 1% Isopropanol.

On August 26, 1993, ATC performed a VOC emissions analysis of the uncontrolled exhaust gases from the Golden Astro Furnace. ATC performed the stack test within the parameters of the Pre-Test Agreement.

On the date of the stack test, CEPC was able to process a total of 36 lbs (1.5 lbs/hr) of greenware for fire. The installation permit application process weight rate was 50 lbs (2.08 lbs/hr). The average process weight is 12 lbs (0.5 lbs/hr). Since the emissions rate is low, it was recommended to maintain the 2.08 lbs/hr process weight.

ATC tested for VOC's using EPA test method 25A. The results of the test showed an actual VOC emissions rate of 0.0096 lbs/hr. The allowable VOC emissions limitation of 1.54 was previously designated as BACT [Rule 25.3(2)]. From the results of the stack test this limitation was too high to be considered as BACT. A more appropriate BACT VOC emissions limitation is 0.02 lbs/hr. A breakout of the constituent VOC emissions are listed in Table VI.

Organic constituents of the solvent mixture are MIBK, MEK, Synasol, Isopropanol, and Toluene. Toluene, MIBK, and MEK are listed on EPA's list of 189 hazardous air pollutants to be regulated under Title III of the New Clean Air Act Amendments. According to the "Documentation Of The Threshold Limit Values And Biological Exposure Indices" produced by the American Conference of Governmental Industrial Hygienists, neither Toluene, MIBK, MEK, Ethanol, nor Isopropanol are considered to be Human Carcinogens. A breakdown of the constituent HAP emissions based on the actual emissions rate of 0.0096 lbs/hr are listed in Table VII.

Previous modeling of this source was performed with the adjusted allowable VOC emission rate of 0.012 lbs/hr for MIBK, MEK, Ethanol, Isopropanol, and Toluene. The modeling results showed maximum ambient air concentrations of 6.6395 $\mu g/m^3$ (1-hr. avg.), 4.6476 $\mu g/m^3$ (8-hr. avg.), and 0.2523 $\mu g/m^3$ (annual avg.) at a distance of 48 meters from the source. Comparing this concentration to MIBK (the pollutant with the lowest TLV-TWA of 205,000 $\mu g/m^3$) yielded an eight-hour concentration that is 0.002% of the TLV-TWA for MIBK. Evaluating the one-hour concentration with the odor threshold for MIBK revealed the concentration to be 0.24% of the odor threshold of 0.68 ppm (2,784 $\mu g/m^3$). The concentration resulting from an approximate

annual averaging time is 0.05% of the TLV-TWA divided by 420.

Because the particulate constituents of the binder and plasticizer have no Threshold Limit Values, the particulate emissions were not modeled.

Particulate emissions were previously determined to be limited by BACT [Section 4-8 (e)(2)b]. Using Rule 10.3 (Schedule 2) the allowable BACT particulate emissions limitation for this source was previously determined to be 0.051 lbs/hr. Actual particulate emissions from this source were previously determined to be too low to quantify.

The Golden Astro Furnace is operated 24 hours/day, 5 days/week, and 52 weeks/year.

This source was determined to be in compliance with Section 4-8 (e)(2)(b) [BACT], Section 4-41, Rule 3 (visible emissions), Rule 10 (process equipment), and Rule 25.3 (standards for new sources), the Ordinance. Section 4-8 (e)(2)(b) [BACT], Section 4-41, Rule 3, Rule 10.3, and Rule 25.3, the Ordinance.

0090-30500899-81C Camco Furnace

The Camco Furnace is also used for production of advanced package parts. This source is specifically used for firing ceramic boards for brazing, shrinkage, metal sintering and refire. This source is fired electrically, and uses an oxygen deficient atmosphere composed of 75% hydrogen and 25% nitrogen during firing. This source was idle on the date of the inspection.

Estimated actual particulate emissions were determined to be too low to quantify. The estimated VOC emissions were determined to be 0.114 lbs/hr. Allowable VOC emissions of 0.15402 lbs/hr were previously determined to be BACT [Section 4-41, Rule 25.3(2)].

SCREEN modeling of this source was previously performed based on an allowable VOC emission rate of 0.154 lbs/hr for MIBK, MEK, Ethanol, Isopropanol, and Toluene. The modeling yielded maximum ambient air concentrations of 184.1 $\mu g/m^3$ (1-hr. avg.), 128.87 $\mu g/m^3$ (8-hr. avg.), and 6.996 $\mu g/m^3$ (annual avg.) at a distance of 48 meters from the source. Comparing this concentration to MIBK (the pollutant with the lowest TLV-TWA of 205,000 $\mu g/m^3$) yielded an eight-hour concentration that is 0.06% of the TLV-TWA for MIBK. Evaluating the one-hour concentration with the odor threshold for MIBK revealed the concentration to be 6.6% of the odor threshold of 0.68 ppm (2,784 $\mu g/m^3$). The concentration resulting from an approximate annual averaging time is 1.4% of the TLV-TWA divided by 420.

0090-30500899-82C AT&T Lab Tube Furnace

Due to the large size of the firing chamber of the AT&T Furnace (-78C), CEPC installed this source to help in producing the end product based on client specifications. Because of the smaller firing chamber, the use of the AT&T Lab Tube Furnace allows CEPC to control with more accuracy the environment inside of the firing chamber. Through the use of the AT&T Lab Tube Furnace, CEPC is able to develop a recipe for providing low tolerances associated with the Spinell product.

The AT & T Furnace is operated 24 hours/day, 4 days/week, and 50 weeks/year. The AT&T Lab Tube Furnace is fired electrically. The exhaust from this source is tied into the exhaust stack of the AT&T Furnace (-78C). The emissions from the AT&T Lab Tube Furnace are uncontrolled. The firing cycle is identical to the firing cycle of the AT&T Furnace. The source was not operating during this inspection due to maintenance work.

The organics given off by the firing of the green ware are composed of 4.8% MIBK or MEK, 14% Toluene, 1% Synasol (Ethanol), and 1% Isopropanol, of 5% total composition. The binder is made of either Polyvinyl Butyral, Acryloid B-7 MEK Resin, or Acryloid B-66 MEK. The binder ranges from 5.0% to 9.0% of the total green ware composition.

The plasticizing constituents are made up of either a 0.4% Diisodecyl Glutarate (DIDG), 2.6% Plasticizer 2072 (Stepan), and 0.0% Santicizer 160 composition or a 0.0% Diisodecyl Glutarate (DIDG), 0.0% Plasticizer 2072 (Stepan), and 3.0% to 9.0% Santicizer 160 composition. The plasticizer ranges from 3.0% to 9.0% of the total green ware composition.

Particulate emissions were previously determined to be limited by BACT [Section 4-8 (e)(2)b]. Based on a process weight rate of 0.0221 lbs/hr (10 grams/hr), the Rule 10.3 (Schedule 2) particulate limitation for this source is 0.003 lbs/hr. The limit of 0.003 lbs/hr was previously determined to be an appropriate BACT limitation. Actual particulate emissions from this source are too low to quantify.

The estimated actual VOC emissions rate for the volatilized products of green ware are 5.01×10^{-4} lbs/hr. The allowable VOC emissions of 1.44×10^{-3} lbs/hr for the total VOC's emitted from the binder and organic constituents of the solvent mixture for the AT&T Lab Tube Furnace was previously determined to be BACT [Rule 25.3(2)].

A breakdown of the VOC emissions include Toluene, MIBK, MEK, Ethanol, and Isopropanol. Toluene, MIBK, and MEK are listed on EPA's list of 189 hazardous air pollutants to be regulated under Title 3 of the New Clean Air Act Amendments. According to the "Documentation Of The Threshold Limit Values And Biological Exposure Indices" produced by the American Conference of Governmental Industrial Hygienists, neither Toluene, MIBK, MEK, Ethanol, nor Isopropanol are considered to be Human Carcinogens.

As previously determined, SCREEN modeling is not required since the allowable VOC emissions from this source are extremely small.

Based on the allowable emissions for particulate (0.003 lbs/hr) and VOC's (1.44×10^{-3} lbs/hr) and continuous operation, this source was previously determined to be a Minor Pollution Source.

Emission Status

Table I Particulate Emissions

Source	Actual Emissions		Potential Emissions		Allowable Emissions	
	lbs/hr	TPY	lbs/hr	TPY	lbs/hr	TPY
-02C	0.080	0.072	0.100	0.438	0.100	0.090
-23C	0.100	0.280	0.360	1.577	0.360	1.008
-36C	0.005	0.016	0.580	2.540	0.580	1.810
-37C	0.010	0.007	0.120	0.526	0.120	0.078
-46C	0.010	0.010	0.060	0.263	0.060	0.062
-47C	0.010	0.031	0.530	2.321	0.530	1.654
-65C	0.500	2.184	0.690	3.022	0.690	3.014
-69C	0.029	0.087	0.050	0.219	0.050	0.017
-70C	0.002	0.002	0.010	0.044	0.010	0.013
-71C	0.029	0.087	0.050	0.219	0.050	0.017
-73C	0.240	0.749	0.500	2.190	0.500	1.560
-76C	0.001	0.003	0.001	0.004	0.001	0.003
-77C	0.019	0.059	0.040	0.175	0.040	0.125
-78C	0.048	0.150	0.173	0.758	0.173	0.540
TOTALS	1.083	3.737	3.264	14.296	---	---

Table II VOC Emissions

Source	Actual Emissions		Potential Emissions		Allowable Emissions	
	lbs/hr	TPY	lbs/hr	TPY	lbs/hr	TPY
-23C	2.030	5.684	2.030	8.891	---	---
-36C	4.660	14.539	4.660	20.411	---	---
-38C	0.005	0.005	0.005	0.022	---	---
-47C	0.500	1.560	0.500	2.190	---	---
-65C	0.720	3.145	0.720	3.154	---	---
-66C	0.210	0.005	0.210	0.920	---	---
-72C	0.093	0.406	0.100	0.438	0.100	0.437
-74C	1.670	2.171	1.950	8.541	1.950	2.535
-75C	0.066	0.288	0.100	0.438	0.100	0.437
-76C	0.058	0.174	0.146	0.640	0.146	0.438
-77C	0.024	0.075	0.047	0.206	0.047	0.147
-78C	0.341	1.064	0.513	2.247	0.513	1.601
-81C	0.114	0.356	0.154	0.675	0.154	0.480
-82C	0.0005	0.001	0.0014	0.006	0.0014	0.003
TOTALS	10.492	29.473	11.136	48.779	---	---

Table III HAP Emissions

Source	Actual Emissions		Potential Emissions		Allowable Emissions	
	lbs/hr	TPY	lbs/hr	TPY	lbs/hr	TPY
Hydrazine (Monohydrate) [CAS# 302-01-2]						
-23C	0.360	1.008	0.360	1.577	---	---
Xylene [CAS# 1330-20-7]						
-36C	1.823	5.688	1.823	7.985	---	---
Hydrogen Chloride [CAS# 7647-01-0]						
-23C	5.284	14.795	5.284	23.144	---	---
-37C	0.062	0.040	0.062	0.272	---	---
-46C	0.008	0.008	0.008	0.035	---	---
-67C	0.100	0.437	0.100	0.438	---	---
TOTALS	5.454	15.280	5.454	23.889	---	---
Methyl Ethyl Ketone [CAS# 78-93-3]						
-77C	0.001	0.003	0.002	0.009	0.002	0.006
-78C	0.017	0.053	0.026	0.114	0.026	0.081
-81C	0.006	0.019	0.009	0.039	0.009	0.028
-82C	2.54×10^{-5}	6.1×10^{-5}	38.12×10^{-5}	0.002	38.12×10^{-5}	0.001
TOTALS	0.024	0.075	0.037	0.164	---	---
Methyl Isobutyl Ketone [CAS# 108-10-1]						
-72C	0.046	0.201	0.050	0.219	0.050	0.218
-74C	0.835	1.086	0.835	3.657	---	---
-75C	0.033	0.144	0.033	0.145	---	---
-76C	0.012	0.036	0.012	0.053	---	---
-77C	0.001	0.003	0.002	0.009	0.002	0.006
-78C	0.017	0.053	0.026	0.114	0.026	0.081
-81C	0.006	0.019	0.009	0.039	0.009	0.028
-82C	2.54×10^{-5}	6.1×10^{-5}	38.12×10^{-5}	0.002	38.12×10^{-5}	0.001
TOTALS	0.950	1.542	0.967	4.238	---	---

Table III Cont. HAP Emissions

Source	Actual Emissions		Potential Emissions		Allowable Emissions	
	lbs/hr	TPY	lbs/hr	TPY	lbs/hr	TPY
Toluene [CAS# 108-88-3]						
-36C	1.823	5.688	1.823	7.985	---	---
-72C	0.046	0.201	0.050	0.219	0.050	0.218
-74C	0.835	1.086	0.835	3.657	---	---
-75C	0.033	0.144	0.033	0.145	---	---
-76C	0.035	0.105	0.035	0.153	---	---
-77C	0.007	0.022	0.014	0.061	0.014	0.044
-78C	0.101	0.315	0.151	0.661	0.151	0.471
-81C	0.034	0.106	0.050	0.219	0.050	0.156
-82C	1.48×10^{-4}	3.6×10^{-4}	2.23×10^{-4}	0.001	2.23×10^{-4}	0.001
TOTALS	2.914	7.667	2.991	13.101	---	---

Table IV Misc. Gaseous Emissions

Source	Actual Emissions		Potential Emissions		Allowable Emissions	
	lbs/hr	TPY	lbs/hr	TPY	lbs/hr	TPY
Acetone						
-36C	0.405	1.264	0.405	1.774	---	---
Polyalkaline Glycol						
-65C	0.720	3.145	0.720	3.154	---	---
Freon 113						
-23C	1.500	4.200	1.500	6.570	---	---
Hydrogen Sulfide (H_2S)						
-46C	0.023	0.024	0.023	0.101	---	---
Nitric Acid (HNO_3)						
-23C	0.050	0.140	0.050	0.219	---	---
Ammonium Hydroxide (NH_4OH)						
-68C	0.100	0.437	0.100	0.438	---	---
Chromic Acid						
-37C	0.180	0.117	0.180	0.788	---	---
-67C	0.100	0.437	0.100	0.438	---	---
TOTALS	0.280	0.554	0.280	1.226	---	---
Sodium Hydroxide (NaOH)						
-23C	0.050	0.140	0.050	0.219	---	---
-68C	0.100	0.437	0.100	0.438	---	---
TOTALS	0.150	0.577	0.150	0.657	---	---
Sulfur Dioxide (SO_2)						
-02C	3.6×10^{-5}	3.2×10^{-3}	0.306	1.340	0.306	0.275
-47C	6.0×10^{-4}	0.002	0.624	2.733	0.624	1.947
-76C	1.0×10^{-4}	3.0×10^{-4}	0.434	1.901	0.434	1.302
TOTALS	7.4×10^{-4}	0.002	1.364	5.974	---	---
Nitrogen Oxides (NO_x)						
-02C	0.044	0.040	0.132	0.578	0.132	0.119
-47C	0.210	0.655	0.269	1.178	0.269	0.839
-76C	0.010	0.030	0.010	0.044	---	---
TOTALS	0.264	0.725	0.411	1.800	---	---

Table V Misc. Gaseous Emissions Cont.

Source	Actual Emissions		Potential Emissions		Allowable Emissions	
	lbs/hr	TPY	lbs/hr	TPY	lbs/hr	TPY
Isopropanol						
-77C	0.0005	0.002	0.001	0.004	0.001	0.003
-78C	0.0072	0.022	0.011	0.048	0.011	0.034
-81C	0.002	0.006	0.004	0.018	0.004	0.012
-82C	1.06×10^{-5}	2.54×10^{-5}	1.59×10^{-5}	6.96×10^{-5}	1.59×10^{-5}	3.82×10^{-5}
TOTALS	0.0097	0.030	0.016	0.070	---	---
Ethanol						
-36C	0.405	1.264	0.405	1.774	---	---
-76C	0.0025	0.0075	0.0025	0.011	---	---
-77C	0.0005	0.0016	0.001	0.004	0.001	0.003
-78C	0.0072	0.022	0.011	0.048	0.011	0.034
-81C	0.002	0.006	0.004	0.018	0.004	0.012
-82C	1.06×10^{-5}	2.54×10^{-5}	1.59×10^{-5}	6.96×10^{-5}	1.59×10^{-5}	3.82×10^{-5}
TOTALS	0.417	1.301	0.424	1.855	---	---

Table VI VOC Emissions for the Golden Astro Furnace (-80C)

Pollutants	Actual Emissions		Allowable Emissions	Potential Emissions	
	lbs/hr	TPY	lbs/hr	TPY[1]	TPY[2]
Binder -					
Polyvinyl Butyral	9.25E-5	6.02E-5			4.1E-4
Acryloid B-7 MEK Resin	4.38E-3	2.85E-3			1.9E-2
Acryloid B-66 100% Resin	1.75E-4	1.14E-4			7.7E-4
Organic Constituents of Solvent Mixture -			0.020*	0.0876	
MIBK or MEK	7.91E-4	5.14E-4			3.5E-3
Ethanol (Synasol)	1.65E-4	1.07E-4			7.2E-4
Isopropanol	1.65E-4	1.07E-4			7.2E-4
Toluene	2.31E-3	1.50E-3			1.0E-2

1 Allowable emissions based on 8,760 hours/year, potential operation.
2 Actual emissions based on 8,760 hours/year, potential operation.
* Allowable emission rate based on BACT [Section 4-41, Rule 25.3 (2)].
Note: Only one of the three binders is used per batch of green ware produced. Either the MIBK or MEK of the solvent mixture is used per batch of green ware produced.

Table VII HAP Emissions for the Golden Astro Furnace (-80C)

Pollutant	Actual Emissions			Potential Emissions
	lbs/hr	lbs/yr	TPY	TPY
MIBK	7.91E-4	1.03	5.14E-4	3.5E-3
MEK	7.91E-4	1.03	5.14E-4	3.5E-3
Toluene	2.31E-3	3.00	1.50E-3	1.0E-2

Note: Either MIBK or MEK is used per batch of green ware produced.

Recommendation

I recommend issuance of certificates of operation for Certificate Nos. -02C, -23C, -36C, -37C, -38C, -46C, -47C, -65C, -66C, -67C, -68C, -69C, -70C, -71C, -72C, -73C, -74C, -75C, -76C, -77C, -78C, -79C, 80C, 81C and -82C. These certificates of operation should expire on March 1, 1995. The following special conditions should be included with the issuance of each source listed.

0090-30500899-69C Nickel Furnace Exhaust, Five (5) Furnaces

1. The maximum allowable particulate emissions rate from the source is 0.050 lbs/hr.

2. This particulate emission limitation is Best Available Control Technology as determined by the Director, the Chattanooga-Hamilton County Air Pollution Control Bureau.

0090-30500899-70C Nickel Furnace Room Exhausts

1. The maximum allowable particulate emissions rate from the source is 0.010 lbs/hr.

2. This emission limitation is Best Available Control Technology (BACT) as determined by the Director, the Chattanooga-Hamilton County Air Pollution Control Bureau.

0090-30500899-71C Nickel Furnace Exhaust, Four (4) Furnaces

1. The maximum allowable particulate emissions rate from the source is 0.050 lbs/hr.

2. The particulate emission limitation is Best Available Control Technology (BACT) as determined by the Director, the Chattanooga-Hamilton County Air Pollution Control Bureau.

0090-30500899-72C Ball Mills Area Exhaust Fan

1. The maximum allowable VOC emissions rate from the source is 0.10 lbs/hr.

2. This emission limitation is Best Available Control Technology (BACT) as determined by the Director, the Chattanooga-Hamilton County Air Pollution Control Bureau.

0090-30500899-73C Ball Mills (7 Units) with Baghouse

1. The maximum allowable particulate emissions rate from the source is 0.50 lbs/hr.

2. This emission limitation is Best Available Control Technology (BACT) as determined by the Director, the Chattanooga-Hamilton County Air Pollution Control Bureau.

3. Emissions testing for this source, if required by the Director, the Chattanooga-Hamilton County Air Pollution Control Bureau, shall, at a minimum, consist of and be performed in accordance with EPA Test Methods 5 and 9, Title 40 Code of Federal Regulations Part 60, Appendix A, (July 1, 1991) and in accordance with the provisions of Section 4-3 of the Chattanooga Air Pollution Control Ordinance.

0090-30500899-74C Tape Casters (2 Identical Yokoyama Units; 1 Smaller Interamics Unit) with Fume Oxidizer

1. The maximum allowable VOC emission rate for each of the Yokoyama tape casters shall not exceed 0.75 lbs/hr per 80 lbs process weight.

2. The maximum allowable VOC emission rate for the Interamics tape caster shall not exceed 0.375 lbs/hr per 40 lbs process weight.

3. This source shall be limited to the operation of not more than any two of the three Tape Casters during any time period.

4. These emissions limitations are Best Available Control Technology (BACT) as determined by the Director, the Chattanooga-Hamilton County Air Pollution Control Bureau.

5. Emissions testing for this source, if required by the Director, the Chattanooga-Hamilton County Air Pollution Control Bureau, shall, at a minimum, consist of and be performed in accordance with EPA Test Method 25A, Title 40 Code of Federal Regulations Part 60, Appendix A, (July 1, 1991) and in accordance with the provisions of Section 4-3 of the Chattanooga Air Pollution Control Ordinance.

0090-30500899-75C Tape Caster Area Exhaust Fan

1. The maximum allowable VOC emissions rate from the source is 0.10 lbs/hr.

2. This emission limitation is Best Available Control Technology (BACT) as determined by the Director, the Chattanooga-Hamilton County Air Pollution Control Bureau.

0090-30500899-76C GCA Vacuum Furnace

1. The maximum allowable particulate emission rate for this source shall not exceed 0.001 lbs/hr.

2. The maximum allowable VOC emission rate for this source shall not exceed 0.15 lbs/hr.

3. These emission limitations are Best Available Control Technology (BACT) as determined by the Director, the Chattanooga-Hamilton County Air Pollution Control Bureau.

0090-30500899-77C Deltech Furnace

1. The maximum allowable particulate emission rate for this source shall not exceed 0.04 lbs/hr.

2. The maximum allowable VOC emission rate for this source shall not exceed 0.047 lbs/hr.

3. These emission limitations are Best Available Control Technology (BACT) as determined by the Director, the Chattanooga-Hamilton County Air Pollution Control Bureau.

0090-30500899-78C AT & T Furnace

1. The maximum allowable particulate emission rate for this source shall not exceed 0.17 lbs/hr.

2. The maximum allowable VOC emission rate for this source shall not exceed 0.51 lbs/hr.

3. These emission limitations are Best Available Control Technology (BACT) as determined by the Director, the Chattanooga-Hamilton County Air Pollution Control Bureau.

0090-30500899-80C

1. The maximum allowable VOC emission rate for this source shall not exceed 0.02 lbs/hr.

2. These emission limitations are Best Available Control Technology (BACT) as determined by the Director, the Chattanooga-Hamilton County Air Pollution Control Bureau.

0090-30500899-81C Camco Furnace

1. The maximum allowable VOC emission rate for this source shall not exceed 0.15 lbs/hr.

2. These emission limitations are Best Available Control Technology (BACT) as determined by the Director, the Chattanooga-Hamilton County Air Pollution Control Bureau.

3. Testing of this source to determine the emissions of volatile organic compounds, if required by the Director, the Chattanooga-Hamilton County Air Pollution Control Bureau, shall at a minimum, consist of and be performed in accordance with EPA Test Method 25A, Title 40 Code of Federal Regulations Part 60, Appendix A (July 1, 1991).

0090-30500899-82C AT&T Lab Tube Furnace

1. The maximum allowable VOC emission rate for this source shall not exceed 1.44×10^{-3} lbs/hr.

2. This emission limitation is Best Available Control Technology (BACT) as determined by the Director, the Chattanooga-Hamilton County Air Pollution Control Bureau.